

3.3.2 Number of research papers per teachers in the Journals notified on UGC website during the last five years.

| Title of paper   | Name of the author/s  | Department of the teacher | Name of journal  | Year of publication | ISSN number  | Link to the recognition in UGC  |   |  |
|--|---|---------------------------|--|---------------------|--|---|---|--|
|  |   |                           |  |                     |  | Link to website of the Journal  | Link to article/paper/abstract of the article   | listed in UGC Care list/Scopus/Web of Science/other, |
| <b>2017-18</b>   |   |                           |  |                     |  |   |   |  |
| A Filtering System for Unwanted Messages from OSN User Walls using Text Classification           | Harsha V. Talele, Prativina V. Talele   | Computer                  | <i>International Journal of Current Engineering and Scientific Research (IJCESR)</i> | 2017                | ISSN (PRINT): 2393-8374, (ONLINE): 2394-0697, Volume 4, Issue 7, pp. 28-31, 2017 | <a href="http://troindia.in/journal/ijcesr/index.html">http://troindia.in/journal/ijcesr/index.html</a> | <a href="http://troindia.in/journal/ijcesr/vol4iss7part5/28-31.pdf">http://troindia.in/journal/ijcesr/vol4iss7part5/28-31.pdf</a>         | peer reviewed  |
| Frequent Item Set using Apriori and Map Reduce algorithm: An Application in Inventory Management | Kranti Patil, Jayashree Fegade, Diksha Chiramade, Srujan Patil, Pradnya A. Vikhar | Computer                  | <i>International Journal of Recent Development in Engineering and Technology</i>     | 2018                | (ISSN 2347 - 6435 (Online)) Volume 7, Issue 5                                    | <a href="http://www.ijrdet.com">www.ijrdet.com</a>  | <a href="https://www.ijrdet.com/files/Volume7Issue5/IJRDET_0518_02.pdf">https://www.ijrdet.com/files/Volume7Issue5/IJRDET_0518_02.pdf</a> | Peer Reviewed  |

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|---|---|------------|---|------|--|---|---|---------------|
| Content based Image Retrieval (CBIR) System using Threshold based Color Layout Descriptor (CLD) and Edge Histogram Descriptor (EHD) | Pradnya A. Vikhar, P. P. Karde                | Computer   | International Journal of Computer Applications (IJCA)                         | 2018 | ISSN: 0975 – 8887 Volume 179, Issue 41, PP- 39-43, , | <a href="https://www.ijcaonline.org/">https://www.ijcaonline.org/</a> | <a href="https://www.ijcaonline.org/archives/volume179/number41/29358-2018916985">https://www.ijcaonline.org/archives/volume179/number41/29358-2018916985</a>     | Peer Reviewed |
| Analysis of Power Quality Improvement by using D-STATCOM  | Prof.Kalpesh Mahajan                          | Electrical | International Journal of Advanced Research And Innovative Ideas in Education  | 2016 | 2395-4396  | <a href="http://www.ijarie.com">www.ijarie.com</a>                    | <a href="http://www.ijarsmt.com/docs/issues/snehal-b-nerkar-prof-k-mahajan-263.pdf">http://www.ijarsmt.com/docs/issues/snehal-b-nerkar-prof-k-mahajan-263.pdf</a> | NO            |
| Enhancement of Active Power Flow Capability of Standard IEEE 14 Bus System using Unified Power Flow Controller                      | Suvarna Vitthal Patil; Kalpesh Mahaja         | Electrical | International Journal for Science Research and Development (IJSRD)            | 2018 | ISSN(Online)-2321-0613                               | <a href="http://ijsrd.com">http://ijsrd.com</a>                       | <a href="http://www.ijrsd.com/articles/IJSRDV5I110261.pdf">http://www.ijrsd.com/articles/IJSRDV5I110261.pdf</a>   | NO            |
| Analysis of Solar Power Generation With A Multilevel Inverter   | Gaikwad Dilip Dadasaheb; Prof.Kalpesh Mahajan | Electrical | International Journal of Advance Research & Innovative Ideas in Education     | 2017 | IJARIE- ISSN(O)-2395-4396                            | <a href="http://ijarie.com/">http://ijarie.com/</a>                   | ANALYSIS_OF_SOLAR_POWER_GENERATION_WITH_A_MULTILEVEL_INVERTER_ijarie7257.pdf  | NO            |
| Design and Fabrication of PLC Based Conveyor System with Programmable Stations  | Mr.Manoj Nehete                               | Mechanical | International Journal of Analytical, Experimental and Finite Element Analysis | 2017 | e-ISSN: 2394-5141, p-ISSN: 2394-5133, pp 53-58       | <a href="https://www.rame.org">https://www.rame.org</a>               | <a href="https://www.rame.org.in/pdf/papers4/issue3/v4paper6.html">https://www.rame.org.in/pdf/papers4/issue3/v4paper6.html</a>                                   | NO            |
| PLC Based 2D pneumatic palletizer Design & Manufacturing  | Mr.Manoj Nehete                               | Mechanical | International Journal of Analytical, Experimental and Finite Element Analysis | 2017 | ( e-ISSN 2394-5141 & p-ISSN 2394-5133                | <a href="https://www.rame.org.in">https://www.rame.org.in</a>         | <a href="https://www.rame.org.in/pdf/papers4/issue3/v4paper6.html">https://www.rame.org.in/pdf/papers4/issue3/v4paper6.html</a>                                   | NO            |

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|--|----------------------|------------|---|------|--|---|---|----|
| Vibrational analysis of composite leaf spring by finite element method                                     | Mr.Hemant Nehete     | Mechanical | International journal   | 2018 | ISSN2349-6010                          | <a href="https://www.ijirst.org">https://www.ijirst.org</a> | <a href="https://www.ijirst.org/articles/IJRSTV4I8005.pdf">https://www.ijirst.org/articles/IJRSTV4I8005.pdf</a>   | NO |
| Vibrational analysis of leaf spring of different composition material                                      | Prof.Hemant Nehete   | Mechanical | International journal   | 2017 | ISSN2454-535X                          | <a href="https://www.ijirst.org">https://www.ijirst.org</a> | <a href="https://www.ijirst.org/articles/IJRSTV4I8005.pdf">https://www.ijirst.org/articles/IJRSTV4I8005.pdf</a>   | NO |
| Experimental investigation of pool boiling and optimization of critical heat flux by using AI203 Nanofluid | Prof.Vilas B. Jadhav | Mechanical | INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY | 2018 | ISSN: 2277-9655                        | <a href="http://www.ijesrt.com">http://www.ijesrt.com</a>   | <a href="http://www.ijesrt.com/issues%20pdf%20file/Archive-2018/May-2018/75.pdf">http://www.ijesrt.com/issues%20pdf%20file/Archive-2018/May-2018/75.pdf</a>                                     | NO |
| Analysis of single phase z-source inverter using variable load   | Prof.G.S.Somani      | E&TC       | IJEET   | 2017 | ISSN p: 0976-6545                      | <a href="https://www.iaeme.com/">https://www.iaeme.com/</a> | <a href="https://iaeme.com/MasterAdmin/Journal_uploads/IJEET/VOLUME_8_ISSUE_4/IJEET_08_04_005.pdf">https://iaeme.com/MasterAdmin/Journal_uploads/IJEET/VOLUME_8_ISSUE_4/IJEET_08_04_005.pdf</a> | No |
| Adhar enabled ration distribution and monitoring using smart card  | Prof. J. P. Fegade   | E&TC       | PRATIBHA: IJSSBT, Jan 2018  | 2018 | ISSN: 2277-7261                        | <a href="http://www.ijssbt.org">www.ijssbt.org</a>          | <a href="http://www.ijssbt.org/volume6/pdf/11.pdf">http://www.ijssbt.org/volume6/pdf/11.pdf</a>   | No |
| Design Approach for Automatic Rationing Distribution System  | Prof. J. P. Fegade   | E&TC       | IRJET   | 2017 | e-ISSN: 2395-0056<br>p-ISSN: 2395-0072 | <a href="http://www.irjet.net">www.irjet.net</a>            | <a href="https://www.irjet.net/archives/V4/i12/IRJET-V4I12286.pdf">https://www.irjet.net/archives/V4/i12/IRJET-V4I12286.pdf</a>   | No |

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| A Survey: Offline Handwritten Signature Recognition System                             | Pradnya A. Vikhar Harsha G.Chavan     | Computer | Multidisciplinary Journal of Research in Engineering and Technology,                 | 2018 | ISSN:2348-6953 Vol 5, Issue 3&4, PP: 8-15. Date of publication: Oct 2018         | <a href="http://www.mjret.in/">http://www.mjret.in/</a>   | <a href="https://doc-0g-68-docs.googleusercontent.com/docs/securesc/7aqs0j2jhai56g4a1raa1lfgqgsagi8k/49kg12jt9kqlnvi6urv394nh7h1j1vou/1631903325000/04825729628807681590/00065701254961381396/1_nwy5DQLin95y8a4CuNOXkU6YfLBk-G1?authuser=0">https://doc-0g-68-docs.googleusercontent.com/docs/securesc/7aqs0j2jhai56g4a1raa1lfgqgsagi8k/49kg12jt9kqlnvi6urv394nh7h1j1vou/1631903325000/04825729628807681590/00065701254961381396/1_nwy5DQLin95y8a4CuNOXkU6YfLBk-G1?authuser=0</a> | Peer Reviewed |





# A FILTERING SYSTEM FOR UNWANTED MESSAGES FROM OSN USER WALLS USING TEXT CLASSIFICATION

Harsha Talele<sup>1</sup>, Prativina Talele<sup>2</sup>

## Abstract

Now a days, rapidly increasing the use of online social networks (OSNs). Through this services user's can communicate and transfer any data. The major disadvantage of these Online Social Networking (OSN) services is the lack of privacy for the user's own private space. We use pattern matching and text classification algorithm for accurate filtering results. We propose a system allowing OSN users to have a direct control on the messages posted on their walls. This is a flexible rule-based system that allows users to customize the filtering process applied to their user's profiles. A machine learning technique automatically labeling messages in support of content-based filtering.

**Index Terms:** content-based filtering, filtering rule, filtering system, machine learning , online social networks

## I. INTRODUCTION

We all are using one or more of the networking site for communication that are available now a day. Online Social Network are today's popular interactive medium to communicate, share and announce a important quantity of users information. We transfer different types of content if including free text, video, audio image data. Therefore in Online Social Networks (OSN) there is possibility of posting unwanted content on particular public/private are called in general walls. In this paper we are mainly focus on the text based messages. OSN provide less amount of security in posting the unwanted messages.

Here we introduce some technique which is helpful for filtering unwanted messages. Those techniques are filtering techniques and Black List techniques. This filtering technique are used to remove unwanted contents by using content

based filtering rules, Machine learning approach, according to user's interest and recommends an item. Recommender systems works like content based filtering, collaborative filtering, policy based filtering. Blacklists are directly managed by system and should be able to determine the users to be inserted in the BL and decide a user's retention in BL is finished. Such information is given to the system through a set of rules called BL rules. Additional contribution is that we used pattern recognition technique.

## II. LITERATURE SURVEY

Table I shows the comparison of literature survey:

TABLE I. Comparison of Literature Survey

| Authors Name                                    | Title   | Year | Technique  | Result  |
|---|---|------|--|---|
| Lorienne Roy and R.J.Mooney                     | Content Based Book Recommending Using Learning for Text Categorization[1]       | 2000 | mutual filtering method                          | A system filter content-based messages from user's walls            |
| B. Carminativ e, M.vanetti, E.ferrari, M.Craull | Content Based Filtering In Social Networking Sites Using Web Application [2]    | 2006 | take decision about the message which is blocked | That messages block system run successfully                         |
| Katta Rakesh, Nageswara Rao, Suresh             | A System Approach to Avoid Unwanted Messages using Filtering Methods [3]        | 2009 | Content Base Filtering Methods                   | Avoid Unwanted Messages using Filtering Methods from OSN User Walls |
| Bodicev and M.Sokolov a                         | Message Filtering Techniques for On-Line Socialnetworks[3]                      | 2010 | Fractional Matching method                       | They got text classification of message                             |
| Mayuri uttarwar, Prof. Yogesh blute             | A Review on Customizable Content-Based Message Filtering from OSN User Wall [4] | 2013 | Customizable content-based Message filtering     | filter undesired messages from OSN walls                            |

L. Roy and R.J. Mooney uses mutual filtering method, but in our proposed system content based filtering is used. It explains the content based book proposal system that develops information pulling out and machine learning technique for text categorization.

B. Carminative, M. vanetti, E. ferrari, M. Craull In this the system can generally take decision about the message which is blocked, due to the acceptance depends on statistical information.

Bodicev and M. Sokolova classification of text put in complex and specific terminology need the application of learning process. Fractional Matching method is applied which shrink the text for confining the text characteristic. Fractional matching develops a language model. The output of fractional matching compression provides consistent care of text classification.

### III. ARCHITECTURE

Fig 1 shows the architecture of proposed system. In this architecture following components are included as follows:

1. Content-based filtering
2. Filtered Wall Architecture
3. Short Text Classifier
4. Text Representation

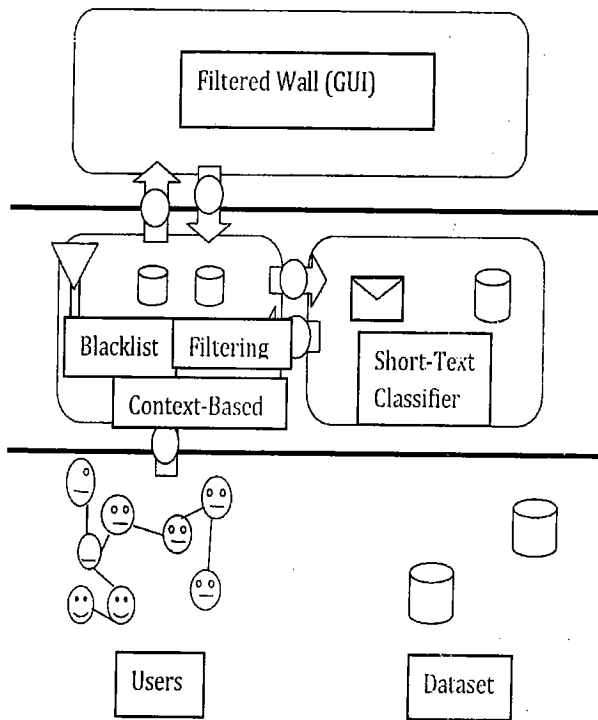


Fig 1. System Architecture

### A. Content-based filtering

Documents processed in content-based filtering are mostly textual in nature and this makes content-based filtering close to text classification. Content-based filtering is mainly based on the use of the ML paradigm according to which a classifier is automatically induced by learning from a set of pre-classified examples. A remarkable variety of related work has recently appeared which differ for the adopted feature extraction methods, model learning and collection of samples. The feature extraction procedure maps text into a compact representation of its content and is uniformly applied to training and generalization phases.

### B. Filtered Wall Architecture

The architecture in support of OSN services is a three-tier structure. The first layer called Social Network Manager (SNM) commonly aims to provide the basic OSN functionalities (i.e. profile and relationship management) whereas the second layer provides the support for external Social Network Applications (SNAs). The supported SNAs may in turn require an additional layer for their needed Graphical User Interfaces (GUIs). According to this reference architecture the proposed system is placed in the second and third layers. In particular users interact with the system by means of a GUI to set up and manage their FRs/BLs. Moreover the GUI provides users with a FW that is a wall where only messages that are authorized according to their FRs/BLs are published.

### C. Short Text Classifier

Established techniques used for text classification work well on datasets with large documents such as newswires corpora but suffer when the documents in the corpus are short. In this context critical aspects are the definition of a set of characterizing and discriminate features allowing the representation of underlying concepts and the collection of a complete and consistent set of supervised examples. Our study is aimed at designing and evaluating various representation techniques in combination with a neural learning strategy to semantically categorize short texts.

D. Text Representation

The extraction of an appropriate set of features by which representing the text of given document is a crucial task strongly affecting the performance of overall classification strategy. Different sets of features for text categorization have been proposed in the literature however the most appropriate feature set and feature representation for short text messages have not yet been sufficiently investigated. Proceeding from these considerations and on the basis of our experience we consider three types of features Bag of Word (BW), Document properties (Dp) and Contextual Features (CF). The first two types of features already used in are endogenous that is they are entirely derived from the information contained within the text of the message.

#### iv. ALGORITHM

##### Filtering Algorithm

Step 1 Start

Step 2 A User tries post the message in a wall.

Step 3 Machine learning checks each word of the message using Bayesian technique.

Step 4 If (Words == Good Words)

Step 5 Message is posted on the wall.

Step 6 Else if (Words == Bad Words)

Step 7 Reject Bad Words using Blacklist and post the filtered message on the wall.

Step 8 Stop

#### v. RESULT

Our system will expected to produce output in different forms:

1] Registration

2] Login

3] In Our system following modules are includes.

##### 1) Account Authentication

1. In this module to check the message id and password.

2. If these two fields are valid, the account is authenticated.

3. Otherwise is not valid.

##### 2) Uploading Messages

1. In this module we will check how many Messages a single person is uploading and how many messages are flagged as spam in history.

2. This messages either spam or non-spam.

3. Spam means the more copies of the single message are send.

4. And it contains more than 20 lines.

##### 3) IP Detection

1. In this module to capture the IP address of the system.

2. That system messages are applied to filtering process.

3. In this process, the message content is filtered.

4. Finally to produce the result of filter.

##### 4) CT Detection

1. In this module to set the threshold value Cs.

2. Cs denotes the fixed length of spam Message.

3. Also to count the number of lines in each Message.

4. If the each Message counts are greater than equal to threshold value.

5. So, these messages are spam Message.

##### 5) PT Detection

1) C<sub>a</sub>- specifies the minimum number of message that machine must send.

2) P- specifies the maximum spam message percentage of a normal machine.

1. This algorithm is used to compute the count of total messages and the count of spam messages of machine.

2. To check this count of total messages are greater than equal to C<sub>s</sub> and the count of spam messages are greater than equal to P.

3. If it's true these messages are spam message.

#### CONCLUSION

We develop a system which filters unwanted messages from OSN user's wall. In previous system, there are some disadvantages like content-based filtering is not allow and any type (political, bad words) of messages can posted on user's wall now in the current system now we used content-based filtering and ruled based filtering where message posted on wall no matter who post them but in current system. We provide matching of message with database words and block those messages if matching. We also display how much percent message match with database word collection. And also, in this

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# Frequent Item Set using Apriori and Map Reduce algorithm: An Application in Inventory Management

Kranti Patil<sup>1</sup>, Jayashree Fegade<sup>2</sup>, Diksha Chiramade<sup>3</sup>, Srujan Patil<sup>4</sup>, Pradnya A. Vikhar<sup>5</sup>

<sup>1,2,3,4,5</sup>KCES's COEIT, Jalgaon, Maharashtra, India.

**Abstract**— Data mining (DM) is a computerized technology that uses complicated algorithms to find relationships in large data bases. Extensive growth of data gives the motivation to find meaningful patterns among the huge data. Sequential pattern provides us interesting relationships between different items in sequential database. Association Rules Mining (ARM) is a function of DM research domain and arise many researchers interest to design a high efficient algorithm to mine association rules from transaction database. It is a universal technique which uses to refine the mining techniques. In computer science and data mining, Apriori is a classic algorithm for learning association rules. Apriori algorithm has been vital algorithm in association rule mining. Apriori algorithm is a realization of frequent pattern matching based on support and confidence measures produced excellent results in various fields. Main idea of this algorithm is to find useful patterns between different set of data. It is a simple algorithm yet having many drawbacks. So Apriori based MapReduce algorithm is proposed. Thus, there have been many approaches to convert many sequential algorithms to the corresponding Map/Reduce algorithms. Thus we presents Map/Reduce algorithm of the legacy Apriori algorithm that has been popular to collect the item sets frequently occurred in order to compose Association Rule in Data Mining. Theoretically, it shows that this algorithm provides high performance computing depending on the number of Map and Reduce nodes.

The used Apriori based MapReduce algorithm will help in reducing multiple scans over the databases by cutting down unwanted transaction records for finding frequent itemsets.

**Keywords**—Map/Reduce, Apriori algorithm, Data Mining, Association Rule

## I. BACKGROUND

Data mining is the essential process of discovering hidden and interesting patterns from massive amount of data where data is stored in data warehouse, OLAP (on line analytical process), databases and other repositories of information. This data may reach to more than terabytes.

Data mining is also called (KDD) knowledge discovery in databases, and it includes an integration of techniques from many disciplines such as statistics, neural networks, database technology, machine learning and information retrieval, etc. Interesting patterns are extracted at reasonable time by KDD's techniques. KDD process has several steps, which are performed to extract patterns to user, such as data cleaning, data selection, data transformation, data preprocessing, data mining and pattern evaluation.

Association rule are the statements that find the relationship between data in any database. Association rule has two parts "Antecedent" and "Consequent". Antecedent is that item which is found in the database, and consequent is the item that is found in combination with the first i.e. the antecedent. Association rule is used to abstract the data by picking the frequently used data in retail store for marketing, inventory control, etc.

Apriori is an algorithm for frequent item set mining and association rule learning over transactional databases. It proceeds by identifying the frequent individual items in the database and extending them to larger and larger item sets as long as those item sets appear sufficiently often in the database. The frequent item sets determined by Apriori can be used to determine association rules which highlight general trends in the database: this has applications in domains such as market basket analysis.

Map/Reduce is an algorithm used in Artificial Intelligence as functional programming. It has been received the highlight since re-introduced by Google to solve the problems to analyze Big Data, defined as more than pita bytes of data in distributed computing environment. It is composed of two functions to specify, "Map" and "Reduce". They are both defined to process data structured in (key, value) pairs.





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## II. INTRODUCTION

Almost all industries stores huge quantities of their operational data in their local and distributed databases. Current developments are producing enormous amount of data day-by-day resulting in the need for persistent storage, analysis and efficient processing of the complex data. Data mining is a new powerful technology with great potential which discovers Information within the data that queries and reports can't effectively reveal. Current developments are producing enormous amount of data day-by-day resulting in the need for persistent storage, analysis and efficient processing of these complex data. Almost all industries stores huge quantities of their operational data in their local and distributed databases. These data can be used for analyzing customer trends which can be helpful in marketing the products to maximize profit and to efficiently manage the inventory.

The mining of Association Rules helps to extract interesting patterns, relationships or associations between the item sets in a transactional database. The Apriori Algorithm can be used for the mining of Association Rules which involves Frequent Item set Mining and Association Rule Generation over the operational data stored in transactional databases. However, processing of such voluminous data requires greater processing capabilities as the data is distributed in nature. Cloud computing helps in setting up an infrastructure required for distributed environment and enables companies to consume compute resources by increasing the capability of the shared resources. In this project we develop a programming model called MapReduce for processing massive datasets and it provides reliability, scalability and fault tolerance. In our work, we are implementing an efficient Apriori algorithm with MapReduce model.

## III. METHODOLOGY

In this section we explain the overall view of the Apriori based MapReduce algorithm:

To implement an Apriori algorithm on MapReduce framework the main tasks are to design two independent map and reduce functions for the algorithm and to convert the datasets in the form of (key, value) pairs. In MapReduce programming, all the mapper and reducer on different machines execute in parallel fashion but the final result is obtained only after the completion of reducer. If algorithm is recursive, then we have to execute multiple phase of map-reduce to get the final result.

Phases of performing Apriori based MapReduce algorithm:

### > Map:

Map is the name of a higher-order function that applies a given function to each element of a list.

### > Reduce:

Reduce is the name of a higher-order function that analyze a recursive data structures and recombine through use of a given combining operation the results of recursively processing its constituent parts, building up a return value.

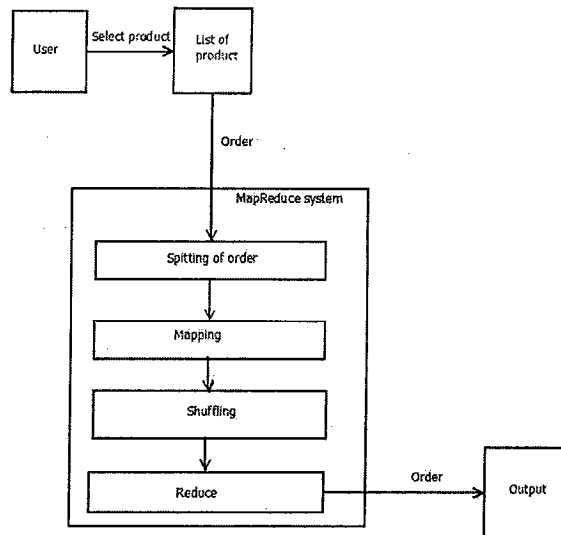


Figure1: Block Diagram for Apriori based MapReduce algorithm

Apriori algorithm is an iterative process and its two main components are candidate item sets generation and frequent item sets generation. In each scan of database, mapper generates local candidates and reducer sums up the local count and results frequent item sets. The count distribution parallel version of Apriori is best suited on MapReduce algorithm whereas to implement data distribution algorithm we have to control the distribution of data which is automatically controlled by MapReduce algorithm.

MapReduce takes an input, splits it into smaller parts, execute the code of the mapper on every part, then gives all the results to one or more reducers that merge all the results into one.



**IV. IMPLEMENTATION**

Here preprocessing means to be the preparation of datasets for identifying the missing, not applicable data values. Partitioning indicates the work of splitting up data to various data nodes and then the map and reduce functions are carried out.

The three important phases of reducer are:

Shuffle, Sort and Reduce.

During Mapper phase calculation, execution and distribution of data takes place. So this is very important to derive a strategy to deal with this issue. In this phase programmer writes his/her logic that will deal with the data. Mapper phase works parallel and to execute code as fast as possible.

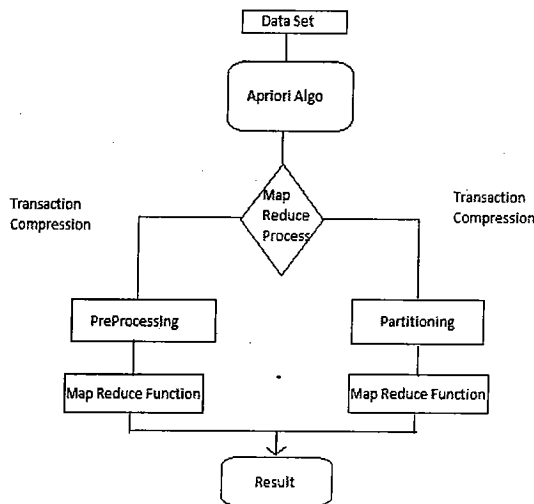


Figure 2: Architecture of Apriori and Mapreduce

**A. MapReduce Algorithm**

MapReduce is a parallel programming model designed for parallel processing of large volumes of data by breaking the job into independent tasks across a large number of machines. MapReduce is inspired from the list processing languages e.g. LISP. It uses two list processing idioms: map and reduce. Based on it a MapReduce program consists of two functions Mapper and Reducer which runs on all machines in a cluster. The input and output of these functions must be in form of (key, value) pairs.

1. The Mapper takes the input  $(k_1, v_1)$  pairs from HDFS and produces a list of intermediate  $(k_2, v_2)$  pairs. An optional Combiner function is applied to reduce communication cost of transferring intermediate outputs of mappers to reducers. Output pairs of mapper are locally sorted and grouped on same key and feed to the combiner to make local sum.
2. The intermediate output pairs of combiners are shuffled and exchanged between machines to group all the pairs with the same key to a single reducer. This is the only one communication step takes place and handle by the MapReduce platform. There is no other communication between mappers and reducers take place. The Reducer takes  $k_2$ , list  $(v_2)$  values as input, make sum of the values in list  $(v_2)$  and produce new pairs  $(k_3, v_3)$ . Figure 2 illustrates the work flow of MapReduce.

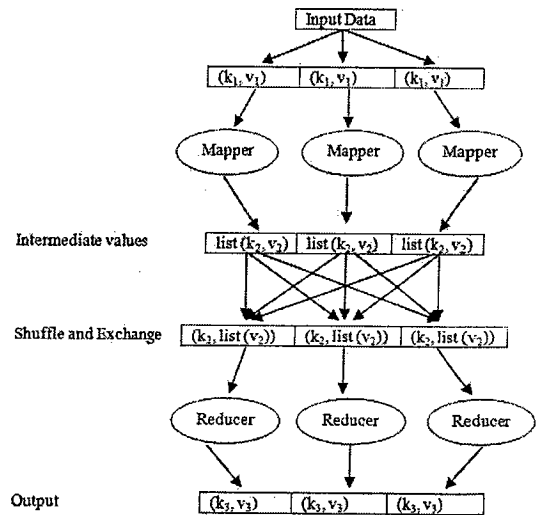


Figure 3: MapReduce Model.

MapReduce is a simplified programming model since all the parallelization, inter-machine communication and fault tolerance are handled by run-time system.

**B. Apriori Algorithm on MapReduce**

To implement an algorithm on MapReduce framework the main tasks are to design two independent map and reduce functions for the algorithm and to convert the datasets in the form of (key, value) pairs. In MapReduce programming, all the mapper and reducer on different machines execute in parallel fashion but the final result is obtained only after the completion of reducer. If algorithm is recursive, then we have to execute multiple phase of map-reduce to get the final result.

Apriori algorithm is an iterative process and its two main components are candidate item sets generation and frequent item sets generation. In each scan of database, mapper generates local candidates and reducer sums up the local count and results frequent item sets. The count distribution parallel version of Apriori is best suited on where as to implement data distribution algorithm we have to control the distribution of data which is automatically controlled by.

The first step of the algorithm is to generate frequent 1-itemsets  $L_1$  which is illustrated in Figure 3 by an example. HDFS breaks the transactional database into blocks and distribute to all mappers running on machines. Each transaction is converted to (key, value) pairs where key is the TID and value is the list of items i.e. transaction. Mapper reads one transaction at a time and output (key, value) pairs where key is each item in transaction and value is 1. The combiner combines the pairs with same key and makes the local sum of the values for each key. The output pairs of all combiners are shuffled & exchanged to make the list of values associated with same key, as (key, list (value)) pairs. Reducers take these pairs and sum up the values of respective keys. Reducers output (key, value) pairs where key is item and value is the support count  $\geq$  minimum support, of that item. Final frequent 1-itemsets  $L_1$  is obtained by merging the output of all reducers.

To generate frequent k-item sets  $L_k$ , each mapper reads frequent item sets  $L_{k-1}$  from previous iteration and generates candidate item sets  $C_k$  from  $L_{k-1}$  as in traditional algorithm. A candidate item set in  $C_k$  is selected as key and assigned a value 1, if it is present in the transaction assigned to the mapper. Now we have (key, value) pairs where key is k-item set and value is 1. All the remaining procedures are the same as generation of  $L_1$ . Table 2 depicts the algorithms corresponding to mapper, combiner and reducer for Apriori algorithm.

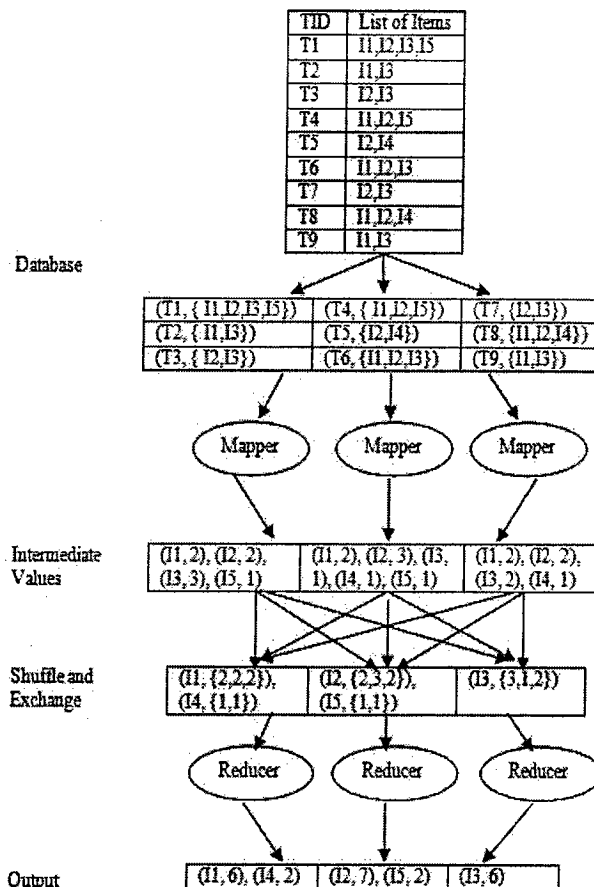
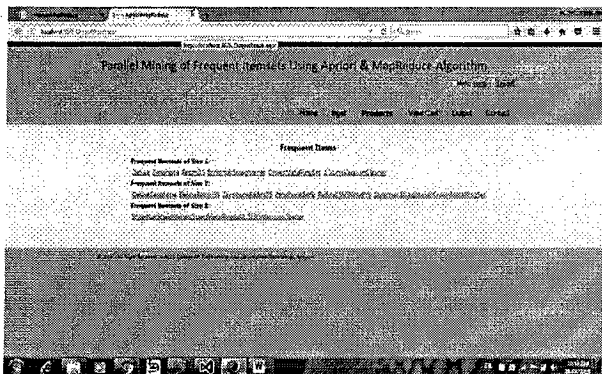
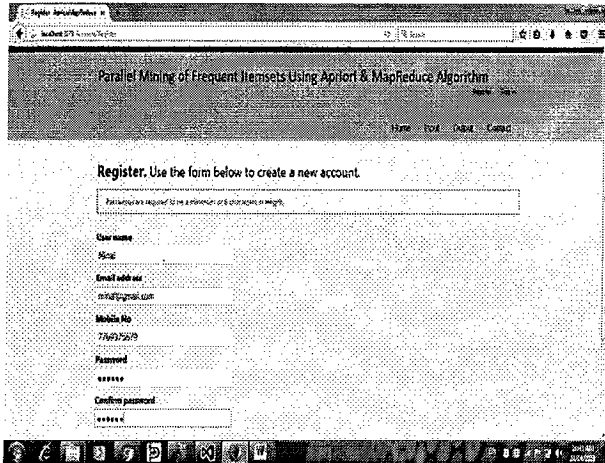


Figure 3: Generation of frequent 1 item set

**V. RESULT**

The Apriori based MapReduce algorithm is very useful for all industries. Almost all industries stores huge quantities of their operational data in their local and distributed databases. These data can be used for analyzing customer trends which can be helpful in marketing the products to maximize profit and to efficiently manage the inventory. Thus, Apriori based MapReduce algorithm can be used which will help in reducing multiple scans over the databases by cutting down unwanted transaction records as well as redundant generation of sub-items while pruning the candidate item sets.





## VI. CONCLUSION

Data mining is emerged as an important area of development with the voluminous data generated during the transactions. The mining of Association Rules helps to extract interesting patterns, relationships or associations between the item sets in a transactional database. The Apriori Algorithm can be used for the mining of Association Rules which involves Frequent Item set Mining and Association Rule Generation over the operational data stored in transactional databases.

The project uses Apriori-Map/Reduce Algorithm which will help in reducing multiple scans over the databases by cutting down unwanted transaction records to gain higher performance than the sequential algorithm as the map and reduce nodes get added.

Same approach can be applicable in various areas like clinical big data analysis, Graph pattern matching, Geospatial Query processing for the identification of frequent item sets.

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# Content based Image Retrieval (CBIR) System using Threshold based Color Layout Descriptor (CLD) and Edge Histogram Descriptor (EHD)

Pradnya A. Vikhar  
Research Scholar,  
SSGB Amravati University, Amravati

P. P. Karde  
PhD, Head, Department of Computer Engineering,  
Government Polytechnic, Amravati

## ABSTRACT

The accuracy of any Content Based Image Retrieval (CBIR) system is depend on the accuracy of features extracted from the images. Therefore feature extraction is the first and most important step to develop the CBIR system. Instead of using single feature, most common CBIR system uses combination of color, texture and/or shape to accurately represent an image. MPEG-7 feature extraction provides standards set of descriptors to represent the images and are widely used in many applications.

In this paper the concept and area of content based image retrieval system is introduced first. Further it covers the overview of basic MPEG-7 visual feature descriptor; CLD (Color Layout Descriptor) and edge histogram descriptor (EHD) to extract the contents from images. To reduce the overall searching process the advancement in CLD and EHD is suggested by introducing the concept of thresholding.

## General Terms

Image Retrieval, MPEG-7 feature Extraction Descriptors.

## Keywords

CBIR, Feature extraction, MPEG-7, Color Layout Descriptor (CLD), Edge Histogram Descriptor (EDH)

## 1. INTRODUCTION

Due to rapid enhancement in digital technology, huge amount of digital information in the form of images and videos is available in recent years. Also gigabytes of new digital information is generated and transmitted everyday [1][2]. Today's technology demands the use of this digital information in form of image in various domains including bioinformatics, medicine, entertainment, designing, advertisement and engineering science. All this visual information is useless, if there is no proper mechanism to effectively store and retrieve these images.

In early days, images were represented by text and then text-based concept of traditional database management system was used to search and retrieve images. As the approach is based on text-based search, it is commonly known as Text-based Image Retrieval (TBIR) [3]. The problems in front of Text-Based image retrieval (TBIR) system became more severe, as volume of digital images produced increased dramatically in various fields of science and engineering. The other and main difficulty faced by this approach is to describe rich content in image manually. It is very expansive and obviously subjective task. This is driving force behind the emergence of Content Based Image Retrieval (CBIR) system [1][3]. In CBIR system manual representation of images by text- based key words is replaced by, their own visual content, such as color, texture

and shape. Since 1990s, it is an active area of research and development. Exhaustive efforts have been undertaken by many researchers to build efficient and effective CBIR system. Most of the work in this area is focused on feature extraction, similarity matching, indexing (to sort output images based on certain attributes), relevance feedback (take users view to display the result). [1][2]. The study of literature proves that if the number of features are combined the resultant CBIR system gives accurate output. [4]

The purpose of this paper is to focus on feature extraction using Color Layout Descriptor (CLD) and Edge Histogram Descriptor (EHD)[5][6]. CLD and EHD belongs to family of MPEG-7 descriptor standard which includes standardized tools to enable detail description of visual information. To develop more efficient CBIR system, these descriptors are refined and modified using the concept of thresholding. This will reduce the search space which results in efficient CBIR system.

## 2. CONTENT BASED IMAGE RETRIEVAL SYSTEM

Application involving automatic indexing, searching, retrieving and browsing of image databases uses concept of Content based image retrieval (CBIR) systems. It is technique which uses visual content (color, shape and texture) of image to search large image database as per users' interest [1][2]. A typical CBIR system is shown in following figure [2]-

In CBIR system, the input query given by user is in the form of image. It has to search the relevant images similar to input image from image database. For this feature extraction of query image and images present in database is done based on certain visual features. It forms feature space (digital representation of image using visual feature).

Then feature vector of query image is matched with feature vectors of images present in feature database. After similarity matching, most similar images results as an output. Thus in the CBIR system, the input given and output produced are both in form images [3].

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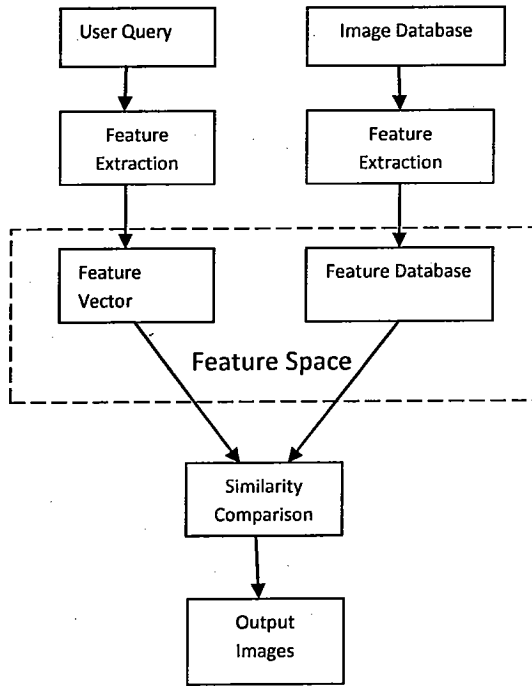


Figure 1: A typical view of CBIR System

### 3. COLOR LAYOUT DESCRIPTOR

In order to describe and interpret visual contents from images, MPEG-7 standard provides different Multimedia Descriptors. These MPEG-7 visual standard descriptors offer interoperability across different multimedia database systems [6]. MPEG-7 provides standardized descriptors for visual, audio and video retrieval. Main visual features descriptors are color descriptors, shape descriptors and texture descriptors.

A color layout descriptor (CLD) is used to extract the spatial distribution of color in an image. The feature extraction process divided into two parts; grid based representative color selection and discrete cosine transform with quantization.

Color is the most important visual content to recognize or identify the image, therefore it is possible to use colors to describe and represent an image. The MPEG-7 standard has tested the most efficient procedure to describe the color and has selected those that have provided more satisfactory results.

The typical steps to extract the features using CLD are as follows-

1. The image is divided into 64 blocks (8 rows X 8 columns).
2. A representative color was chosen for each block by averaging the RGB values of all the pixels in that block. This results in three 8x8 arrays, one for each color component.
3. Each 8x8 matrix was transformed to the YCbCr color space.
4. These will be again transformed by 8x8 DCT (Discrete Cosine Transform) to obtain three 8x8 DCT matrices of coefficients, one for each YCbCr component.
5. The CLD descriptor was formed by performing zigzag scanning with these three sets of 64 DCT coefficients.

The purpose of the zigzag scan is to group the low frequency coefficients of the 8x8 matrix.

### 3.1 Procedure to form the threshold based clusters using CLD

For each image in dataset match ratio is calculated-

$$MR_i = \int_{i=1}^n \frac{R_{channel} + G_{channel} + B_{channel}}{3} \times CR$$

Where: MR- Match ratio of image i

Rchannel, Gchannel, Bchannel- Values of R,G,B optioned after applying CLD algorithm

$$CR = (1/1000) \text{ constant}$$

use to make truncation

Threshold value is calculated from the input search image

$$CTh = \frac{\sum Vr, Vg, Vb}{3} \times CR$$

Where: Vr,Vg,Vb- Value of R,G,B for searching image

CTh= Threshold value for CLD

CR= Constant divider

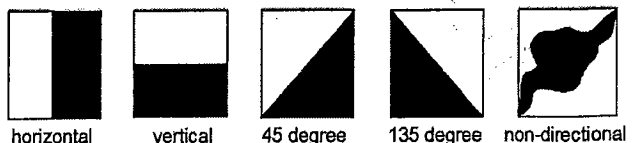
### 4. EDGE ORIENTATION HISTOGRAM

To represent the image content more accurately the methodology suggested here uses, popularly used texture descriptor: Edge Histogram Descriptor (EHD) along with Color Layout Descriptor (CLD).

The EHD [4][6][7] is used to characterizes edges in form of spatial distribution in an image. The process of feature extraction using EHD consists of following steps:

1. The sub-image is defined by dividing the image space into 4x4 non-overlapping blocks. Thus, the image partition always yields 16 equal-sized sub-images regardless of the size of the original image.
2. To characterize the sub-image, then generate a histogram of edge distribution for each sub-image.
3. Edges in the sub-images are categorized into 5 types: vertical, horizontal, 45-degree diagonal, 135-degree diagonal and non-directional edges.
4. Thus, the histogram for each sub-image represents the relative frequency of occurrence of the 5 types of edges in the corresponding sub-image.
5. As a result, each local histogram contains 5 bins. Each bin corresponds to one of 5 edge types. Since there are 16 sub-images in the image, a total of 5x16=80 histogram bins is required.

By applying above steps, the texture features are extracted from the input image and all the images present in image database.



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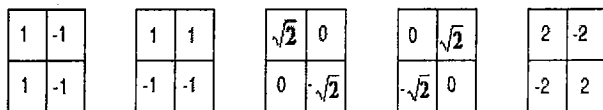


Figure 2. Five types of edges and corresponding filters [7]

#### 4.1 Procedure to form the threshold based clusters using EHD

For each image in dataset match ratio is calculated-

$$MW_i = \int_{i=1}^n \frac{E_v + E_h + E_{d1} + E_{d2} + E_n}{5} \times CR$$

Where: MW<sub>i</sub>- Match weight of image i

E<sub>v</sub>, E<sub>h</sub>, E<sub>d1</sub>, E<sub>d2</sub>, E<sub>n</sub>- Edge values obtained by calculated values of 5bins i.e vertical edge, horizontal edge, 45o diagonal, 135o diagonal and non-direction edge respectively

CR = (1/1000) constant use to make truncation

Threshold value is calculated from the input search image

$$E_{Th} = \frac{\sum V_v, V_h, V_{d1}, V_{d2}, V_n}{5} \times CR$$

Where: V<sub>v</sub>, V<sub>h</sub>, V<sub>d1</sub>, V<sub>d2</sub>, V<sub>n</sub>- Value of 5 bins obtained after applying EHD on searching image

E<sub>Th</sub>= Threshold value for EHD

CR= Constant divider

### 5. METHODOLOGY

In this paper, Threshold based Color Layout Descriptor (CLD) and Edge Histogram Descriptor (EHD) of MPEG-7 is used to develop the Content Based Image Retrieval system. By using threshold based CLD and EHD the color and texture features of image is extracted [8][9]. The true positive and true negative images based on the threshold value are calculated and the result is displayed.

The major steps involved in the proposed methodology are as follows:

Step 1: All the images initially are stored in a directory, called image database. Directory of image database is selected first.

Step 2: Through interface, user select Query image as an input.

Step 3: Using the CLD the color features of input image is extracted, the threshold value is computed.

Step 4: By executing threshold based the Edge Histogram Descriptor (EDH), the threshold value of 5 bins received by applying EHD of image is calculated.

Step 5: Similarly thresholds of all images present in image database is calculated.

Step 6: Based on the threshold value of input image, true positive and true negative images are calculated.

Step 7: True positive images searched by applying threshold based CLD and EHD are displayed as the result of retrieval process.

### 6. RESULT AND DISCUSSION

The approach discussed here is implemented in JAVA. The interface is developed which select image database and generate (load) feature database. Further user select query image whose feature vector is compared with vectors in feature database and output is displayed. The system developed is tested on standard WANG dataset containing 1000 images.

Step 1: User has to first select the input image from the specified directory. This Input the query image is then process to obtain color and texture features of an image.

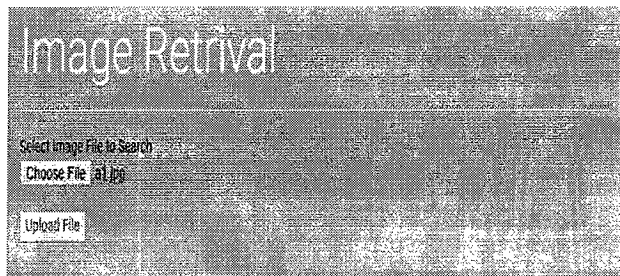


Figure 3. Input Image

Step 2: The input image is then portioned using CLD as shown in following figure. Its Color values are extracted.

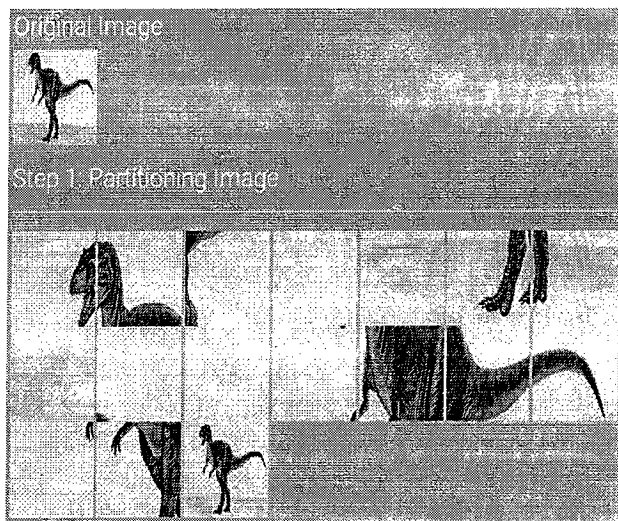


Figure 4. Image partitioning after applying CLD

Step 3: Values of Rchannel, Gchannel and Bchannel after applying CLD are as shown in figure 5.



RGB Value Weighing with searching Image Using CLD

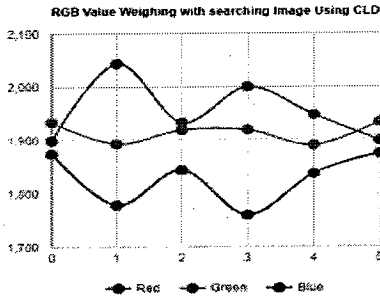


Figure 5. Color Values of input image and other selected images in database

Step 4: By comparing threshold based CLD values of input image and other images present in the image database the search result Threshold based CLD is displayed.

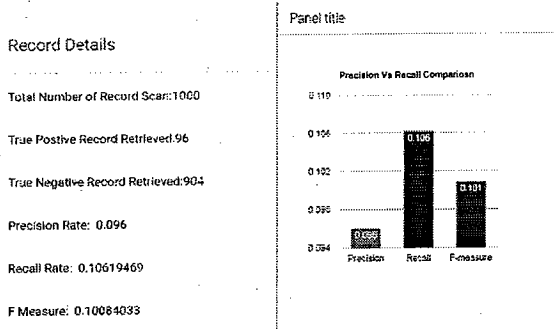


Figure 6. Result of Threshold based CLD

Step 5: Similarly the Threshold values of input image and all images in database are calculated using threshold based EHD

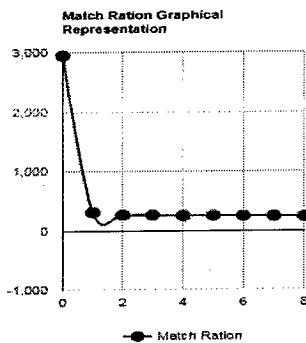


Figure 7. Weight calculated using Threshold based CLD

Step 6: Based on the weight calculated using threshold based EHD, the true positive set of images is displayed as an output.

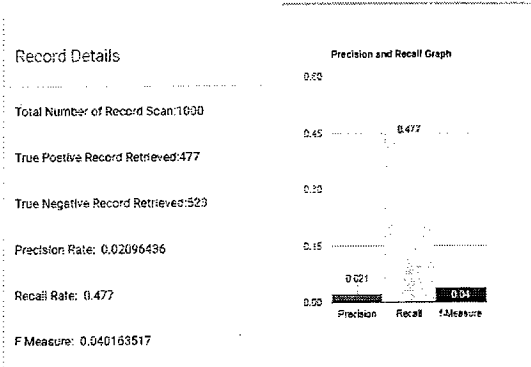


Figure 8. Result Threshold based EHD

Step: 7 The WANG dataset used for experimental purpose contains 1000 images of 10 different categories. For the comparison between Threshold based CLD & EHD, the sample image from each category is selected and average of precision, recall and fmeasure are calculated are shown in figure 9 and 10.

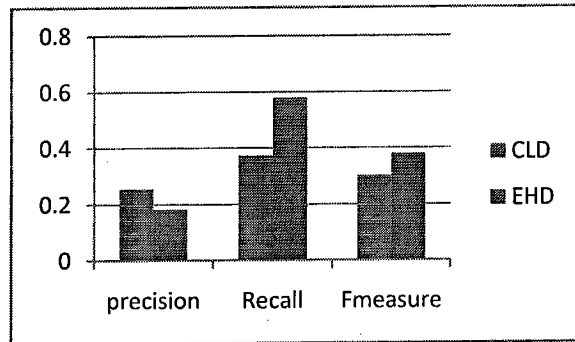


Figure 9. Result of Threshold based CLD and EHD

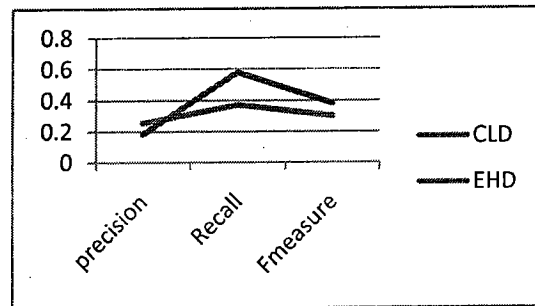


Figure 10. Result of Threshold based CLD and EHD

## 7. CONCLUSION

Image feature extraction is most important step in developing any CBIR system. The accuracy of result and efficiency is also based on the feature extracted technique used for extraction of features. Combination of more than one feature is obviously represent the image more accurately. The methodology presented here uses MPEG-7 Color Layout Descriptor (CLD) and Edge Histogram Descriptor (EHD), as main feature extraction technique. These techniques are further improved using the concept of thresholding to decrease the search space. Reduction in search space is obviously reduces the searching time. The result of system developed using the approach is effective to represent any image contents and reduces the search space to generate the fast output.

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# Enhancement of Active Power Flow Capability of Standard IEEE 14 Bus System using Unified Power Flow Controller

Miss. Suvarna V. Patil<sup>1</sup> Prof. Kalpesh Mahajan<sup>2</sup>

<sup>1</sup>M.E Student <sup>2</sup>H.O.D

<sup>1,2</sup>Department of Electrical Engineering

<sup>1,2</sup>KCE's COEIT, Jalgaon, Maharashtra, India

**Abstract**— The Unified Power Flow Controller (UPFC) is a Flexible AC transmission system (FACTS) uses the thyristor controlled devices that can control all the three system. UPFC is capable of controlling real and reactive powers in a transmission system. This paper presents control and performance of Unified Power Flow Controller (UPFC) is investigated in controlling the real and reactive power flow control using IEEE 14 bus standards system. UPFC is studied to improve the power flow over a transmission line in a standard IEEE 14 bus system by using MATLAB / SIMULINK software in a power system. For the selected standard system, real and reactive power flows are compared with and without UPFC to improve the performance and also improve the voltage profile. In this paper implementation and digital simulation using UPFC to improve the power flow is presented. The MATLAB/SIMULINK model results are presented to verify the results. It can be shows that compare the waveforms results of active, reactive power and voltage when with and without UPFC in connected to IEEE 14 bus standards system.

**Key words:** Unified Power Flow Controller, Thyristor, Real and Reactive Power Flow, IEEE 14 Bus System, MATLAB/SIMULINK

## I. INTRODUCTION

The Flexible ac transmission a system (FACTS) is the combination of the power “electronics” devices to controls the power flow and the quantities in power system. Its first concept was introduced by N.G Hingorani, in 1988 (FACTS) is very popular and essential device in power systems [1].The flexible AC transmission systems (FACTS) concept based on applying leading edge Power Electronics Technology to existing AC transmission systems, improves stability to increase usable power transmission capacity to its thermal limit. FACTS controllers are used for the dynamic control of voltage, impedance and phase angle of high voltage AC transmission lines. These FACTS controllers are based on voltage source converters. Thus, FACTS can facilitate the power flow control, enhance the power transfer capability, decrease the generation cost, and improve the security and stability of the power system. FACTS controllers can be divided into four categories,

- Series Controllers (SSSC,TSSC),
- Shunt Controllers (SVC,STATCOM),
- Combined Series-Series Controllers (IPFC),
- Combined Series-Shunt Controllers (UPFC)

UPFC is the most flexible multi-functional FACTS device which is a new generation of FACTS devices proposed by Gyugyi in1991. UPFC is a Combined Series-Shunt Controllers. The UPFC is one of the most versatile devices. In interconnected power systems, it is important to

have control over power transfer [1].This can improve stability and allow transmission lines to be loaded closer to their thermal limits A UPFC can simultaneously provide control of the transmission line impedance, phase angle and voltage. The UPFC is constructed from two power electronic inverters which are connected together by a common DC link. Two transformers are used to isolate the UPFC and to match the voltage levels between the power system and the power electronic inverters. One of the inverter is connected to the transmission line. The series connected inverter can generate a voltage which can have adjustable magnitude and phase angle. This inverter therefore can provide both real and reactive power to the transmission line. The second inverter primarily provides the real power required by the series inverter but it can also operate as an independent VAR compensator. Therefore the UPFC can control the flow of real and reactive power in the transmission line. In UPFC, the transmitted power can be controlled by changing three parameters of power transmission line namely transmission magnitude voltage, impedance and phase angle.

The UPFC can be used to improve the power quality due to the separate controlling capability of real and reactive power. In this proposed work two bus systems is simulated with UPFC. The 14 bus system is simulated with and without UPFC and The real and reactive power is investigated and observed from simulation model. The 14 bus system is simulated with and without UPFC show the real power is increases and reactive power is compensated and increases voltage profile.

## II. UNIFIED POWER FLOW CONTROLLER

The Unified Power Flow Controller consists of two switching converters, which in the implementations considered are voltage sources inverters, as illustrated in Figure 1. These inverters, labeled “Converter 1” and “Converter 2” in the figure, are operated from a common dc link provided by a dc storage capacitor. This arrangement functions as an ideal ac to ac power converter in which the real power can freely flow in either direction between the ac terminals of the two inverters and each inverter can independently generate or absorb reactive power at its own ac output terminal.

Converter 2 provides the main function of the UPFC by injecting an ac voltage  $V_{pq}$  with controllable magnitude  $V_{pq}$  ( $0 \leq V_{pq} \leq V_{pqmax}$ ) and angle  $\rho$  ( $0 \leq \rho < 2\pi$ ) at the power frequency, inserted with line via an insertion transformer. This injected voltage can be considered essentially as a synchronous ac voltage source. The transmission line current flows through this voltage source resulting in real and reactive power exchange between it and the ac system. The real power exchanged at the ac terminal (



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# ANALYSIS OF SOLAR POWER GENERATION WITH A MULTILEVEL INVERTER

Gaikwad Dilip Dadasaheb<sup>1</sup>, Prof. K. M. Mahajan<sup>2</sup>

<sup>1</sup> ME student, Department of Electrical engg, KC

ECOE&IT Jalgaon, maharashtra, India.

<sup>2</sup> ME Coordinator, Department of Electrical engg, KCECOE&IT Jalgaon, maharashtra, India.

## ABSTRACT

**Abstract—** In this paper a solar power generation system with a multilevel inverter, which consists of a DC/DC power converter and a new grid connected solar seven-level pulse-width modulated (PWM) inverter. The DC/DC boost converter and a transformer to convert the output voltage of the solar cell into two self-determining voltage sources with numerous relationships integrate by DC/DC power converter. This new seven-level inverter is configured using a capacitor selection circuit and a full-bridge power converter, connected in cascaded. The capacitor selection circuit converts the two output voltage sources of DC/DC power converter into a three-level dc voltage, and the full-bridge power converter which further converts this three-level DC voltage into a seven-level AC voltage.

In this way, the proposed solar power generation system generates a sinusoidal output. This inverter consists of only six power electronics switches, and using only one power electronic switch is switched at high frequency at any time this is salient features of a project. A model is developed and tested to verify the performance of proposed solar power generation.

**Keywords—** Grid-connected, multilevel inverter, pulse-width modulated (PWM) inverter.

## 1. INTRODUCTION

Now a day's many industrial applications have begun to require high power. Some appliances in the industries however require medium or low power for their operation. Using a high power source for all industrial loads may prove beneficial to some motors requiring high power.

The energy of solar array is proving to be more essential as it creates less contamination and the cost of fossil energy increases, while the expense of solar panel exposures is diminished. The power conversion interface is important for grid-connected solar power systems because it converts DC power generated by a solar cell array into AC power and feeds AC power into the utility grid [1]. An inverter is required in the power conversion interface to convert DC power to AC power [2]. The power conversion efficiency of the power conversion interface is very important to ensure that there is no misuse of the energy produced by the solar cell array. In the inverter there is a loss due to the active device and the passive device. Power losses due to active devices include both conduction losses and switching losses. The loss of conduction results from the use of active devices, while the switching loss is proportional to the voltage and current changes for each switching and switching frequency. The voltage change in each switching operation for a multi-level inverter is reduced in order to improve its energy conversion efficiency. The rival of the switching harmonics is further attenuated, so that the loss of art caused by all the filter inductance is further reduced. Multi-level inverter must be designed at the highest voltage levels in order to recover conversion efficiency and reduce harmonic content [2].

The multilevel inverter normally has three types:

# Design and Fabrication of PLC Based Conveyor System with programmable Station

Manoj M. Nehete<sup>1</sup>  
manojnehete24.7@gmail.com

Uday C. Patil<sup>2</sup>  
patiluday24.7@gmail.com

Department of Mechanical  
Engineering,

Sinhgad College of  
Engineering,  
Vadgaon Bk.,  
Pune-411042, Maharashtra,  
India

**Abstract**— The conveyors are the basic primitive component of material handling. There are various types of conveyors used in industry like belt conveyor, chain conveyor, gravity conveyor, etc. The basic features of conveyor systems are not only to convey the objects but also to stop at predefined locations for some operation. The dissertation on conveyor is taken up to design and manufacture a table top model, with programmable number of stations and relevant control panel. The proposed conveyor is 780mm long, capable of conveying the objects of 60 cubic mm size, The number of stations are programmable from 2 to 5, with or without interlocks. The efficient use of timers and counters are incorporated to optimize the/ios. The proposed conveyor is PLC based and with little amendment, it will be coupled with the palletizer. The advanced programming features of PLC with respect to timers and counters and programmable variable inputs are the key operating features which minimizes the input and outputs as required by PLC.

**Index Terms**— Programmable conveyer, Palletizer, Programmable PLC, Material Handling

## I. INTRODUCTION

The “Mechatronics” is now being deployed in Flexible Manufacturing System (FMS). The material handling was one of the significant applications of Mechatronics in FMS followed by Robotics. In this dissertation the main focus is to develop a demonstrative setup of conveyor system with programmable workstations and a provision to be interfaced with Palletizer with see through technology. The conveyer system is selected as it is most commonly used, simple to demonstrate yet it has highly complicated PLC programming aspects. One of the objective was to develop a test bench for the undergraduate students to study PLC programming with all the insights.

The PLC was selected to be a controller for obvious reasons. The most significant is market share of PLC, which is more than 60% in automation industry. The students who are familiar with PLC programming have a natural preference while in selection process of the recruitment drives. Simultaneously the post graduate students shall have an opportunity to amend the set up and take it further for the artificially intelligent tasks for PLC programming. The application setup also has a unique feature that it could be interfaced with Palletizer, which arranges the objects being conveyed with a systematic array. This enables the dissertation work to demonstrate how the independent components are interfaced and linked for the common objective of material handling. Some of the important features and control procedures are inherited from the selective research publications which are summarized as below.

Tsalidis et al. (1998) explained the design phases of belt-conveyor design. Design parameter, design task, design prototype, design state and design rule these are the five steps of designing a product. Yilrnaz et al (1999) configured PLC unit for fuzzy logic to synchronize the speed of two conveyor belts. Sum-min method is used for

inference and Center of Gravity method is used for defuzzification. Experimentation is carried out to validate the simulation results. Vallance et al (2003) designed the split-groove kinematic coupling technique for locating the pallets in multi-station assembly systems. The split-groove kinematic couplings are more effective than three-groove couplings when geometric constraints are not feasible.

Xiaohui Cheng and Jie Wan (2013) states in paper that the supply speed of the coal and energy utilization rate of telescopic belt conveyor can be increased upto 150% by implementing PLC based conveyor system. Closed loop motor control system is designed by using frequency convertor. The system regulates the speed of motor along with the on-off control of conveyor power equipment. Kanmani et al. (2014) elaborates in a paper about the need of automation and proposes a SCADA and delta series PLC based automation system which is highly reliable and efficient in operation without delay. The parameters used for monitoring are tearing of belt conveyor, oil level reduction and temperature level of conveyor motor.

## II. PROBLEM STATEMENT

To design and fabricate the demonstrative setup of PLC based conveyor with optimized inputs/outputs, with minimum two locations as InLoc and OutLoc, along with three intermediate programmable locations interlocked with respective timers, with overall conveyor length of 1 m, with a suitable control panel, with a feature button to interface this conveyer with palletizer.

The basic objective is to develop PLC based conveyor system having centralized control over five stations to minimize total time required for material handling using conveyor.

## III. LAYOUT OF THE SYSTEM

Layout of conveyor system can be classified in following sections



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**A. DC Motor:**

The DC motor used in this system. The DC motor used here is bidirectional in nature but it is restricted to unidirectional. Shaft of motor get engage with shaft of pulley with grub screw on flat surface of motor shaft. Rotation of shaft is completely depends upon rotation of motor direction. the motor is high speed rpm motor .The rpm of the motor is reduced to suitable range through geared box which increases its torque capacity .The geared box is integral part of dc motor assembly.It has reduction ratio for every step by 5. As per signals received from the controlling device motor will react accordingly. The motor used here having operating voltage range from 12V to 30V.

In the system motor is used to rotate only in single direction With given supply voltage of motor 24V. As per signal received from programming logic control unit motor will start to rotate or stop according to the signal.

Dimensions: 1050x120mm.

**B. Sensor Mounting Sub-assembly**

With Inloc and Outloc, also 3 intermediate positions inductive proximity sensors are provided which sense the actual presence of object location. It can sense up to range of 5mm. Due to its inductive property it sense any metallic component. It tells to controller to take further actions as soon as it senses the object.

Sensor mounting plates maintain the constant distance throughout length from object. Sensors are fixed to Inloc and Outloc as well as three work stations. Proximity sensor used here are PNP NO in nature. It has sensing range up to 5mm with total length of 35mm. Sensor mounting assembly has overall dimensions are 1050mm x 80mm.

Above all drawings shows detail drawings of manufactured parts of conveyor system. A complete assembly of model of a model for a conveyor system with most important components is shown in the drawing. In following table, all the important technical data listed in an overview.

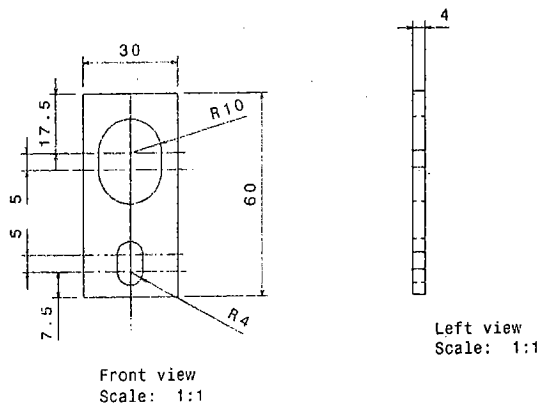


Figure 5: Sensor monitoring

The conveyor has following specifications:

- Total Length : 780 mm
- Total Width : 150 mm
- Total Height : 200 mm
- Driving Motor : SM1 Gearbox D.C. Motor
- Proximity Sensor : M18 x 35mm, 5mm sensing distance
- Power Supply : 24 Volt
- Maximum Speed : 10 rpm
- Weight of conveyor System : 15kg

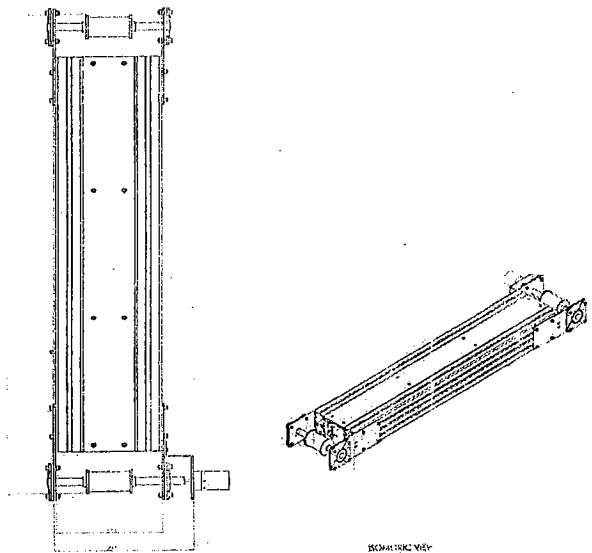


Figure 6: Conveyor final assembly

**C. Wiring and Control Panel:**

Control panel is required to batch controls at one location and monitor the process flow at particular stage. Consist of following components:

- [1] Plastic Board: For the mounting of lamps and switches needs to cut profile for required mountings. Dimension of the board is 200x150x50mm.
- [2] Switches: start button: 1x push to ON (NO) 18mm diameter switch
- Stop button: 1x push to OFF (NC) 18mm diameter switch
- Selector Switch: 1x 1Pole and 3 selector position 4mm diameter switch
- Reset switch: 1x push to ON (NO) 18mm diameter switch
- iii) Lamps: Process Lamp: 1x 24v 12mm diameter Green Lamp
- Emergency Stop Lamp: 1x 24v 12 mm diameters Red Lamp
- Object position indicators: 5 x 24v 12mm diameter Green Lamp

**Wiring Layout:**

The wiring is an important phase for installing a conveyor and configuring the sensors and actuators so they can all communicate with each other seamlessly. It is done scientifically to save time and money. The following figure gives more simplified idea about the wiring layout.



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C. Selector Switch at Station 4 (Work Station 3)

When selector switch is at station 4 position i.e. selection for workstation 3, the object detection at InLoc station will occur and it will set timer of 5 sec for the demonstrative loading purpose and then it will move to station 4 i.e. workstation 3, skipping workstation 1 and 2. After successful detection at workstation 3 it will go directly to OutLoc station.

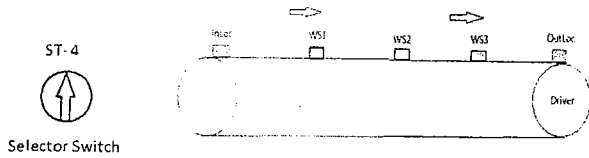


Figure 13: Selector switch at station 4 position

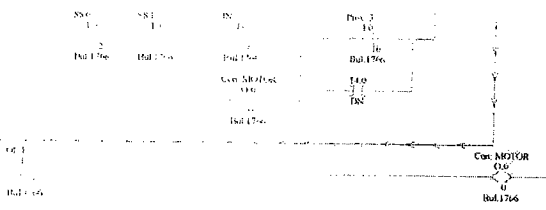


Figure 14: Logic Ladder for Work Station 3



Figure 15: Logic Ladder Common Timer for workstations

D. I/O Definition and Programming

I/O definitions play a role of bridge between the PLC and physical setup of the system. It allows the system program to communicate with switches, sensors as inputs and actuators as outputs. At first, total inputs and outputs of the system are identified.

TABLE I  
INPUT DEFINITIONS OF SYSTEM

| Sr. No | Input  | Description             | Address  |
|--------|--------|-------------------------|----------|
| 1      | Start  |                         |          |
|        | .Btn   | Start switch            | I:0.0/1  |
| 2      | Stop   |                         |          |
|        | .Btn   | Emergency Stop          | I:0.0/2  |
| 3      | SS 2   | Selector S/W Station 2  | I:0.0/3  |
| 4      | SS 3   | Selector S/W Station 3  | I:0.0/4  |
| 5      | SS 4   | Selector S/W Station 4  | I:0.0/5  |
| 6      | InLoc  | InLoc Proximity Sensor  | I:0.0/6  |
| 7      |        | Station 2 Proximity     |          |
|        | ST-2   | Sensor                  | I:0.0/7  |
| 8      |        | Station 3 Proximity     |          |
|        | ST-3   | Sensor                  | I:0.0/8  |
| 9      |        | Station 4 Proximity     |          |
|        | ST-4   | Sensor                  | I:0.0/9  |
| 10     | OutLoc | OurLoc Proximity Sensor | I:0.0/10 |

|    |  |                         |          |
|----|--|-------------------------|----------|
| 11 |  | Reserved for Palletizer | I:0.0/11 |
| 12 |  | Reserved for Palletizer | I:0.0/12 |
| 13 |  | Reserved for Palletizer | I:0.0/13 |
| 14 |  | Reserved for Palletizer | I:0.0/14 |
| 15 |  | Reserved for Palletizer | I:0.0/15 |
| 16 |  | Reserved for Palletizer | I:0.0/16 |
| 17 |  | Reserved for Palletizer | I:0.0/17 |
| 18 |  | Reserved for Palletizer | I:0.0/18 |

Once physical address is acquired we can start programming due to the wrong addressing. As shown in the table below, purposefully physical blank addresses are kept in order to further connections of subsystem like conveyor.

RSlogix 500 software is used for the programming purpose which is capable of offline logic failure detection.

TABLE II  
OUTPUT DEFINITIONS OF SYSTEM

| Sr. No. | Output | Description             | Address |
|---------|--------|-------------------------|---------|
| 1       |        | Reserved for Palletizer | O:0.0/1 |
| 2       |        | Reserved for Palletizer | O:0.0/2 |
| 3       |        | Reserved for Palletizer | O:0.0/3 |
| 4       |        | Reserved for Palletizer | O:0.0/4 |
| 5       |        | Reserved for Palletizer | O:0.0/5 |
| 6       |        | Reserved for Palletizer | O:0.0/6 |
| 7       |        | Reserved for Palletizer | O:0.0/7 |
| 8       | Motor  | DC-Motor                | O:0.0/8 |

VI. CONCLUSION

The important deductions of the dissertation work are as follows:

- The PLC based Conveyor system with programmable locations of 1 m span is ready in the laboratory for undergraduate and post graduate students.
- The installed control panel has start, stop, selector switch, reset switch and indicator lamps.
- The Conveyor has InLoc, OutLoc and 3 processing stations.
- Each intermediate location has a 5 sec timer to process the specified operation.
- The speed of conveyor is synchronized with palletizer.

System setup, wiring connections and programming is accomplished. Mentioned objectives are achieved.

In RSlogix 500 logic ladder and sensor inputs are checked and errors are eliminated. The system is ready for experimentation, bug fixings as well as upgrades.

VII. FUTURE SCOPE

The conveyor objects are picked by an at loading point of its path and are delivered to palletizing mechanism at unloading station. This is entirely planned by PLC control in a modular way. This will not only expose the student to programming environment but also open an aspect of PLC program planning and execution. The next operation plan to be introduced is with RFID. The RFID identifier shall be fixed on the object to be stored on pallet racks and PLC

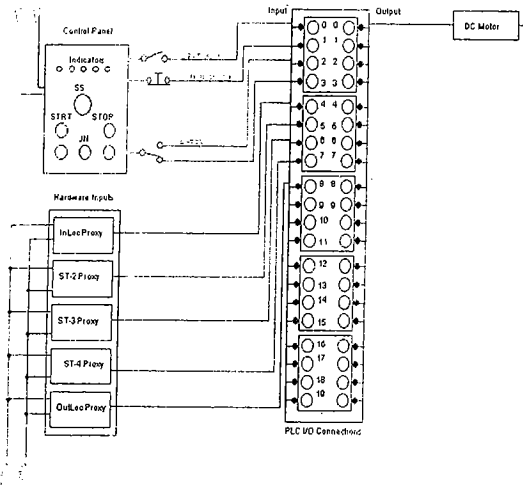


Figure 7: conveyor wiring layout

V. PROGRAMMING

The main objective of this dissertation is to control motor motion at five stations including three intermediate working and two mandatory stations. This section quickly introduces the PLC Environments with respect to dissertation work carried out. It specifies requirement of the system and its working. This section gives overall working idea and its physical system. Developed logic in the system is in terms of ladder diagrams. All program and inputs of the system developed using Picosoft software in terms of ladder logic.

Following figures shows the algorithm / flow chart which is implemented in the system:

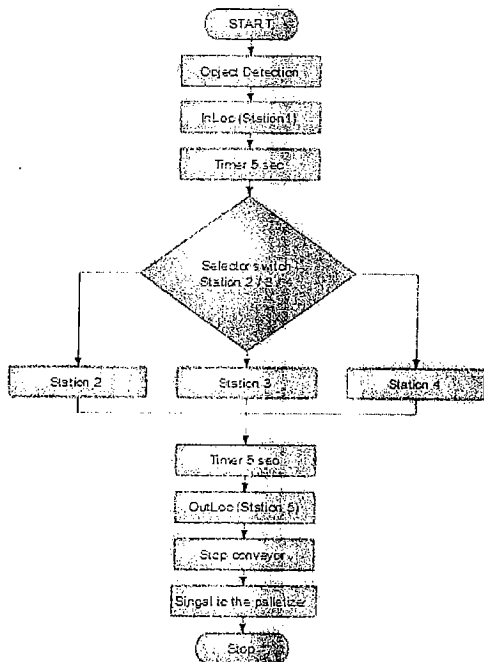


Figure 8: System flow chart

Following are demonstrative diagrams to understand the working of system at different position selection at selector switch.

A. Selector Switch at Station 2 (Work Station 1)

When selector switch is at station 2 position i.e. selection for workstation 1, the object detection at InLoc station will occur and it will set timer of 5 sec for the demonstrative loading purpose and the it will move to station 2 i.e. workstation 1. After successful detection at workstation 1 it will skip station 3 and 4 and will go directly to OutLoc station.

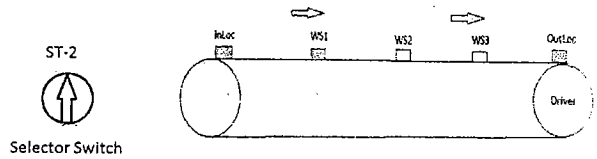


Figure 9: Selector switch at station 2 position

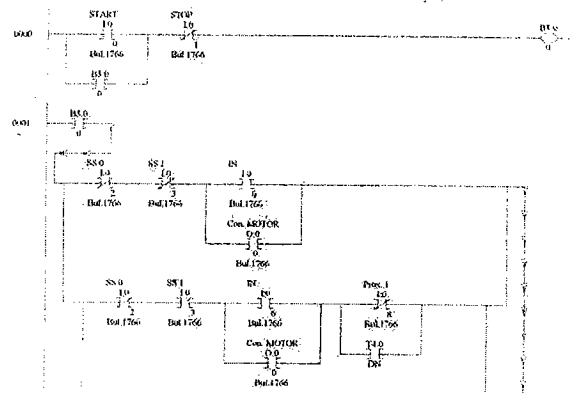


Figure 10: Logic Ladder for Work Station 1

B. Selector Switch at Station 3 (Work Station 2)

When selector switch is at station 3 position i.e. selection for workstation 2, the object detection at InLoc station will occur and it will set timer of 5 sec for the demonstrative loading purpose and the it will move to station 3 i.e. workstation 2, skipping workstation 1. After successful detection at workstation 2 it will skip station 4 and will go directly to OutLoc station.

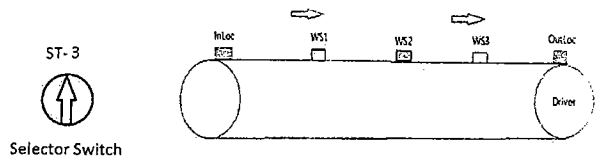


Figure 11: Selector switch at station 3 position

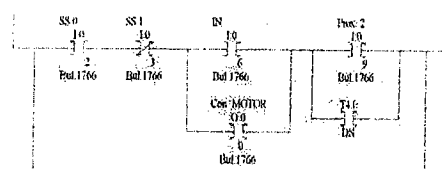


Figure 12: Logic Ladder for Work Station 2

shall store the IDs and respective location the IDs shall be categorized so that similar group shall be stored nearby.

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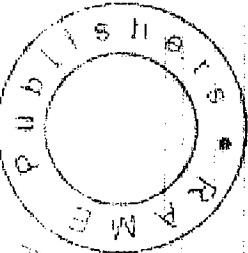
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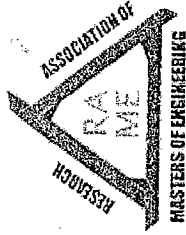
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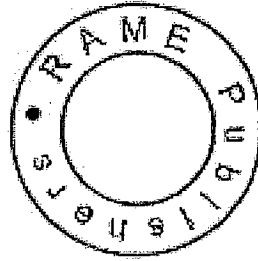
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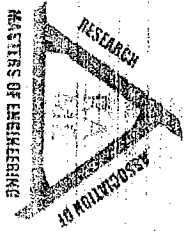
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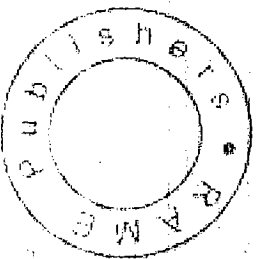
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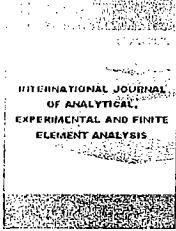
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# PLC Based 2D Pneumatic Palletizer Design and Manufacturing

Uday Chhagan Patil<sup>1</sup>  
patiluday24.7@gmail.com

Manoj M.Nehete<sup>2</sup>  
manojnehete24.7@gmail.com

Department of Mechanical  
Engineering,

Sinhgad College of  
Engineering,  
Vadgaon Bk.,  
Pune-411042, Maharashtra,  
India

**Abstract**—The proper material handling has a huge impact on production and distribution system. The use of pallets is efficient to handle small objects in large quantities so as to properly pack in cartons. The manual palletization is time consuming, expensive and also puts unnecessary stress on workers. The palletizers available are manual and microcontroller based. These solutions are not flexible enough to match production system requirements, and not cost effective as well. In this study the main aim is to incorporate flexibility with the help of PLC while being cost effective. It is proposed to have desired flexibility in pallet array size and layers in pallet. The proposed system has the pallet array size of 3×3 to 5×5 and single layer to 3 layers. The neatly and aesthetically designed control panel is used to select array size, layer control with advance PLC programming features. The algorithm is so designed it shall smoothly bridge other FMS components like conveyer. This system is not only cost effective but also adds the dimension of flexibility to palletization, so as to make it capable of handling future requirements including change in operation, etc. with the help of simple change in programming and/ or control and thus shall be avoiding expensive hardware changes.

To design, manufacture a PLC based 2D pneumatic table top palletizer with the pallet array size of 3×3 to 5×5, consist of single layer to 3 layers and suitable control panel to indicate object presence in the process at particular stage, essential buttons, a special button to integrate the palletizer with supporting conveyor.

**Index Terms**— Palletizer, Palletiser, Programmable PLC, Material Handling

## I. INTRODUCTION

The manual material handling continues to be an inevitable component in mechanization and automation on Indian canvas, as of economic considerations, practical situations, or social consideration, etc., posing a great challenge to industrial productivity.

Manual Material Handling (MMH) of pallets generally causes health problems. Survey carried by the Mine Safety and Health organization (MSHA) 1999, USA shows that manual material handling causes increase in development of Musculoskeletal disorders (MSDs) by 68% , mainly low back sprains and strains. The automation of palletization is a required since it can reduce MMH and material handling activities could be more efficient. A recent market research carried on Logistic Service Providers (LSPs) 2009, US and Europe says that total number of pallet used in US is estimated To 1.9 billion, and forecasts an increasing annual demand for new pallets about 3.5% per year until 2018.

The proposed system intended not only to reduce fatigue of operator by using specific height of operation but also to minimize human need to handle pallet with help of vertical motion, horizontal motion and rotational motion. It leads to minimize the operator efforts in pick and place operations involved in palletizing. The system also provides ability to reprogram with minimal or without hardware changes and having ease troubleshooting with help of software in compilation mode which also provides ability to check system logic ladder offline.

The MMH can cause mental and physical illness in human workers, decreasing material handling efficiency. Hence the prime objective of the dissertation work is to implement an alternative solution to palletizing which is economic, efficient, involving minimum repair &

maintenance and flexible in operations so as to increase the productivity in automation [1].

In discussion on Evaluation of palletizing aid, It is reported that simple palletizing aid with ergonomic change in height of pallet reduces bending by the operator. In the tests consist of 16 identical boxes, weighing 10kg arranged in four layers and proceeded with 80 experimental trials. With the aid the incident of lower back pain in 200000 working hrs/yr drops from 0.086 to 0.022. Results from the discussion motivated to improve ergonomic factors of palletizer such as height and position of controls [2].

The significant concepts of (1) Logic for operation sequencing (2) Possible component list (3) Basic design idea for working system (4) Experimentation procedure as discussed Development of Automatic Pallet Handling System [3], leading to stacking of 1416 trays/hr, with 95% of pallet loading success rate with the unloading capacity of 1380 trays/hr, were analyzed and adopted in the present work.

In the Survey of Pallet Loading Problem (PLP) Consideration taken in to account are: (1) maximizing area of pallet used, (2) maintaining integrity of system during transportation, (3) efficiency of palletization, (4) access to palletized loads. The considerations are also taken in account during design of the system. [4]

The primary concepts of design and algorithm are adopted and developed from the discussion on physical model for robotics palletization. The discussion gives information regarding algorithm for demonstration system development with the help of a Scorbot ER-V robot and conveyor model with example, which gives 100% pallet utilization [5].

Algorithm and PLC logic ladder is further developed with help of deep look in the research investigation on Control System Design of Palletized Loading System based on PLC and fuzzy control technology for special purpose vehicle



Direction Control valves and flow regulator. The pneumatic circuit for the components is designed in order to achieve specified movements with efficient operation.

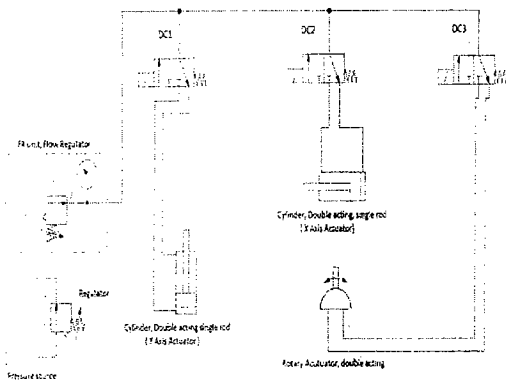


Figure 6: System pneumatic circuit

H. Wiring Layout

The wiring is an essential first phase to installing a palletizer system and configuring the devices so they can all communicate with each other seamlessly. It is done systematically to save time and money. The following figure gives more simplified idea about the wiring layout.

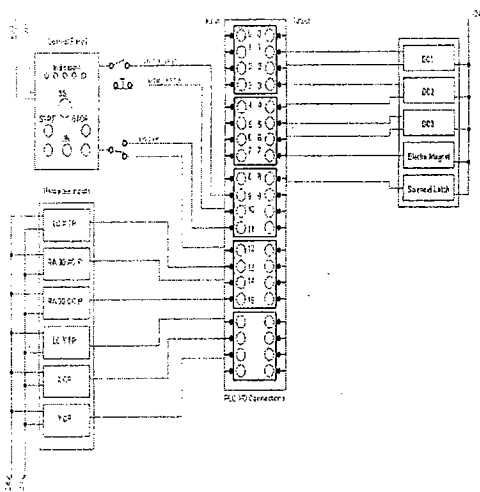


Figure 7: System wiring layout

- Where;
- LC X TP: X axis displacement Linear Cylinder Tail Proximity sensor
- RA 90 AC P: Rotating Actuator 90 degree Clockwise Proximity Sensor
- RA 90 CC P: Rotating Actuator 90 degree Anticlockwise Proximity Sensor
- LC Y TP: Y axis displacement Linear Cylinder Tail Proximity sensor
- X CP: X axis Counter Proximity Sensor
- Y CP: Y axis Counter Proximity Sensor
- DC1: Direction control valve 1,
- DC2: Direction control valve 2,
- DC3: Direction control valve 3.

IV. PROGRAMMING

a. PLC

The batch process of units is sequential in nature, requiring time or event based decisions. PLC is used as total solutions to a batch problem rather than just a tool. In batch process savings are developed principally from reduced cycle time and scheduling. Cycle automation provides rigid control enforcement to eliminate human errors and to minimize manual interventions. Increased efficiency in scheduling is to be expected with maximum utilization of equipment and reduction of fluctuating demands on critical equipment.

In system Allen Bradley ML 1400 PLC is used for automatic control of equipments, having 20 inputs and 12 outputs. The PLC ensures that equipment cannot be started unless all the permissive conditions for safe start have been established. It also monitors the conditions necessary for safe running of the system and trip the equipment whenever any abnormality in the system is detected.

PLC is implemented in system due to following facts taken into account:

1. It is very fast
2. It allows system to change in process logic i.e. flexibility
3. It increases reliability of system.
4. Lowers overall power consumption of system.
5. Adds system facilities in fault finding and diagnostic.
6. Adds good documentation facilities to the
7. Counters and timers can be added.

b. I/O definition and programming

I/O definitions plays role of bridge between the plc and physical setup of the system. It allows to system program to communicate with switches, sensors as inputs and actuators as outputs. At first total inputs and outputs of system are identified. Once physical address is acquired we can start programming with the addressing of the physical address on memory. It is done carefully and systematically so as to avoid any errors and mistakes generally happens at the time of programming due to the wrong addressing. As shown in table bellow, purposefully physical blank addresses are kept in order to further connections of subsystem like conveyor.

c. Programming

RSLogix 500 software is used for the programming purpose which is capable of offline logic failure detection. Following programming is implemented in order to achieve system work done.

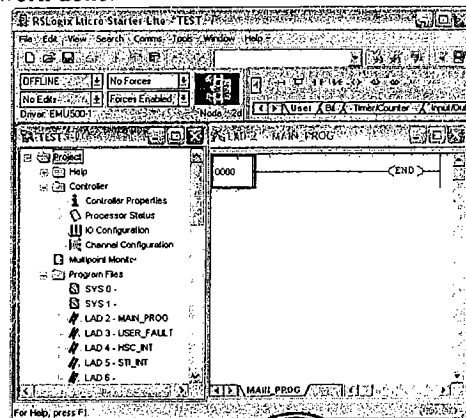


Figure 8: I/O Definition of System

TABLE I  
INPUT ADDRESS

| Sr No. | Input     | Description  | Address  |
|--------|-----------|--|----------|
| 1      |           | Reserved for conveyor                                  |          |
| 2      |           | Reserved for conveyor                                  |          |
| 3      |           | Reserved for conveyor                                  |          |
| 4      |           | Reserved for conveyor                                  |          |
| 5      |           | Reserved for conveyor                                  |          |
| 6      |           | Reserved for conveyor                                  |          |
| 7      |           | Reserved for conveyor                                  |          |
| 8      |           | Reserved for conveyor                                  |          |
| 9      | Start Bin | Start Process  | I:0.0/9  |
| 10     | Stop Bin  | Emergency Stop   | I:0.0/10 |
| 11     | SS 4      | Selector S/W 4 Array Mode                              | I:0.0/11 |
| 12     | SS 5      | Selector S/W 5 Array Mode                              | I:0.0/12 |
| 13     | LCH-1-1F  | Linear Cylinder Horizontal Tail Proxy (Forward Motion) | I:0.0/13 |
| 14     | RA90-1:1A | Rotary Actuator Proxy 1 (Anticlockwise Motion)         | I:0.0/14 |
| 15     | RA90-1:2C | Rotary Actuator Proxy 2 (Clockwise Motion)             | I:0.0/15 |
| 16     | LCV-1-1F  | Linear Cylinder Vertical Tail Proxy (Forward Motion)   | I:0.0/16 |
| 17     | P5(HCP)   | Horizontal Counter Proxy                               | I:0.0/17 |
| 18     | P6(VCP)   | Vertical Counter Proxy                                 | I:0.0/18 |

TABLE II  
OUTPUT ADDRESS

| Sr No. | Output  | Description                             | Address |
|--------|---------|---|---------|
| 1      | RA 2-1  | Rotary Actuator DC Valve anti-clockwise | O:0.0/1 |
| 2      | RA 2-2  | Rotary Actuator DC Valve clockwise      | O:0.0/2 |
| 3      | LCH 1-1 | Linear Cylinder Horizontal DC Valve fwd | O:0.0/3 |
| 4      | LCH 1-2 | Linear Cylinder Horizontal DC Valve Bwd | O:0.0/4 |
| 5      | LCV 3-1 | Linear Cylinder Vertical DC Valve fwd   | O:0.0/5 |
| 6      | LCV 3-2 | Linear Cylinder Vertical DC Valve Bwd   | O:0.0/6 |
| 7      | EM      | Electromagnet                           | O:0.0/7 |
| 8      | SOL     | Solenoid Latch                          | O:0.0/8 |
| 9      |         | Reserved for conveyor                   |         |
| 10     |         | Reserved for conveyor                   |         |
| 11     |         | Reserved for conveyor                   |         |
| 12     |         | Reserved for conveyor                   |         |

V. CONCLUSION

Physical setup, system wiring, pneumatic circuit connections and programming of the system are completed. The setup gives better idea of algorithm and real world constrains compared to theory.

In RSlogix 500 logic ladder and sensor inputs are checked and errors are eliminated. The system is geared up for experimentation, bug fixings as well as upgrades.

VI. FUTURE SCOPE

Experimentation is to be done on for different input values. Overall efficiency and accuracy of the system is to be calculated. After the successful experimentation and upgrades system mounting on table according to ergonomics is aimed.

For the future research purpose RFID tagging is will be a direction which will enable operator for real time unit monitoring in process and record keeping.

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developed on the basis of type II chassis of cross country automobile. It is used to illustrate method for developing the algorithm of pallet loading [6].

The rack design and suitable rack material for palletizer is discussed in research named: Design of Down Aisle Pallet Rack Structures and Behavior of Steel Storage Pallet racks. The discussion referred typical European practice for pallet racks, structure by Devies and Lewis. It helped not only in design and selection of material but also to better understand effect of beam to column joint, base plate joint modeling on total frame response at ultimate stress. Result during the study also mentioned that effect of the base plate joint is more remarkable [7, 8].

In deep study of A Robotic Palletizer Control Strategy Redesign author contributed towards simplification of process for pallet pattern generation, palletizer configuration according to required pattern and shown the way to connect sub systems with help of Human Machine Interface (HMI). It became helpful to understand the method of connecting subsystems like conveyor to palletizer [9].

A. Objectives

- (a) The total dimension of the PLC based 2D pneumatic table top palletizer shall be less than 600×600 mm,
- (b) The Palletizer shall be PLC based.
- (c) The Palletizer shall have a START and STOP buttons with conventional meanings.
- (d) The Palletizer shall have one to three layers of pallet.
- (e) The Palletizer shall have pallet array size of 3×3 to 5×5.
- (f) The Palletizer shall use counters to count object passing from particular location up to set value and to signal for further step process once set value is reached.
- (g) The Palletizer shall have a suitable control panel to indicate object presence in particular stage of the operation, START and STOP button, interlock push buttons (if any) and button to integrate the palletizer with supporting conveyor.

II. PROCESS ALGORITHM FOR THE SYSTEM

To execute the task of palletization the system needs to follow the algorithm:

- i. Start
- ii. Select array size
- iii. Array selection sets the counter value for row former and row pusher according to array size
- iv. Check object presence at conveyor
- v. Set pick and place system at position A near to conveyor
- vi. Pick up the object
- vii. Turn pick and place system to position B near row former surface
- viii. Extend row former cylinder up to desired position
- ix. Repeat the process until complete row is formed
- x. After complete row formation push the complete row with row pusher
- xi. Repeat the process until complete layer is formed

- xii. After successful filling of one layer move to next vacant layer
- xiii. Stop

\* Flowchart on next page gives exact idea about the sequence of steps during execution of process

III. LAYOUT OF THE SYSTEM

System layout consists of following major parts:

A. Rack

Rack is needed to hold the pallets and provide structural support. It intended to hold units/boxes having size of 60×60×60 and weighing 100gm each. As per requirements following components of rack are selected:

a. Aluminum Extrusion:

It is required for column structure, needs to be light weight and strong enough to hold the structure. Aluminum extrusions are light weight, strong and corrosion resistant (low weight to high strength ratio). Best suited for the structure because it offers required features like fixings, channels, and interlocking systems. Fixing and interlocking provision is used to connect aluminum extrusion column to base plate. Channel sliding provision is used for loading next pallet level.

Specifications: Cross section area of 40×40mm  
4 bars of 400mm length and weighing 300 gm each

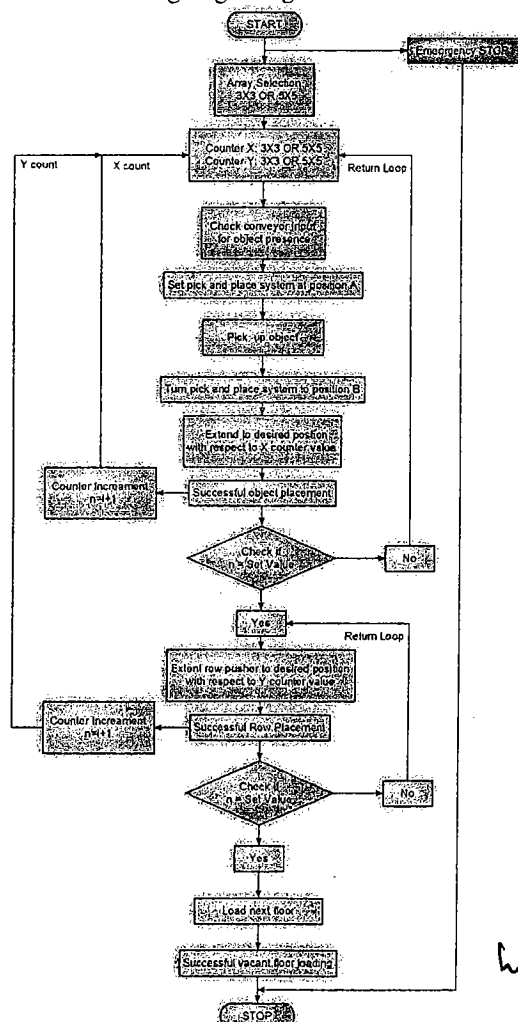


Figure 1: Flow chart of the system



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c. Electromagnet:

Electromagnet is needed to pick the unit from conveyor and hold it until the desired position reached, once desired location is reached electromagnet have to release the unit. Need is to hold object of 100gm and pick up range of 5mm. The electromagnet used possesses following specifications:

Specification: dimension: circular cross section area of 20 mm radius and 18mm height  
 Voltage: 24v  
 Current: .33A  
 Lifting power: 5N/2.5kg

D. Row Pusher

The component is needed to push the row formed by row former and place at desire location in layer forming area/ base plate, linear displacement requirement is of 460mm. Requirement of component is to push row of 5 units/3units of mentioned specifications. It's motion with 3/2 Direction Control valve Pneumatic cylinder fits for the specified requirements as mentioned below:

Specifications: Company: SMC  
 Type: single rod double acting  
 Stroke: 500mm  
 Bore size: 25mm  
 Operating pressure: 0.5-10bar  
 Weight: 580gm

E. Sensors

Sensors are essential in order to detection of object and input feed to PLC with desired accuracy. Sensors are required in for the following requirements:

A) Position detection of Actuators (Row former linear cylinder, rotary actuator, row pusher cylinder)

i) Row former linear cylinder:

Read proximity sensor:

Cylinder mounted  
 Type: inductive type NPN/ No  
 Supply Voltage: 5-30v

Proximity sensor piston head position detection

Type: inductive type NPN/ No  
 Supply Voltage: 5-30v  
 Size: M12  
 Sensing range: 5mm

ii) Rotary Actuator: 2 proximity switches required for position detection of rotary actuator shaft:

Read proximity sensor: cylinder mounted  
 Type: inductive type NPN/ No  
 Supply Voltage: 5-30v

iii) Row pusher linear cylinder:

Read proximity sensor: cylinder mounted  
 Type: inductive type NPN/ No  
 Supply Voltage: 5-30v

Proximity sensor piston head position detection:

Type: inductive type NPN/ No  
 Supply Voltage: 5-30v  
 Size: M12  
 Sensing range: 5mm

F. Control Panel

It is required to control and monitoring the process flow at particular stage.

Consist of following components:

i) Plastic Board: For the mounting of lamps and switches needs to cut profile for required mountings. Dimension of the board is 250×200×50mm.

ii) Switches: start button: 1× push to ON (NO)

18mm diameter switch  
 Stop button: 1× push to OFF (NC) 18mm diameter switch  
 Selector Switch: 1× 1Pole and 3 selector position 4mm diameter switch  
 Reset switch: 1× push to ON (NO) 18mm diameter switch

iii) Lamps: Process Lamp: 1× 24v 12mm diameter Green Lamp

Emergency Stop Lamp: 1× 24v 12 mm diameters Red Lamp

Object position indicators: 10× 24v 12mm diameter Green Lamp

G. Pneumatic circuit Layouts

Pneumatic actuators are used in system plays major role considering advantages:

a. Availability of the source

Air is the essential thing in the pneumatic system, and as we all know, air is available in the world around us in unlimited quantities at all times and places.

b. Easy channeled

Air is a substance that is effortlessly conducted from one place to another through a small pipe, the long and winding.

c. Temperature is flexible

Air can be used flexibly at various temperatures are required at industry, through equipment designed for specific circumstances, even in quite extreme conditions, the air was still able to work.

d. Safety

The air can be loaded more safely than it is not flammable and does not short circuit occurs or explode, so protection against both of these things pretty easily, unlike the electrical system that could lead to fires.

e. Clean

The air around us are tend to clean without chemicals that are harmful, and also, it can be minimized or cleaned with some processes, so it is safe to use pneumatic systems to the pharmaceutical industry, food and beverages and textiles.

f. The transfer of power and the speed is very easy to set up

Air could move at speeds that can be adjusted from low to high or vice versa. When using a pneumatic cylinder actuator, the piston speed can reach 3 m / s. For pneumatic rotating actuators can spins at 30,000 rpm.

g. Can be stored

The air can be stored. Moreover, it can be installed so that the pressure boundary or the safety of the system to be safe.

Though considering the advantages improper handling can lead to leakage and noise, hence proper circuit is needed to form in order to efficient system operations. The system posses pneumatic components: Linear cylinder double acting single rod for X and Y axis displacements, rotating actuator,

W/L



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# Vibration Analysis of Composite Leaf Spring by Finite Element Method

Hemant Rajendra Nehete  
Assistant Professor

Department of Mechanical Engineering  
J. T. Mahajan college of Engineering, Faiz-pur Faiz-pur 425503, India

## Abstract

Vibration is an oscillation wherein the quantity is a parameter that defines the motion of a mechanical system. The main causes of vibration are unbalanced forces in the machine, dry friction between the mating surfaces, external excitation, earthquakes, and self-excited vibrations, misalignment of rotating shaft, looseness in rotating machinery, loose foundations and excessive bearing clearances, oil whirl in bearing. The harmful effects of vibrations are excessive stresses in machine parts and undesirable noise. Also due to high vibration there are looseness of parts and partial or complete failure of parts. This vibration phenomenon is used in some musical instruments, vibrating conveyors, shakers, vibrating screens, stress relieving. This vibration can be reduced by removing the causes of vibration, by vibration isolation. Also vibration can be controlled by using shock absorbers and by installing dynamic vibration absorbers. Using composite material also vibration reduce. Automobile suspension Leaf spring consist high vibration during motion. By binding the composite material to steel spring the vibration can be reduced. ANSYS software used for Finite Element Analysis for vibration analysis.

**Keywords:** Vibration, Composite Material, Natural Frequency, Mode Shape

## I. INTRODUCTION

Hemant Rajendra Nehete  
Assistant Professor

A leaf spring is a simple form of spring, commonly used for the suspension in vehicles. A leaf spring which is an automotive component is used to absorb vibrations induced during the motion of vehicle. Leaf Springs are long and narrow plates attached to the frame of a trailer that rest above or below the trailer's axle. There are single leaf springs and multi leaf spring used based on the application required. It also acts as a structure to support vertical loading due to the weight of the vehicle and payload. Under operating conditions, the behavior of the leaf spring is complicated due to its clamping effects and interleaf contact, hence its analysis is essential to predict the displacement and mode frequency. The objective of this paper is to analyze the leaf spring for the constraints such as material composition, vibrations developed in the springs. And finally for both the analytical results are compared with experimental results and verified. Vibration analysis is done and also how much damping will be required for the spring is determined. Mode frequency for the spring is also determined using ANSYS software. This project vibration analysis plays a very important role in the design of composite leaf spring, since the failure due to vibration is more prominent rather than material failure. The heavy & light vehicles need a good suspension system that can deliver a good ride and handling. At the same time, it needs to be lightweight and have an excellent fatigue life. Springs are crucial suspension elements in cars necessary to minimize the vertical vibrations, impacts, and bumps due to road irregularities and create a comfortable ride. Vertical vibrations and impacts are buffered by variations in the spring deflection so that potential energy is stored in spring as strain energy and then releases slowly. So increasing the strain energy capacity of the leaf spring ensures a more compliant suspension system. Therefore material with maximum strength and minimum modulus of elasticity in the longitudinal direction is the most suitable material for a leaf spring. Composite materials are now used extensively in the automotive industry to take the place of metal parts. So it is essential to provide hybrid composite leaf spring with reduced spring rate, which evenly distributes glass fibers and carbon fibers-graphite fiber throughout resin matrix. The hybrid composite materials offer the various advantages like maximum strength, minimum modulus of elasticity in the longitudinal direction, weight & vibration reduction, improved packaging, strain energy capacity, improved durability & fatigue life and cost reduction due to the use of glass fibers & carbon fibers over the conventional composites materials.

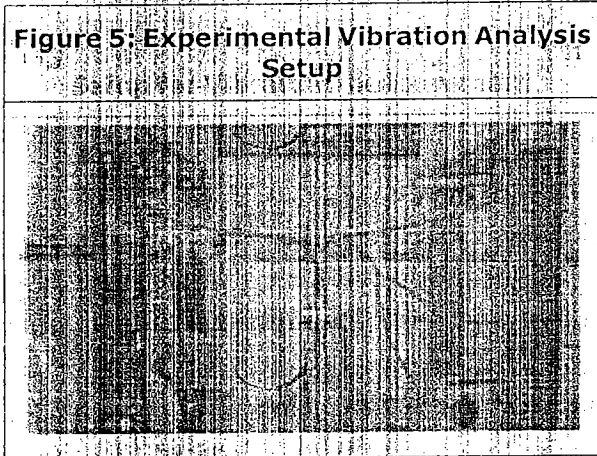
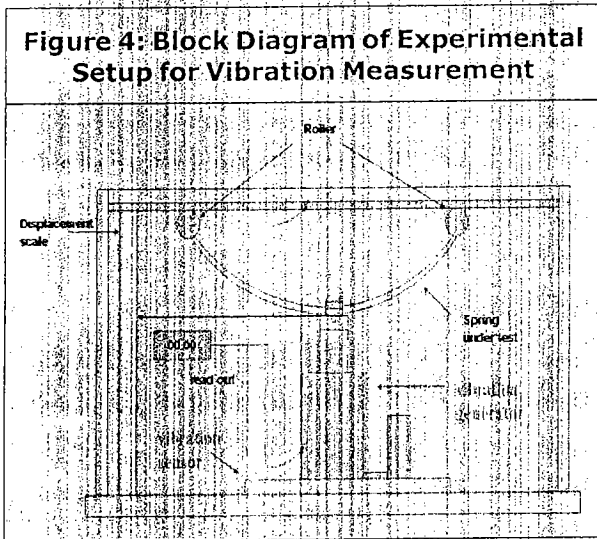
## II. PROBLEM DEFINITION

Now-a-days vibration is very important factor for study in many fields because vibration cause many undesirable effect on machine. To reduce the effect of vibration and to reduce the repulsive effect of damper is the main purpose of this project work. The objective of this project work is to analyze the leaf spring for the constraints such as material composition, vibrations developed in the springs. And finally for both the analytical results are compared with experimental results and verified. Vibration analysis is done and also how much damping will be required for the spring is determined. Mode frequency for the spring is also determined using ANSYS software. This project vibration analysis plays a very important role in the design of composite leaf spring, since the failure due to vibration is more prominent rather than material failure. The heavy & light vehicles need a good suspension system that can deliver a good ride and handling. At the same time, it needs to be lightweight and have an excellent fatigue life. Springs are crucial suspension elements in cars necessary to minimize the vertical vibrations, impacts, and bumps due to road irregularities and create a comfortable ride. Vertical vibrations and impacts are buffered by variations in the spring deflection so that potential energy is stored in spring as strain energy and then releases slowly. So increasing the strain energy capacity of the leaf spring ensures a more compliant suspension system. Therefore material with maximum strength and minimum modulus of elasticity in the longitudinal direction is the most suitable material for a leaf spring. Composite materials are now used extensively in the automotive industry to take the place of metal parts. So it is essential to provide hybrid composite leaf spring with reduced spring rate, which evenly distributes glass fibers and carbon fibers-graphite fiber throughout resin matrix. The hybrid composite materials offer the various advantages like maximum strength, minimum modulus of elasticity in the longitudinal direction, weight & vibration reduction, improved packaging, strain energy capacity, improved durability & fatigue life and cost reduction due to the use of glass fibers & carbon fibers over the conventional composites materials.



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composite leaf spring theoretically now we need to find the same by using FFT analyzer for different conditions. Also we need to how the leaf spring would behave on different road conditions i.e. at different frequencies of the road. The increase in frequency of the road surface causes what changes in the spring vibration also can be determined. For all the above purpose we need to design a set up on which the composite leaf spring should be mounted which give the expected results. The set up for mounting of the composite leaf spring is mounted in a way in which it is mounted in the vehicle. One end of the composite leaf spring is fixed and the other end is movable.

The end which is fixed is attached to a rigid heavy frame and the movable end is also attached to the rigid frame through the shackle. This shackle helps in accommodating the length of the leaf spring when large loads are applied on the spring.

The load on the leaf spring acts on the centre and is then distributed all over the spring through its body. The spring thus vibrates and prevents the vibrations to pass over to the other parts. In our analysis load is given by using a cam jump which is placed right below the leaf spring and it gives the vibrations that will take place on the leaf spring. The frequency of the vibrations generated by the cam jump set up. Vibrations given to the spring are given on the basis of the different road conditions that the spring will encounter and how will it act during those conditions. Thus the vibration analysis is important and it is done by connecting the FFT analyzer with one end connected to a computer and the other end to the leaf spring having accelerometer which receives the vibrations the spring. The computer using MCME2 software after receiving the readings provides the necessary graphs required for the purpose. From the above set up we get the natural frequency of composite leaf spring vibrations.

**Materials for Leaf Spring**

The material used for leaf springs is usually a plain carbon steel having 0.90 to 1.0% carbon. The leaves are heat treated after the forming process. The heat treatment of spring steel products has greater strength and therefore greater load capacity, greater range of deflection and better fatigue properties.

**Carbon/Graphite Fibers**

Their advantages include high specific strength

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move to front wheel drive, and more sophisticated suspension designs saw automobile manufacturers use coil springs instead. Today leaf springs are still used in heavy commercial vehicles such as vans and trucks, SUVs, and railway carriages. For heavy vehicles, they have the advantage of spreading the load more widely over the vehicle's chassis, whereas coil springs transfer it to a single point. Unlike coil springs, leaf springs also locate the rear axle, eliminating the need for trailing arms and a Pan hard rod, thereby saving cost and weight in a simple live axle rear suspension.

A more modern implementation is the parabolic leaf spring. This design is characterised by fewer leaves whose thickness varies from centre to ends following a parabolic curve. In this design, inter-leaf friction is unwanted, and therefore there is only contact between the springs at the ends and at the centre where the axle is connected.

Spacers prevent contact at other points. Aside from a weight saving, the main advantage of parabolic springs is their greater flexibility, which translates into vehicle ride quality that approaches that of coil springs. There is a trade-off in the form of reduced load carrying capability, however. The characteristic

of parabolic springs is better riding comfort and not as "stiff" as conventional "multi-leaf springs". It is widely used on buses for better comfort. A further development by the British GKN company and by Chevrolet with the Corvette amongst others, is the move to composite plastic leaf springs. Typically when used in automobile suspension the leaf both supports an axle and locates/ partially locates the axle. This can lead to handling issues (such as 'axle tramp'), as the flexible nature of the spring makes precise control of the unsprung mass of the axle difficult. Some suspension designs which use leaf springs do not use the leaf to locate the axle and do not have this drawback. The Fiat 128's rear suspension is an example.

A leaf spring is a long, flat, thin, and flexible piece of spring steel or composite material that resists bending. The basic principles of leaf spring design and assembly are relatively simple, and leaves have been used in various capacities since medieval times. Most heavy duty vehicles today use two sets of leaf springs per solid axle, mounted perpendicularly to support the weight of the vehicle. This

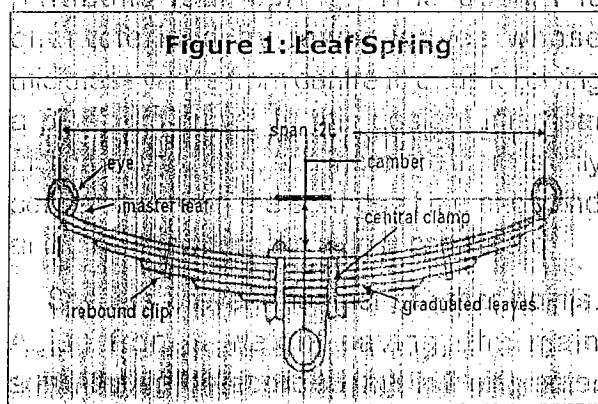


Figure 1: Leaf Spring

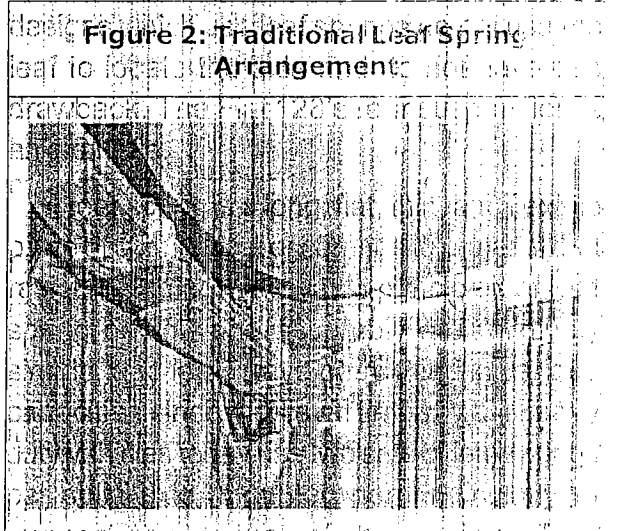


Figure 2: Traditional Leaf Spring Arrangement

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for steering system, bumpers, body panels and doors.

**Space:** Payload bay doors, remote manipulator arm, high gain antenna, antenna ribs and struts, etc. **Marine:** Propeller vanes, fans and blowers, gear cases, valves and strainers, condenser shells.

**Aircraft:** Drive shafts, rudders, elevators, bearings, landing gear doors, panels and floorings of air.

**Sports Goods:** Tennis rackets, Golf club shafts, Fishing rods, etc.

Drive shafts, rudders, elevators, bearings, landing gear doors, panels and floorings of airplanes

**Marine:** Propeller vanes, fans and blowers, gear cases, valves and strainers, condenser shells

**Advantages of Composites**

The advantages of composites over the conventional materials are:

- High strength to weight ratio.
- High stiffness to weight ratio.
- High impact resistance.
- Better fatigue resistance.
- Improved corrosion resistance.
- Good thermal conductivity.
- Low Coefficient of thermal expansion.

As a result, composite structures may exhibit a better dimensional stability over a wide temperature range, high damping capacity.

**Disadvantages of Composites**

The limitations of composites are:

- Mechanical characterization of a composite structure is more complex than that of a metallic structure.
- The design of fiber reinforced structure is difficult compared to a metallic structure.
- The fabrication cost of composites is high.
- Rework and repairing are difficult.

**Composite Leaf Spring**

Modern composites using fiber-reinforced matrices A composite is a structural material that consists of two or more combined constituents that are combined at a macroscopic level and are not soluble in each other. engineered composite materials include:

- 1) Composite building materials such as cements, concrete.
- 2) Reinforced plastics such as fiber-reinforced polymer.
- 3) Metal composites.
- 4) Ceramic Composites (composite ceramic and metal matrices).

Advantages and properties that can influence the different parameters of automobile design by selecting composite material are:

- 1) High strength to wear ratio.
- 2) Corrosion resistance.
- 3) Wear resistance.
- 4) Stiffness.
- 5) Fatigue life.
- 6) Temperature depending behavior.
- 7) Thermal insulation.
- 8) Thermal conductivity.
- 9) Low electrical conductivity.



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desired conceptions of the designer. This material group becomes interesting for use as constructional and functional materials, if the property profile of conventional materials either does not reach the increased standards of specific demands, or is the solution of the problem. However, the technology of MMCs is in competition with other modern material technologies, for example powder metallurgy. The advantages of the composite materials are only realized when there is a reasonable cost – performance relationship in the component production. The use of a composite material is obligatory if a special property profile can only be achieved by application of these materials. The possibility of combining various material systems (metal – ceramic – nonmetal) gives the opportunity for unlimited variation. The properties of these new materials are basically determined by the properties of their single components. The reinforcement of metals can have many different objectives. The reinforcement of light metals opens up the possibility of application of these materials in areas where weight reduction has first priority. The precondition here is the improvement of the component properties. The development objectives for light metal composite materials are:

- Increase in yield strength and tensile strength at room temperature and above while maintaining the minimum ductility or rather toughness
- Increase in creep resistance at higher temperatures compared to that of conventional alloys.
- Increase in fatigue strength, especially at higher temperatures.

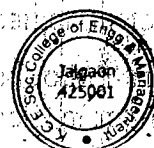
- Improvement of thermal shock resistance.
- Improvement of corrosion resistance,
- Increase in Young's modulus,
- Reduction of thermal elongation.

To summarize, an improvement in the weight specific properties can result, offering the possibilities of extending the application area, substitution of common materials and optimisation of component properties. With functional materials there is another objective, the precondition of maintaining the appropriate function of the material. Objectives are, for example:

- Increase in strength of conducting materials while maintaining the high conductivity,
- Increase in Young's modulus,
- Improvement in low temperature creep resistance (reactionless materials),
- Improvement of burnout behavior (switching contact)
- Improvement of wear behavior (sliding contact)
- Increase in operating time of spot welding electrodes by reduction of burnouts.
- Production of layer composite materials for electronic components,
- Production of ductile composite superconductors,
- Production of magnetic materials with special properties.

For other applications different development objectives are given, which differ from those mentioned before. For example in medical technology, mechanical properties, like extreme corrosion resistance and low degradation as well as biocompatibility are

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and economize energy, weight reduction has been the main focus of automobile manufacturers in the present scenario. Weight reduction can be achieved primarily by the introduction of better material, design optimization and better manufacturing processes.

Composite materials consist of two or more physically dissimilar and instinctively separable components. These two components can be mixed in a restricted way to achieve optimum properties, which are superior to the properties of each individual component. The suspension leaf spring is one of the potential items for weight reduction in automobile as it accounts for 10-20% of the unsprung weight. This helps in achieving the vehicle with improved riding qualities. Since the strain energy in the spring is inversely proportional to density and young's modulus of the material, it is always suggested that the material for leaf spring must have low density and modulus of elasticity (Ranjeet Mithari *et al.*, 2012).

A composite material is characterized as a material made out of two or more constituents joined on a naturally visible scale by mechanical and chemical bonds. Composites are blends of two materials in which one of the materials is known as the "matrix phase" and is implanted in the other material called the "reinforcing stage". Numerous composite materials offer modulus that is either equivalent or superior to any metals. In light of their low specific gravities, the strength to weight-proportion and modulus to weight-proportions of these composite materials are better than those of metallic materials. The fatigue quality weight proportions and fatigue damage

tolerance of numerous composite overlays are fantastic (Hargude *et al.*, 2014).

## COMPOSITE MATERIAL

A material composed of 2 or more constituents is called composite material. Composites consist of two or more materials or material phases that are combined to produce a material that has superior properties to those of its individual constituents. The constituents are combined at a macroscopic level and or not soluble in each other. The main difference between composite and an alloy are constituent materials which are insoluble in each other and the individual constituents retain those properties in the case of composites, whereas in alloys, constituent materials are soluble in each other and forms a new material which has different properties from their constituents.

Classification of Composites  
or material phases that are combined to

- A) Polymer matrix composites
- B) Metal matrix composites
- C) Ceramic Matrix

### Polymer Matrix Composite

Polymer Matrix Composites (PMCs) are comprised of a variety of short or continuous fibers bound together by an organic polymer matrix. Unlike a Ceramic Matrix Composite (CMC) in which the reinforcement is used primarily to improve the fracture toughness, the reinforcement in a PMC provides high strength and stiffness. The PMC is designed so that the mechanical loads to which the structure is subjected in service are supported by the reinforcement. The function of the matrix is to bond the fibers together and to transfer loads between them. Polymer matrix composites are

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Research Paper

# VIBRATION ANALYSIS OF LEAF SPRING OF DIFFERENT COMPOSITE MATERIALS

Hemant Rajendra Nehete<sup>1\*</sup> and T D Garse<sup>2</sup>

\*Corresponding Author: Hemant Rajendra Nehete, ✉ hemantnehe3@gmail.com

Vibration analysis plays a very important role in the design of composite leaf spring. The failure occurs due to vibration as well as due to material. The failure occurs due to vibration is more prominent than material failure. The research consists vibration analysis of leaf spring of different composite material like E Glass/Epoxy, Graphite/Epoxy, Boron/Aluminium, Carbon/Epoxy and Kevlar/Epoxy. Leaf springs are the oldest component frequently used for suspension. There are multileaf springs with steel material also. But it has high weight, low natural frequency, high corrosion, more noise. Due to this, the multileaf springs of steel material are replaced by composite leaf spring which has high natural frequency, low weight. We found that the modified design of springs has better strength characteristics and increase service life of leaf spring.

**Keywords:** Leaf spring, Composite material, Natural frequency, Suspension

## INTRODUCTION

For increasing demands of high performance together with long life and low weight necessitate consistent development of almost every part of automobile. A suspension system is very important part of automobile. Increasing competition and innovations in automobile sector tends to modify the existing products or replacing old products by new and advanced material products. A suspension system of vehicle is also an area where these innovations are carried out regularly. Leaf springs are mainly used in suspension

systems to absorb vibration induced during the motion of vehicle (Gulshad Karim Pathan *et al.*, 2015).

Leaf spring is a simple form of a spring, commonly used for the suspension in wheeled vehicles. It is also one of the oldest forms of springing, dating back to medieval times. Just for the common form of its conception in Italian language a leaf spring suspension is called "balestra" (cross bow). An advantage of a leaf spring over a helical spring is that the end of the leaf spring may be guided along a definite path. In order to conserve natural resources

<sup>1</sup> B.E. (Mechanical Engg), M.E (Machine Design) Scholar, Department of Mechanical Engg, J T Mahajan College of Engg, Faizpur, Maharashtra 425503, India.

<sup>2</sup> Assistant Professor, Department of Mechanical Engg, J T Mahajan College of Engg, Faizpur, Maharashtra 425503, India.

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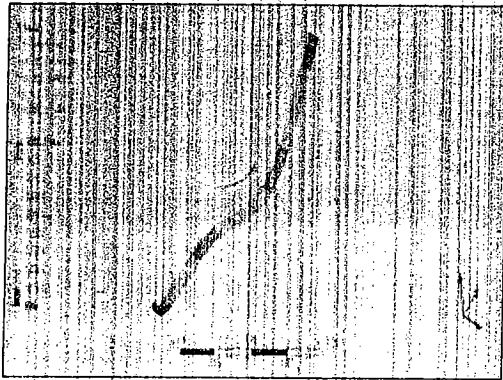


Fig. 9: Mode 1 of master leaf

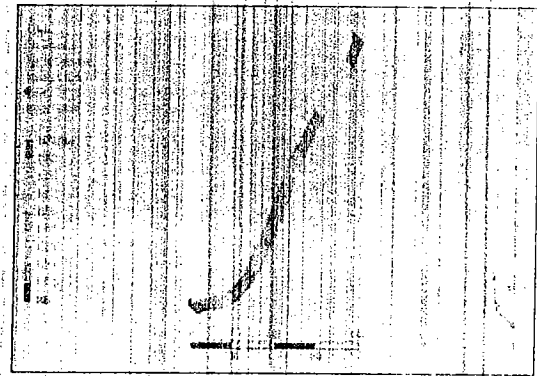


Fig. 10: Mode 1 of composite leaf

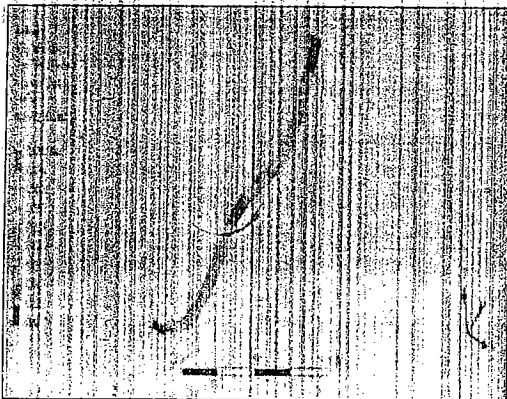


Fig. 11: Mode 2 of master leaf

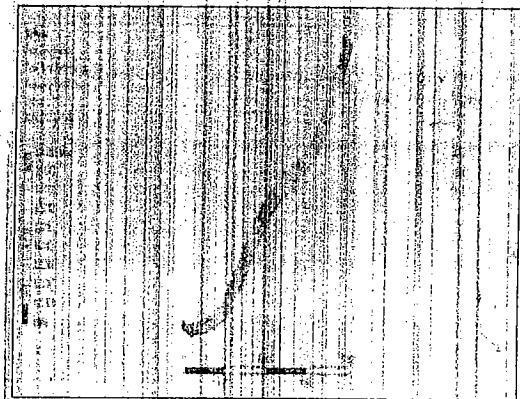


Fig. 12: Mode 2 of composite leaf

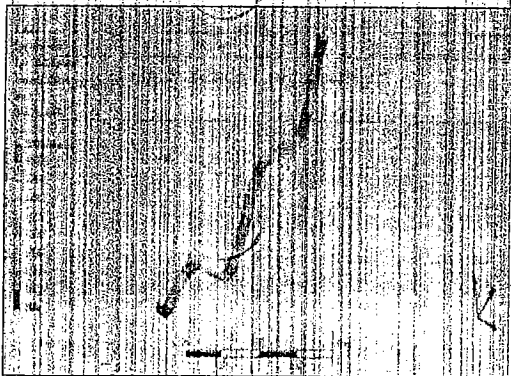


Fig. 13: Mode 3 of master leaf

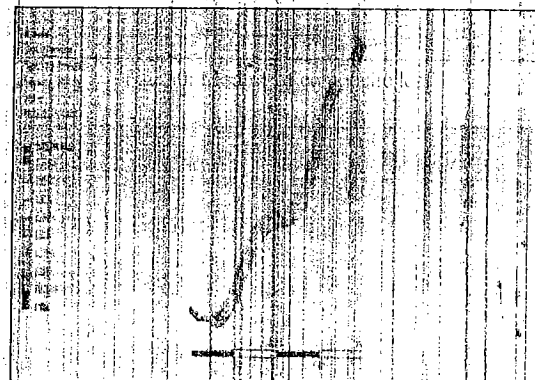


Fig. 14: Mode 3 of composite leaf



Fig. 16: Mode 4 of master leaf

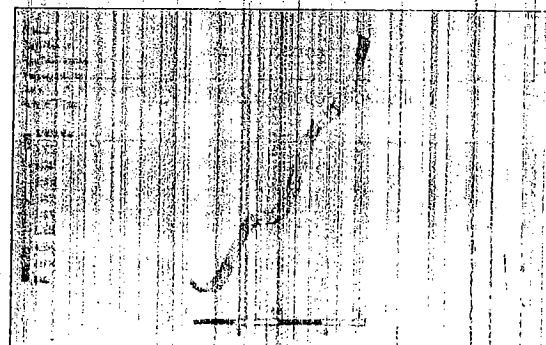
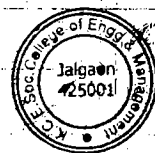


Fig. 17: Mode 4 of composite leaf



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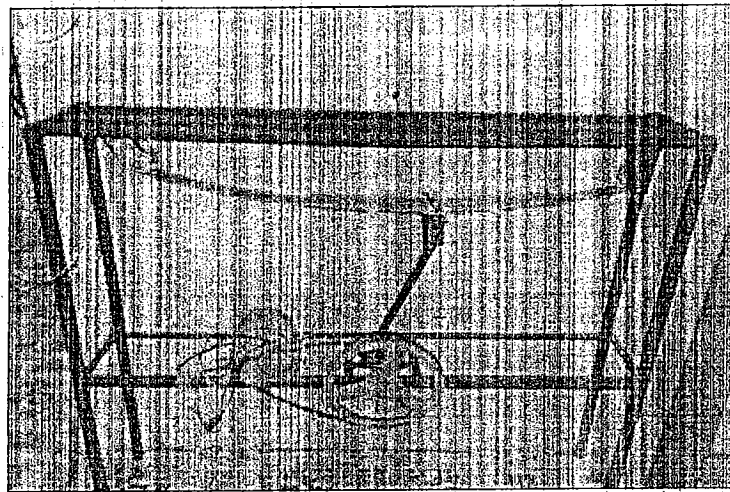


Fig. 2: Composite Leaf spring

Material Properties required for static and vibration analysis

Mode shape analysis (vibration analysis)

Case- simply supported

Load required for static analysis= 3250N

Material properties of both composite and M.S Spring:

Table - 1  
 Material properties

| Material      | Density Kg/m <sup>3</sup> | Youngs Modulus N/mm <sup>2</sup> | Yield tensile strength N/mm <sup>2</sup> |
|---------------|---------------------------|----------------------------------|--|
| Mild Steel    | 7.7x10 <sup>3</sup>       | 2.1x10 <sup>5</sup>              | 1962                                     |
| E glass Epoxy | 7.7x10 <sup>3</sup>       | 207x10 <sup>3</sup>              | 1575                                     |

Dimensions of spring

Length (Eye to eye) = 1200mm

Thickness of Leaf spring = 8mm

Width of Leaf spring = 60mm

Dimension of clamping = 80x40mm

Free casher load condition = 120mm

## V. FINITE ELEMENT MODELING

Fig. 2: Composite Leaf spring

The main rule that involved in finite element method is "DEVIDE and ANALYZE". The greatest unique feature which separate finite element method from other methods is "It divides the entire complex geometry into simple and small parts, called "finite elements". These finite elements are the building blocks of the finite element analysis. Based on the type of analysis going to be performed, these elements divided into several types. Division of the domain into elements is called "mesh". The forces and moments are transferred from one element to next element are represented by degrees of freedom (DOFs) at coordinate locations, which are called as "nodes". Approximate solutions of these finite elements give rise to the solution of the given geometry which is also an approximate solution.

The approximate solution becomes exact when

- 1) The geometry is divided into numerous or infinite elements
- 2) Each element of geometry must define with a complete set of polynomials (infinite terms).

The finite element method has become a powerful tool for the numerical solution of a wide range of engineering problems. It has developed simultaneously with the increasing use of high-speed electronic digital computers and with the growing emphasis on numerical methods for engineering analysis. This method started as a generalization of the structural idea to some problems of elastic continuum. Its well-established numerical method applicable to any continuum problem, stated in terms of differential equations or as an eigenvalue problem.

The fundamental areas that have to be learned for working capability of finite element method include

- 1) Matrix algebra
- 2) Solid mechanics
- 3) Variational methods.
- 4) Computer skills.

Matrix techniques are definitely the most efficient and systematic way to handle algebra of finite element method. Matrix algebra provides a scheme by which a large number of equations can be stored and manipulated. Since vast majority of the elements of the stiffness matrix are zero, the finite element method is well suited for computers. The finite element method is a powerful tool for the numerical solution of a wide range of engineering problems. It has developed simultaneously with the increasing use of high-speed electronic digital computers and with the growing emphasis on numerical methods for engineering analysis. This method started as a generalization of the structural idea to some problems of elastic continuum. Its well-established numerical method applicable to any continuum problem, stated in terms of differential equations or as an eigenvalue problem.



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leaf its maximum value is 18.13 mm. Red zone indicates the area of maximum deflection and blue zone indicates the area of minimum deflection. Whereas experimentally it is calculated as 16.89 mm.

**Figure 12: Von Mises Stresses in Master Leaf Model**

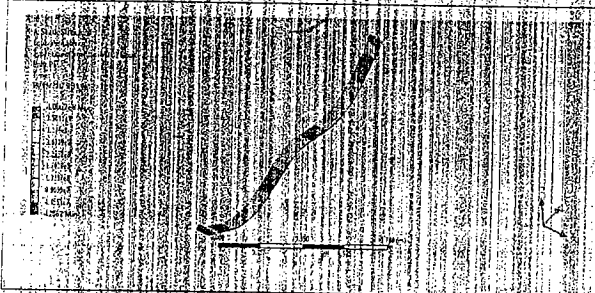


Fig shows the equivalent von-Mises stress induced in master leaf under the load of 3250 N load. The maximum stress is induced near the fixed eye end of the leaf its maximum value is 400 MPa. Whereas experimentally, it is calculated as 369.92 MPa. Red zone indicates the area of maximum stress and blue zone indicates the area of minimum stress.

**Figure 13: Von Mises Stresses in Composite Leaf Model**

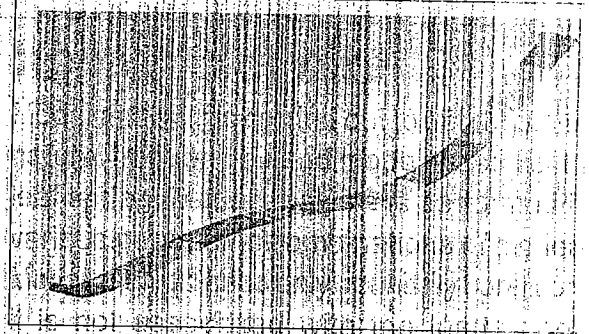


Fig shows the equivalent von-Mises stress induced in master leaf under the load of 3250 N load. The maximum stress is induced near the fixed eye end of the leaf its maximum value is 151 MPa. Whereas analytically stress for this design is 143.21 MPa. Red zone indicates the area of maximum stress and blue zone indicates the area of minimum stress.

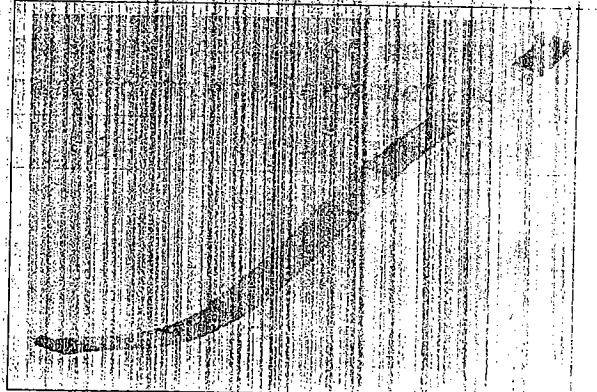
## MODAL ANALYSIS

Modal analysis is carried out to determine the natural frequencies and mode shapes of the leaf spring. Modal analysis is performed for various parametric combinations of the leaf. Modal analysis need only boundary conditions, it is not associated with the loads apply, because natural frequencies are resulted from the free vibrations. The boundary conditions are same as in the case of static analysis. 3 number of modes are expanded.

**Figure 14: Vibration in Master Leaf**



**Figure 15: Vibration in Composite Leaf**



## RESULTS AND DISCUSSION

For the first mode the natural frequency calculated for master leaf from experiment is 15.5hz and it is 16.445 hz according to ANSYS. Similarly for composite leaf the natural frequency from experiment is 17 hz and from ANSYS is 18.811hz.



analysis

- Assign appropriate physical properties to each type
- Define one or more sets of materials used in the model
- Define mass distribution for dynamic analysis
- Create geometry
- Mesh elements
- Apply loads and boundary conditions

**Solution — SOLUTION module**

- Choose appropriate analysis type and solution algorithm
- Initiate solution

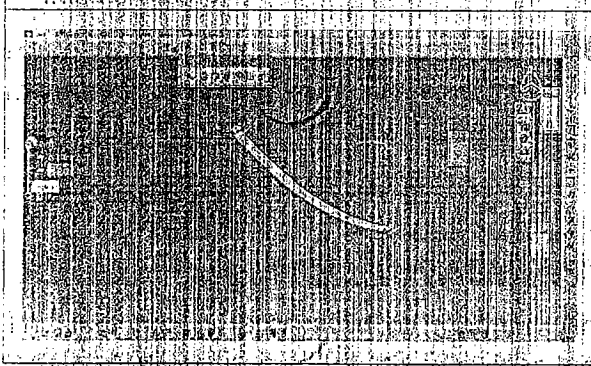
**Post-processing — POST1 and POST26 modules**

- View results
- Export results

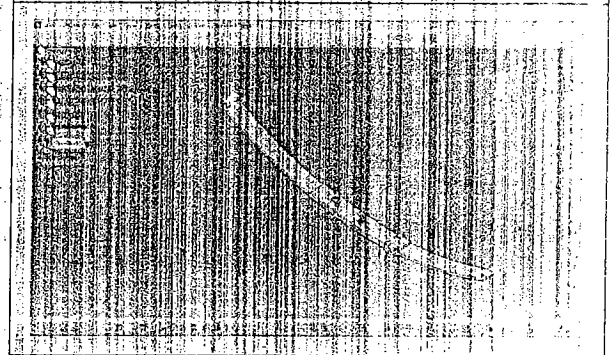
**DESIGN AND FEA ANALYSIS**

The leaf model is created by modeling in CATIA V5 software and it is imported in to the ANSYS Workbench software. As FEA is a computer based mathematically idealized real system, which breaks geometry into element.

**Figure 4: Modeling of Master Leaf**



**Figure 5: Modeling of Composite Leaf Using CATIA V5**



It links a series of equation to each element and solves simultaneously to evaluate the behavior of the entire system. This tool is very useful for problem with complicated geometry, material properties and loading where exact and accurate analytical solution is difficult to obtain. 1. Meshing Discretising of model into the small sections called as the element. Mesh element for this analysis was tetrahedron.

**Figure 6: Meshing of Master Leaf**

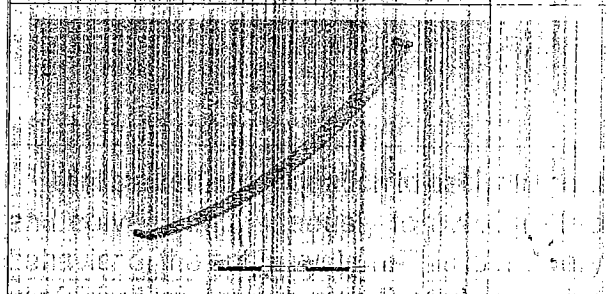
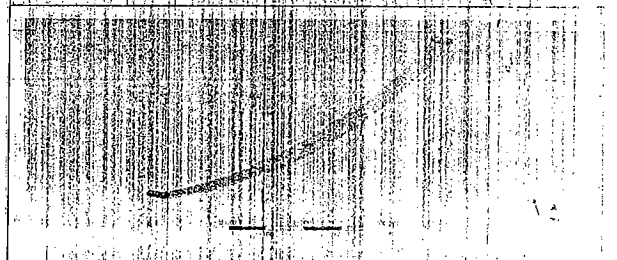


Figure shows the meshed model of master leaf in which mesh has been selected considering the concept of grid independence.

**Figure 7: Mesh Model of Composite Leaf**



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in which  $F(x)$  is the mode shape function and  $\omega$  is the circular natural frequency.

Substituting (49) in eq. (47), one has

$$\frac{\partial^4 W}{\partial x^4} - \beta^4 W(x) = 0$$

$$W(x) = C_1 \cosh \beta x + C_2 \sinh \beta x + C_3 \cos \beta x + C_4 \sin \beta x$$

In order to solve Eq. 3.7 the following boundary conditions for Cantilever Beam are needed:

1. At  $x=0 \rightarrow W=0$
2. At  $x=0 \rightarrow WI=0$
3. At  $x=L \rightarrow WII=0$
4. At  $x=L \rightarrow WIII=0$

By substituting boundary conditions in to  $W$ ,  $WI$ ,  $WII$ ,  $WIII$  We obtain the following values of  $C_1$ ,  $C_2$ ,  $C_3$ , and  $C_4$ .

$$[\cosh \beta L + \cos \beta L] C_1 + [\sinh \beta L + \sin \beta L] C_2 = 0$$

$$[\sinh \beta L - \sin \beta L] C_1 + [\cosh \beta L - \cos \beta L] C_2 = 0$$

We can write Eq. 3.8 in matrix form as

$$\begin{bmatrix} \cosh \beta L + \cos \beta L & \sinh \beta L + \sin \beta L \\ \sinh \beta L - \sin \beta L & \cosh \beta L - \cos \beta L \end{bmatrix} \begin{bmatrix} C_1 \\ C_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

For solving matrix of Eq. 3.9, we get determinant

$$(\cosh \beta L + \cos \beta L)(\cosh \beta L - \cos \beta L) - (\sinh \beta L + \sin \beta L)(\sinh \beta L - \sin \beta L) = 0$$

$$\cosh^2 \beta L - \cos^2 \beta L - 2 \cosh \beta L \sin \beta L + \sinh^2 \beta L + \sin^2 \beta L = 0$$

Hence we get

$$\cos \beta L \cosh \beta L = 1$$

This transcendental Eq. has an infinite number of solutions

Corresponding giving an infinite number of natural frequencies

$$\omega_i = (\beta_i)^2 \sqrt{\frac{EI}{\rho A}}$$

The natural frequency of both the steel leaf spring and composite leaf spring is calculated analytically by Euler's Beam Theory for Continuous System.

The Euler's Equation for natural frequency is given as

$$F = (1/2)(Bnl)^2(EI/\rho aL^4)^{1/2}$$

where,

$(Bnl)^2 =$  constant depending on end conditions

$I =$  Moment of inertia of system

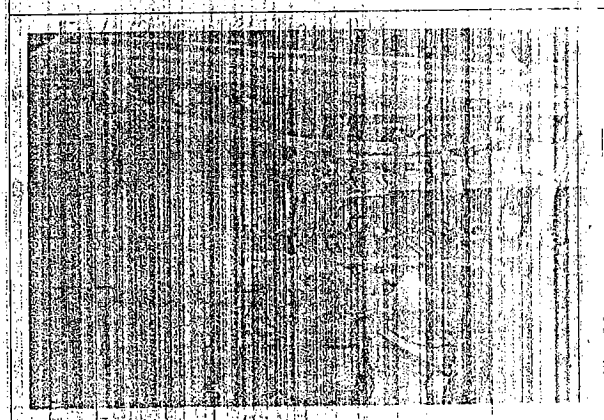
$P =$  Density of Material

$A =$  Area of cross section

$L =$  Length of spring

## EXPERIMENTAL SETUP

Figure 3: Experimental Setup



Dimensions of spring

Length (Eye to eye)=1200mm

Thickness of Leaf spring=8mm

Width of Leaf spring=60mm

Dimension of clamping=80x40mm

Free casher load condition=120mm





A spring is defined as an elastic body whose function is to distort when loaded and to recover its original shape when the load is removed. Leaf springs absorb the vehicle vibrations, shocks and bump loads (induced due to road irregularities) by means of spring deflections, so that the potential energy is stored in the leaf spring and then relieved slowly.

Reduction of vibration done by using suspension system in case of vehicle. Leaf spring is commonly used suspension system in vehicles. There are steel leaf spring and composite leaf spring also. But nowadays for conserving natural resources and economize energy, weight reduction is the main focus of the automobile manufacturer. Weight reduction can be achieved primarily by the introduction of better material, design optimization and better manufacturing processes. The suspension leaf spring is one of the potential items for weight reduction in automobile as it accounts for ten to twenty percent of the unstrung weight. This gives vehicle an improved riding qualities. Springs absorb and store energy and then release it. Hence strain energy of material is the major factor in designing a spring. The introduction of composite materials was made it possible to reduce the weight of the leaf spring without any reduction on load carrying capacity and stiffness. Since the composite materials have more elastic strain energy storage capacity and high strength-to-weight ratio as compared to those of steel.

Composite materials are ideal for structural application where high strength to weight and stiffness to weight ratio are required. These materials are basically hybrid materials formed

of multiple materials in order to utilize their individual structural advantages in a single structural material. The composite material then has the properties of the two materials that have been combined. The advantage of composite materials is that, if well designed, they usually exhibit the best qualities of their components or constituents and often some qualities that neither constituent possesses. Some of the properties that can be improved by forming a composite material are Strength, Fatigue life, Stiffness, Corrosion resistance, Thermal insulation, Weight, Wear resistance, Attractiveness, Thermal conductivity, Acoustical insulation. Naturally, not all of these properties are improved at the same time nor is there usually any requirement to do so. In fact, some of the properties are in conflict with one another, e.g., thermal insulation versus thermal conductivity. Modern composites using fiber reinforced matrices of various types have created a revolution in high-performance structures in recent years. Advanced composite materials offer significant advantages in strength and stiffness coupled with light weight relative to conventional metallic materials [8].

## LAMINATED SEMIELLIPTICAL SPRING

A laminated semi-elliptic spring. The top leaf is known as the master leaf. The eye is provided for attaching the spring with another machine member. The amount of bend that is given to the spring from the central line, passing through the eyes, is known as camber. The camber is provided so that even at the maximum load the deflected spring should not touch the machine member to which it is attached. The camber shown in the figure is



### ABSTRACT

This work performed the experimentation to study the pool boiling and optimization analysis of critical heat flux using nanofluid. Phenomenon of boiling heat transfer plays a crucial role in the design of high heat flux system like boilers, heat exchanger, microscopic heat transfer devices. This works uses the Al<sub>2</sub>O<sub>3</sub> nanoparticles for experimentation. The experiments covered the following range: Nanofluid concentration (NF<sub>C</sub>) 6 gm/lit, 9 gm/lit and 12 gm/lit, surface area of heater (A<sub>S</sub>) 94.79 mm<sup>2</sup>, 129.90 mm<sup>2</sup> and 193.17 mm<sup>2</sup> and mass flow rate of condenser water (M<sub>F</sub>) 6 kg/min, 12 kg/min and 18 kg/min. Critical heat flux (CHF) and surface roughness (Ra) considered as performance parameters. The factorial method of design of experiment (DOE) with 3 factors and 2 levels is used for the sequence of experimental trails. The correlations are used for determining theoretical critical heat flux for distilled water. The experimental results for distilled water are compared with theoretical results obtained from correlation equations. There is a good agreement between theoretical and experimental results which gives validation of experimental test rig. The analysis is done with regression method and D'optimal method is used for response optimization.

**Keywords:** Critical Heat Flux, Pool Boiling, Nanofluid, Concentration, Surface Roughness, Factorial Method.

### I. INTRODUCTION

The rapid advancement in the field of nuclear and fossil energy, electronic chips, electric power generation, compact computing devices etc. which gives tremendous impetus to study the heat transfer phenomenon. Heat transfer associated with phase change has gained lot of attention by engineers and researchers throughout the world aimed at improving the heat transfer performance. This rapid heat transfer is possible due to removal of heat from the surface as a combined effect of heat of vaporization and sensible heat, and motion of bubbles leading to rapid mixing of the fluid. This phenomenon of boiling heat transfer plays a crucial role in the design of high heat flux systems like boilers, heat exchangers, microscopic heat transfer devices, thermal ink jet printers etc [1]. Therefore, it is important to predict and enhance the CHF value for improved safety and cost effectiveness. Improved CHF allows operation at thermal power levels higher than those possible in present power plants. The effect of improving CHF in several power plants was considered to be nearly as beneficial as building a new nuclear power plant but obviously without the construction costs. It is important to enhance the CHF in order to improve the safety margin and economic performance in a thermal system. Heat transfer to boiling liquids is a convection process involving a change in phase from liquid to vapor. The phenomena of boiling heat transfer are considerably more complex than those of convection without phase change because in addition to all of the variables associated with convection; those associated with the phase change are also relevant. In liquid phase convection, the geometry of the system, the viscosity, the density, the thermal conductivity, coefficient of expansion and specific heat of the fluid are sufficient to describe the process. In boiling heat transfer, however, the surface characteristics, the surface tension, the latent heat of vaporization, pressure, density and possibly other properties of the vapor play an important part [2]. This has forced the researchers to focus on cooling fluids enhanced heat transfer characteristics. With the surge of nanofluids as potential candidates for cooling fluids, many studies have been reported on enhancement of CHF using nanofluids.

### II. EXPERIMENTAL SET-UP

Experimental Set-up consists of various components such as Glass Beaker, Bakelite Covers, Fluid Heater, Test Wire, Copper Electrode, Thermocouple, and Condenser. A glass beaker has capacity of 3000 ml having size 15



cm diameter and 21.5 cm height. Material of glass beaker is Borosilicate. It can sustain temperature up to 350°C. Two Bakelite sheets are used in test rig. Top Bakelite cover is also having small holes for thermocouple and wire to supply current to copper electrodes. There is one inner Bakelite disk is inserted inside the container to hold four copper electrodes. These Bakelite top cover and inner Bakelite disk are bolted each other firmly. To avoid the escape of vapour silicate paste is pasted on bottom of top Bakelite cover so that the flexible layer will form on bottom side of top Bakelite cover and after bolting top Bakelite to the base steel frame, the vapour will not escape from side. Bakelite sheet has thickness 15 mm. In this experimentations plate heater is used. A plate heater of 1000 W is used to heat the water and nanofluid to the saturation temperature. The plate heater is attached to the copper electrode. This plate is having 110 mm diameter and small thickness. Test wire used is Nichrome wire. Wire is of SWG (standard wire gauge) 24, 28, and 32.

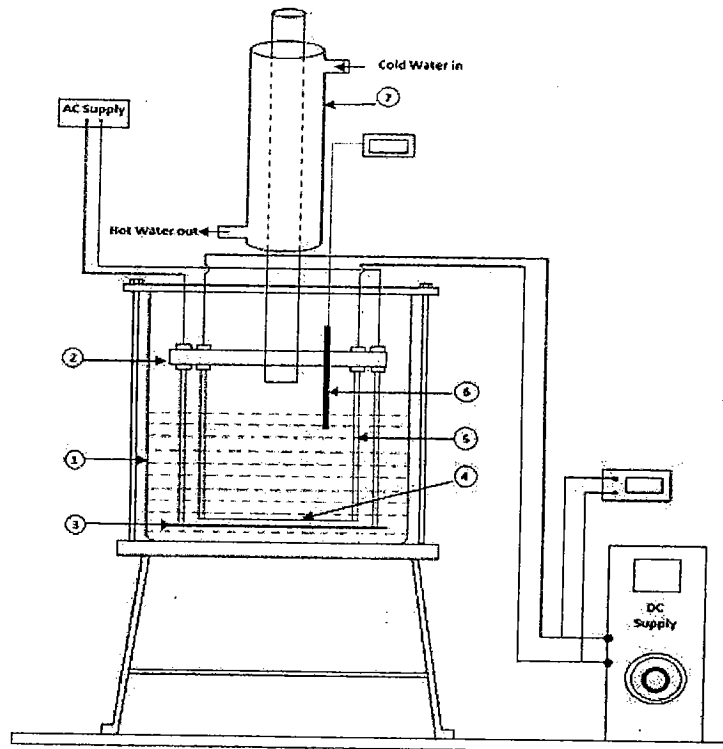


Fig. 1: Schematic of Experimental Set-up: (1) Glass Beaker (2) Bakelite Covers (3) Fluid Heater (4) Test Wire (5) Copper Electrode (6) Thermocouple (7) Condenser

A plate heater of 1000 W is used to heat the water and nanofluid to the saturation temperature. The plate heater is attached to the copper electrode. This plate is having 110 mm diameter and small thickness. Test wire used is Nichrome wire. Wire is of SWG (standard wire gauge) 24, 28, and 32. The diameter of wire is taken according to the standard gauge and length of test wire is selected as 110 mm. Four copper electrodes are used having diameter 5 mm. Two copper electrodes are used to supply current to fluid heater. Other two Copper electrodes are used to supply measured DC power to test wire. The distance between two copper electrodes on which test wire is mounted is 110 mm. K-type thermocouple is used to measure the temperature of the fluid. This thermocouple is calibrated at temperature 50°C, 100°C, and 150°C having uncertainty 4.5 %. The diameter of thermocouple is 8 mm and length is 75 mm having 2 m wire. The temperature range of the thermocouples is from 0°C to 200°C. Condenser is used to condense the water vapors which are formed due to boiling condenser is having one central hole of 20 mm diameter through which vapors can pass. Surrounding this 20 mm hole water jacket is provided. Water jacket is having length 300 mm diameter 30 mm. Cold water supply arrangement is provided. Two the tubes are attached to condenser supply cold water and take hot water from condenser. Central hole of condenser ensure atmospheric condition inside the container. This condenser is fixed on Bakelite top cover.



Table 1: Operating Conditions Pested in Experimentation

| Sr. No | Parameters  | Values                |                        |                        |
|--------|---|-----------------------|------------------------|------------------------|
|        |   | Low                   | Medium                 | High                   |
| 1      | Concentration of Nanofluid (NF <sub>c</sub> )       | 6 gm/lit.             | 9 gm/lit.              | 12 gm/lit.             |
| 2      | Surface Area of Heater (A <sub>s</sub> )            | 94.79 mm <sup>2</sup> | 129.90 mm <sup>2</sup> | 193.17 mm <sup>2</sup> |
| 3      | Mass Flow Rate of Condenser Water (M <sub>f</sub> ) | 6 kg/min.             | 12 kg/min.             | 18 kg/min.             |

In the present investigation, experiments have performed on the basis of the design of experiments (DOE) technique. Factorial design of experiment has employed for experimentation in order to improve reliability of result and to reduce the size of experimentation without loss of accuracy. The design chosen has a two level factorial design 2<sup>3</sup> which gives 8 runs of experiment. The process parameters selected for the experimentation is concentration of nanofluid (NF<sub>c</sub>), surface area of heater (A<sub>s</sub>) and mass flow rate of condenser water (M<sub>f</sub>). Critical heat flux (CHF) and surface roughness (Ra) has taken as response variable.

### III. DATA PROCESSING

#### 3.1 Critical Heat Flux and Surface Roughness

Experimental critical heat flux is determined by following formula

$$q''_{\text{experimental}} = \frac{V_{CHF} \times I_{CHF}}{A} \tag{1}$$

A = Surface area of heater surface

$$A = \pi \times D \times L$$

V<sub>CHF</sub> = Voltage at CHF

I<sub>CHF</sub> = Current at CHF

The value of surface roughness (Ra) for heater surface is directly obtained from surface roughness testing machine. The sample of each experiment is tested on surface roughness Tester MarSurf M400.

#### 3.2 Experimental Uncertainties

The main sources of uncertainty of the applied voltage and current are due to contact resistance between the wire heater and electrodes [6]. In addition, there is uncertainty associated with the length and diameter of the NiCr wire heater. The measurement uncertainty is calculated using the method by Holman as given in Equation (2).

$$\frac{Uq''}{q''} = \sqrt{\left(\frac{U_I}{I}\right)^2 + \left(\frac{U_V}{V}\right)^2 + \left(\frac{U_D}{D}\right)^2 + \left(\frac{U_L}{L}\right)^2} \tag{2}$$

The uncertainties in the Voltage, Current, Length and diameter of wire measurement are 3.44%, 3.98%, 1.81% and 5.32% respectively. The maximum estimated uncertainty of the heat flux measurement is 7.69%.

### IV. RESULT AND DISCUSSION

#### 4.1 Validation of Experimental Set-up

In order to have a basis for the evaluation some experiments were carried out with distilled water. CHF in pool boiling are compared with the most widely accepted Zuber's correlation. It is given by:

$$q''_z = 0.131 \times h_{fg} \times [g \times \sigma \times \rho_v^2 (\rho_l - \rho_v)]^{1/4} \quad (\text{W/m}^2) \tag{3}$$

The predicted value of critical heat flux of distilled water at 100°C by using Zuber's correlation is 1.11MW/ m<sup>2</sup>. Critical heat flux is determined for distilled water at saturated temperature by performing ten pool boiling experiments. Average value of CHF is determined by taking average of CHF of ten experiments. Average



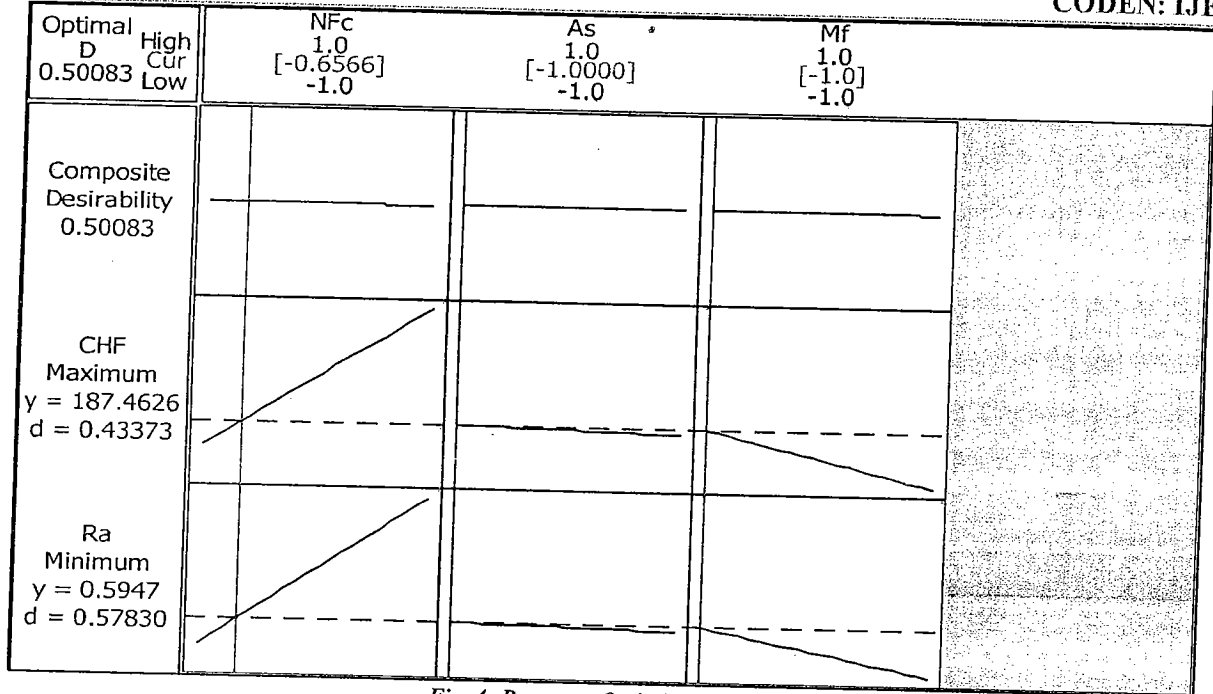


Fig. 4: Response Optimization Plot

V. CONCLUSIONS

In this study, following conclusions are drawn for effective critical heat flux and surface roughness and summarized as:

- Development of Experimental Set-up:** In this work design and development of experimental test rig are carried out for desired investigation of critical heat flux (CHF) and surface roughness.
- Validation of Experimental Set-up:** Validation of experimental set up is carried out with well-known equations for critical heat flux. The average percentage error of experimental and theoretical critical heat flux is 7.12%. Hence experimental set-up is validated.
- Critical Heat Flux Investigation:** The higher values of input parameters such as nanofluid concentration ( $NF_c = 12 \text{ gm/lit}$ ), mass flow rate of condenser water ( $M_f = 18 \text{ kg/min}$ ), and lower value of heater surface area ( $A_s = 94.79 \text{ mm}^2$ ) provided the maximum value of critical heat flux which is equals to  $205.30 \text{ W/cm}^2$ .
- Surface Roughness Investigation:** The lower value of input parameter such as nanofluid concentration ( $NF_c = 6 \text{ gm/lit}$ ), and higher values of heater surface area ( $A_s = 193.17 \text{ mm}^2$ ) and mass flow rate of condenser water ( $M_f = 18 \text{ kg/min}$ ), provided the minimum value of surface roughness which is equals to 0.507
- Response Optimization:** It is observed that maximum critical heat flux and minimum surface roughness are obtained simultaneously by employing  $NF_c = 65.66\%$  of higher value i.e.  $7.8792 \text{ gm/lit}$ ,  $A_s = 94.79 \text{ mm}^2$  and  $M_f = 6 \text{ kg/min}$

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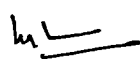
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 COLLEGE OF ENGG. &  
 MANAGEMENT, JALGAON

# ANALYSIS OF SINGLE PHASE Z-SOURCE INVERTER USING VARIABLE LOAD

Gauravi S. Somani, Dr. P. H. Zope

M.E. Scholar, Assistant Professor,  
Department of Electronics and Telecommunication Engineering,  
SSBT's C.O.E.T., Bambhori, North Maharashtra University, India

## ABSTRACT

*This paper presents a high performance, low cost prototype Z-source inverter for variable load or household based application. It is an improvement over Traditional Voltage-source and Current-source inverter with a unique X-shaped network. The X-shaped network can provide a single stage power conversion concept where as the traditional inverter requires two stage power conversion for renewable energy applications. Z-source inverter system is designed and simulated using Matlab-Simulink and their results are compared with the hardware designed by microcontroller ATMEGA AT89S52. The sinusoidal PWM signal are generated using microcontroller with 10Khz switching speed. The performance analysis, simulation and comparison have been carried out it results the Z-source inverter system is more suitable as compared to traditional inverters. The efficiency, stability, faster switching action of the MOSFET, the total harmonics distortion against the nonlinear load is also better as variation in modulation index.*

**Key words:** Z-source inverter (ZSI), Pulse Width Modulation (PWM), Matlab-Simulink, Modulation index.

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## 1. INTRODUCTION

Z-source inverters are new breed of inverter in which voltage boost operation can be simultaneously performed along with inversion operation, which greatly reduces the losses occurring due to two stages while using conventional inverter method. These losses include the losses occurring due to transformer or due to DC-DC boost converter. ZSI although reduces the overall cost by reducing the stages[1] In the initial part of paper a review of the resultant analysis of hardware and software with their modulation index. The technique is discussed with basic principle, methodology, advantages and disadvantages. At last comparative analysis of Hardware and Software is also provided.



## Aadhar enabled ration distribution and monitoring using smart card

Dr. P. H. Zope, Jayashri Ingale,  
Assistant Professor, P.G. student,

SSBT's College of Engineering and Technology, Bambhori, Jalgaon  
[phzope@gmail.com](mailto:phzope@gmail.com)

### ABSTRACT :

This paper proposes Automatic Trailing Machine(ATM) based ration distribution using smart card and Aadhar card technology. Aadhar card contains all related information such as name, permanent address, mobile number, bank account number, biometric information and demographic data. Consumer details are stored in the central data base which is provided by the government authority. In this ATM system, we replace the conventional ration card by smart card (RFID based), which contains unique Aadhar identification number of all the family members, card holder type APL or BPL which is used for user authentication to buy their ration. OTP and SMS will be sent to the card holder and after each transaction the government data base will be updated. The system continuously monitors, alert and notify the government authority during theft. As customer purchases the material amounts get deducted from the registered bank saving account.

**Keywords:-** ATM, Ration, RFID, Smart card, Aadhar, UID etc

### 1. INTRODUCTION

The Public Distribution System (PDS) was launched in India on June 1997 and is recognized by the Ministry of Consumer Affairs, Food, and Public Distribution. The fair price shops are mainly used to distribute the goods with low cost or free of cost. It is a concern of India's public distribution System implanted by Government of India, which distributes rations at a subsidized price to the poor. In India approximately 500000 fair price shops are available. Here the Major commodities distributed include essential food grains, so much as wheat, rice, sugar, and kerosene, through a network of public distribution shops constituted in several states across the country. The central and state governments joint the responsibility of regulating the PDS. While the central government is obligated for procurement, storage, conveyance, and majority allocation of food grains, state governments holds the province for distributing the aforesaid to the consumers through the ingrained network of Fair Price Shops (FPSs). State governments are also responsible for functional obligation, including allotment and identity of families below the poverty line, issue of ration cards, superintendence and monitoring the functioning of FPSs. The Indian ration card is the authority of the Indian peoples. This is mainly used for buying supported food and

fuel (LPG and kerosene). It is an important livelihood tool for the misfortunate, providing proof of personal identity and link with government databases.

India's public distribution system (PDS) runs based on the ration card, including its purpose of identification, eligibility, and entitlement. Ration card has three categories – extreme poverty level (AAY), below poverty line (BPL) and above poverty line (APL). The poverty lines are identified depends upon the annual income of that particular family. Depends upon the family incomes the ration card colour is decided. The different colours of ration cards are navy blue (BPL), white (APL) and orange (AAY). A below poverty line (BPL) correspondence bearer should be collected 35 kg of food grain and the card holder above the poverty line should be collected 15 kg of food grain as per the norms of PDS. Up to the age of 12 years, a half unit ration materials are issued and full unit ration materials is issued in case of age more than 12 years. In fair price shops presently the peoples are facing so many problems like corruption, wastage of time and no proper material distribution [1-10].



Figure 1.1: Queue in Ration Shops.



# Design Approach for Automatic Rationing Distribution System

Miss. Jayashri D. Ingale<sup>1</sup>, Dr. P. H. Zope<sup>2</sup>

<sup>1</sup>PG Student, Department of E&TC, SSBTCOET, Jalgaon, India

<sup>2</sup>Asst. Professor, Department of E&TC SSBTCOET, Jalgaon, India

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**Abstract** – Recently, the Public Ration Distribution System structure is one of the prime government commercial schemes. Low economical group and people below scarcity line use this amenities provided by the government. Due to deception appear in a chain, such amenities do not reach to the needy people. This happens because in the existing system all the work done by physically. To computerize or automate this physical job there is no any specific unreasonable technology or tools involved. Due to this, system facing two problems firstly weight of the material that is given to the people may be inaccurate or imprecise and secondly, at the end of the, illegal wrong entries in the inventory of the shop about the amount of the material given to the consumers. To overcome this problem, we have implemented an idea to exchange the physical work by automating the distribution of product in ration shop. By using embedded system technology the ration distribution is automated with the help of RFID and GSM based paperless system. The people can acquire the material by showing RFID card into RFID reader; the controller checks the consumer database code and details of the amount on the card. After checking details, the LCD will display the consumer details on screen and list of product available for them. By using keyboard consumer needs to enter required material. With the help of GSM, the microcontroller sends the information to government administrative centre and consumer. In the absence of human, this system provides the material to consumer automatically.

**Key Words:** Corruption, Embedded system, GSM Technology, Rationing System, RFID System

## 1. INTRODUCTION

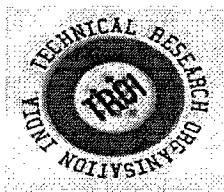
Related to present, ration card is an official document for every resident of India and this is used for various fields such as family member essentials, also for receiving the gas connection and address verification for various purposes, etc. In the world of automation, everyone is trying to change their business to an automated system for reducing the man efforts. Civil Supplies Corporation is the responsible public sector for managing and distributing the vital commodities to the people. In that product like rice, sugar, kerosene, wheat, and oil etc are provided to the people who had ration cards and these are handled through manual ration shop system. In such system manual transactions are carried out in such scenario robbing may be possible due to adding false weight to weighing scale or doing wrong entries to their registers.

Currently, nearly all of the citizens having the ration card for governmental purpose and for buying food from ration shop on less MRP as compared to the market price. Most of the people buy that subsidized foodstuff like rice, sugar, kerosene, wheat, and oil by making entries on their ration card. Due to this, system facing two problems firstly weight of the material that is given to the people may be inaccurate or imprecise and secondly, at the end of the illegal wrong entries in the inventory of the shop about the amount of the material given to the consumers. For overcoming these problems we have proposed the Automatic Ration Materials Distribution Based on GSM and RFID System. RFID technique efficiently used to resolve some of them. RFID acts as ration card and another purpose such as RC book, insurance details, service details etc. Depending on the requirements of the consumer, GSM is used to transfer the information between two or more persons.

Radio Frequency Identification (RFID) based access control system approved or responsible persons to get the materials from ration shops. Other than RFID can't issue the materials from the ration shop. An RFID system having an antenna or coil, a transceiver (with decoder) and a transponder (RF tag) electronically programmed with unique information. In the market, there are so many types of RFID systems are accessible. RFID classified based on their frequency ranges. Low frequency (30 to 500 kHz), mid frequency (900 kHz to 1500MHz) and high frequency (2.4 to 2.5GHz) RFID kits are generally promoted. The active tags are lighter and costly than passive tags.

Global system for mobile communication (GSM) is a worldwide accepted standard for digital cellular communication and it is a most separable protocol for communication. GSM is a common European mobile telephone standard for a mobile cellular radio system operating at 900 MHz currently SIM 300 GSM modules is used. The SIM 300 modules are a Tri band GSM solution in a compact plug in modules featuring an industry standard interface. With low power consumption it delivers voice, data, and fax in a minute form aspect.

The main aim of this paper is to intend and implement embedded based automatic ration materials using RFID and GSM Technology. In this system, only genuine person can be collected ration materials from ration shops based on the amount available in the RFID.



# A FILTERING SYSTEM FOR UNWANTED MESSAGES FROM OSN USER WALLS USING TEXT CLASSIFICATION

Harsha Talele<sup>1</sup>, Prativina Talele<sup>2</sup>

## Abstract

Now a days, rapidly increasing the use of online social networks (OSNs). Through this services user's can communicate and transfer any data. The major disadvantage of these Online Social Networking (OSN) services is the lack of privacy for the user's own private space. We use pattern matching and text classification algorithm for accurate filtering results. We propose a system allowing OSN users to have a direct control on the messages posted on their walls. This is a flexible rule-based system that allows users to customize the filtering process applied to their user's profiles. A machine learning technique automatically labeling messages in support of content-based filtering.

**Index Terms:** content-based filtering, filtering rule, filtering system, machine learning , online social networks

## I. INTRODUCTION

We all are using one or more of the networking site for communication that are available now a day. Online Social Network are today's popular interactive medium to communicate, share and announce a important quantity of users information. We transfer different types of content if including free text, video, audio image data. Therefore in Online Social Networks (OSN) there is possibility of posting unwanted content on particular public/private are called in general walls. In this paper we are mainly focus on the text based messages. OSN provide less amount of security in posting the unwanted messages.

Here we introduce some technique which is helpful for filtering unwanted messages. Those techniques are filtering techniques and Black List techniques. This filtering technique are used to remove unwanted contents by using content

based filtering rules, Machine learning approach, according to user's interest and recommends an item. Recommender systems works like content based filtering, collaborative filtering, policy based filtering. Blacklists are directly managed by system and should be able to determine the users to be inserted in the BL and decide a user's retention in BL is finished. Such information is given to the system through a set of rules called BL rules. Additional contribution is that we used pattern recognition technique.

## II. LITERATURE SURVEY

Table I shows the comparison of literature survey:

TABLE I. Comparison of Literature Survey

| Authors Name                                    | Title   | Year | Technique  | Result  |
|---|---|------|--|---|
| Lorien Roy and R.J.Mooney                       | Content Based Book Recommending Using Learning for Text Categorization[1]       | 2000 | mutual filtering method                          | A system filter content-based messages from user's walls            |
| B. Carminative, M.vanetti, E.ferrari, M.Craulli | Content Based Filtering In Social Networking Sites Using Web Application [2]    | 2006 | take decision about the message which is blocked | That messages block system run successfully                         |
| Katta Rakesh, Nageswara Rao, Suresh             | A System Approach to Avoid Unwanted Messages using Filtering Methods [3]        | 2009 | Content Base Filtering Methods                   | Avoid Unwanted Messages using Filtering Methods from OSN User Walls |
| Bodicev and M.Sokolova                          | Message Filtering Techniques for On-Line Socialnetworks[3]                      | 2010 | Fractional Matching method                       | They got text classification of message                             |
| Mayuri uttarwar, Prof. Yogesh bhute             | A Review on Customizable Content-Based Message Filtering from OSN User Wall [4] | 2013 | Customizable content-based Message filtering     | filter undesired messages from OSN walls                            |





L. Roy and R.J.Mooney uses mutual filtering method, but in our proposed system content based filtering is used. It explains the content based book proposal system that develops information pulling out and machine learning technique for text categorization.

B. Carminative, M.vanetti, E.ferrari, M.Craull In this the system can generally take decision about the message which is blocked, due to the acceptance depends up on statistical information.

Bodicev and M.Sokolova classification of text put in complex and specific terminology need the application of learning process. Fractional Matching method is applied which shrink the text for confining the text characteristic. Fractional matching develops a language model. The output of fractional matching compression provides consistent care of text classification.

### III. ARCHITECTURE

Fig 1 shows the architecture of proposed system. In this architecture following components are included as follows:

1. Content-based filtering
2. Filtered Wall Architecture
3. Short Text Classifier
4. Text Representation

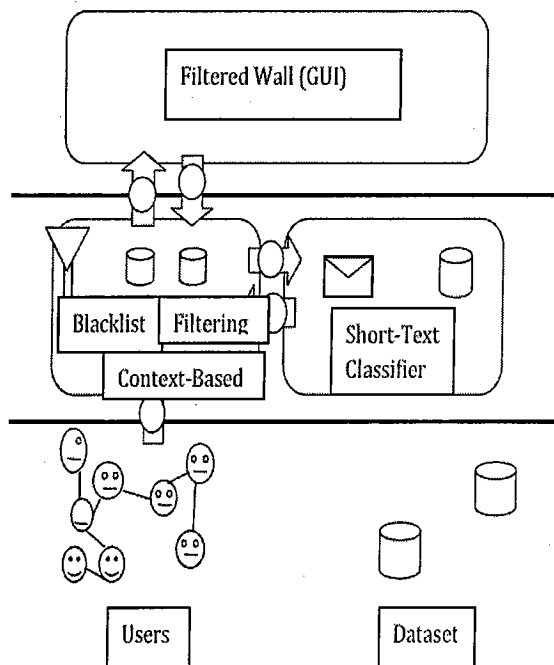


Fig 1. System Architecture

#### A. Content-based filtering

Documents processed in content-based filtering are mostly textual in nature and this makes content-based filtering close to text classification. Content-based filtering is mainly based on the use of the ML paradigm according to which a classifier is automatically induced by learning from a set of pre-classified examples. A remarkable variety of related work has recently appeared which differ for the adopted feature extraction methods, model learning and collection of samples. The feature extraction procedure maps text into a compact representation of its content and is uniformly applied to training and generalization phases.

#### B. Filtered Wall Architecture

The architecture in support of OSN services is a three-tier structure. The first layer called Social Network Manager (SNM) commonly aims to provide the basic OSN functionalities (i.e. profile and relationship management) whereas the second layer provides the support for external Social Network Applications (SNAs). The supported SNAs may in turn require an additional layer for their needed Graphical User Interfaces (GUIs). According to this reference architecture the proposed system is placed in the second and third layers. In particular users interact with the system by means of a GUI to set up and manage their FRs/BLs. Moreover the GUI provides users with a FW that is a wall where only messages that are authorized according to their FRs/BLs are published.

#### C. Short Text Classifier

Established techniques used for text classification work well on datasets with large documents such as newswires corpora but suffer when the documents in the corpus are short. In this context critical aspects are the definition of a set of characterizing and discriminate features allowing the representation of underlying concepts and the collection of a complete and consistent set of supervised examples. Our study is aimed at designing and evaluating various representation techniques in combination with a neural learning strategy to semantically categorize short texts.

D. Text Representation

The extraction of an appropriate set of features by which representing the text of given document is a crucial task strongly affecting the performance of overall classification strategy. Different sets of features for text categorization have been proposed in the literature however the most appropriate feature set and feature representation for short text messages have not yet been sufficiently investigated. Proceeding from these considerations and on the basis of our experience we consider three types of features Bag of Word (BW), Document properties (Dp) and Contextual Features (CF). The first two types of features already used in are endogenous that is they are entirely derived from the information contained within the text of the message.

IV. ALGORITHM

Filtering Algorithm

- Step 1 Start
- Step 2 A User tries post the message in a wall.
- Step 3 Machine learning checks each word of the message using Bayesian technique.
- Step 4 If (Words == Good Words)
- Step 5 Message is posted on the wall.
- Step 6 Else if (Words == Bad Words)
- Step 7 Reject Bad Words using Blacklist and post the filtered message on the wall.
- Step 8 Stop

v. RESULT

Our system will expected to produce output in different forms:

- 1] Registration
- 2] Login
- 3] In Our system following modules are includes.

1) Account Authentication

- 1. In this module to check the message id and password.
- 2. If these two fields are valid, the account is authenticated.
- 3. Otherwise is not valid.

2) Uploading Messages

- 1. In this module we will check how many Messages a single person is uploading and how many messages are flagged as spam in history.
- 2. This messages either spam or non-spam.

3. Spam means the more copies of the single message are send.

4. And it contains more than 20 lines.

3) IP Detection

- 1. In this module to capture the IP address of the system.
- 2. That system messages are applied to filtering process.
- 3. In this process, the message content is filtered.
- 4. Finally to produce the result of filter.

4) CT Detection

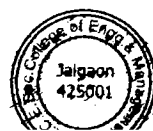
- 1. In this module to set the threshold value Cs.
- 2. Cs denotes the fixed length of spam Message.
- 3. Also to count the number of lines in each Message.
- 4. If the each Message counts are greater than equal to threshold value.
- 5. So, these messages are spam Message.

5) PT Detection

- 1) Ca- specifies the minimum number of message that machine must send.
- 2) P- specifies the maximum spam message percentage of a normal machine.
- 1. This algorithm is used to compute the count of total messages and the count of spam messages of machine.
- 2. To check this count of total messages are greater than equal to Cs and the count of spam messages are greater than equal to P.
- 3. If it's true these messages are spam message.

CONCLUSION

We develop a system which filters unwanted messages from OSN user's wall. In previous system, there are some disadvantages like content-based filtering is not allow and any type (political, bad words) of messages can posted on user's wall now in the current system now we used content-based filtering and ruled based filtering where message posted on wall no matter who post them but in current system. We provide matching of message with database words and block those messages if matching. We also display how much percent message match with database word collection. And also, in this



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system we have presented a system to filter undesired messages from OSN walls.

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## A SURVEY: OFFLINE HANDWRITTEN SIGNATURE RECOGNITION SYSTEM

Ms. Harsha G. Chavan, Prof. Pradnya A. Vikhar  
KCES's COEIT, Computer Engineering, Jalgaon, India.

**Abstract:** A rising need for personal recognition in numerous days after day applications, signature recognition is painstaking with renewed attention. A Handwritten signature is unique biometrics used even beforehand computers. Signature recognition is extensively deliberated using two approaches. On-line approach and offline approach. Offline systems are sparing applicable and trouble-free to make use of in comparison with on-line systems in many parts of the world though it is considered more difficult than on-line recognition due to the need for dynamic information. Offline signature recognition system has more attraction because of its essential for use in day-to-day life routines. This paper gives a survey of signature forgery type, features types, procedures used for features extraction and approaches used for acknowledgment in signature recognition systems.

**Keywords:** Offline signature recognition system, features extraction.

### 1. INTRODUCTION

Human recognition is vital for our usual behavior such as entering any safe and sound locations besides the many other applications. To that end, higher security levels need easier user interaction which can be achieved using biometric confirmation. Biometric recognition helps us recognize people based on their mined physical or behavioral features. These features have certain properties such as uniqueness, durability, suitability, collectability, and the cost to employ any biometric. Frequently, there are two common biometric feature types-

- a) Physical Features are including face, fingerprint, iris, ear, palm print, retina, hand, finger geometry and DNA. Most of these features are comparatively relentless over time.
- b) Behavioral Features are including features that measure the stroke of the person such as speaking and writing. These features change over time due to elderly and other developing factors.

Signature recognition is the chore of validating an individual founded on his handwritten signature. There are two categories of signature recognition systems in the prose:

- i) On-line Signature recognition System is while a signature is written onto an communicating electronic device such as a tablet and it is recite online, and matched to the signatures on file of the person to check for truthfulness. Many vital features are exploited with online signatures that are not obtainable for the offline ones.
- ii) Offline Signature recognition System is while a signature is written offline such as bank checks and the system recites the image scan then authenticates it with the signatures on file for the customer.

Handwritten signatures have used as a biometric feature that recognizes individuals. It has been recognized that handwritten signatures are an actual upright quality biometric feature with a squat conflict percentage. Some signatures might be alike but there are numerous scientific mechanisms to distinguish between them and for recognition of forged signatures.

Forgeries in signature recognition systems are categorized into three types:

1. Unskilled Forgeries are signatures in which forger signs deprived of any information about name and signature shape.
2. Random Forgeries are signatures in which forger knows just the name of the signatory without any previous examples.
3. Skilled Forgeries are signatures in which forger knows the signatory name and the form of the original signature.

## 2. PROPOSED METHODOLOGY

The state of the skill in signature recognition follows a pattern that is like image processing as shown in figure 1.

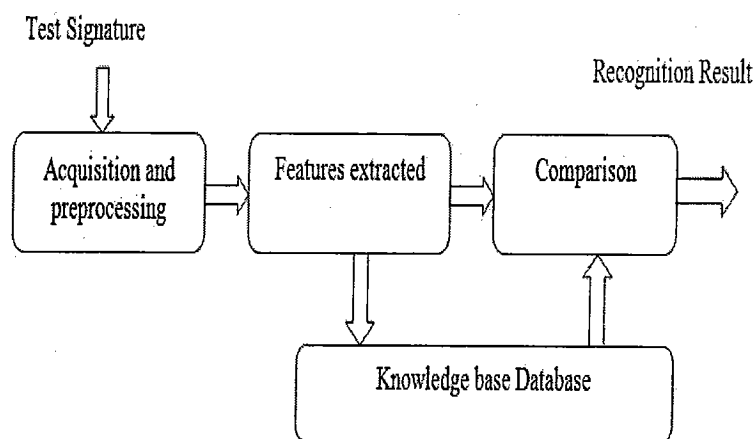


Fig 1 Signature Recognition System

The key in signatures are preprocessed, and then the individual features are extracted and warehoused in the knowledge base. In the classification phase, personal features detached from an inputted signature are compared with pattern signature deposited in the knowledge base, to check the strength of the test signature.

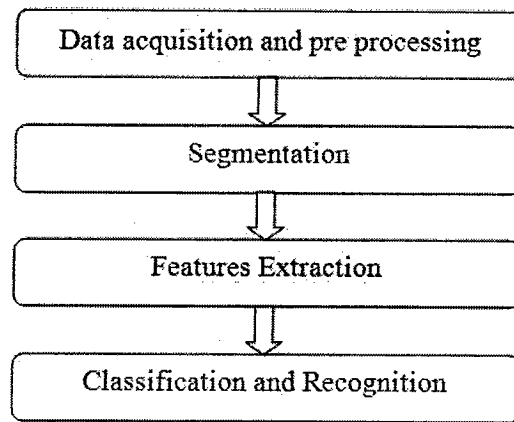


Fig 2. Workflow for a signature recognition system

## 2.1 Data acquisition and pre processing

A preprocessing phase is done to recuperate the signature image afterward scanning it using a scanner device. Signature preprocessing is an essential step to improve the accuracy and to decrease their computational time. It consists of the following steps

- 1) A noise filter (like a median filter) is applied to eliminate the noise caused by the scanner.
- 2) Then the image is cropped, to the bounding rectangle of the signature.
- 3) Transformation from color to grayscale, and then lastly to black and white.
- 4) Thinning the black and white image results always into the enormous information loss.

## 2.2 Segmentation

During segmentation phase, an image of signature is decomposed into sub-images. Segmentation refers to a procedure of dividing an image into groups of pixels which are alike with respect to some criterion, which contains of signature extraction through mining the small package that encompasses the signature data, the signature's height and width are determined, and then the signature image is cropped. Image segmentation is largely classified into two types, Local Segmentation deals by the segmenting sub images which are small windows on an entire image. Global Segmentation refers with the images containing of relatively huge number of pixels and makes predictable factor values for global segments are additional vigorous.

## 2.3 Feature Extraction

It is the process of removing the characteristics or attributes from an image. The accuracy of recognition in pattern systems depends mainly on the removed features. Classification of the signature-recognition systems in terms of mined features are done into two kinds,

### 2.3.1 Global Features:

Global features describe the signature image as a entire like a length, width, density, edge points of the signature, and wavelet transforms. These features are fewer sensitive to noise and signature variations. Therefore it will not give us a high accuracy for skilled forgeries,

then it would be appropriate for random forgeries and it is well to be combined with other types of features.

### 2.3.2 Local Features:

Which illustrate a minor area of signature image and haul out information in more details from it, it is more truthful than the global one but the computational time is high, it can be divided into two groups: statistical as well as geometrical features.

- i) Statistical Features are in use from the pixel distribution of the signature image.
- ii) Geometrical Features describes the geometrical uniqueness of the signature image; Geometrical features contain the aptitude to tolerate with distortion, styles deviations, rotation variations and certain degree of translation.

## 3. SIGNATURE RECOGNITION OUTLOOK

### 3.1 Template Matching

It is a course of action of pattern comparison so it is called "template matching". A test signature is matched with templates of genuine signatures warehoused in a knowledge base; the most communal methods use Dynamic Time Wrapping (DTW) for signature matching. A. Piyush and Rajagopalan [5] proposed an offline signature recognition system founded on DTW and they applied their altered DTW algorithms. The amendment was the adding of a steadiness factor. Improved results were added than using the basic DTW algorithm. Almudena [6] established an offline signature recognition system based on contour features. The features were extracted from the directional contour of the signature and the length of regions together with this between letters. For feature matching phase, each signature (set of features) was signified by probability density function and Hamming distance was used for parallel measure. MCYT database, which consists of 75 subjects, were used. The total signatures were used are 2250.

### 3.2 Neural Networks

This approach is extensively used in signature recognition systems, power, ease of use, capabilities in learning and generalizing are the major reasons to use this approach. When using this loom we have to configuration the Neural Network (NN) by eliminating features from signers' samples and tutoring the association between the signature and its class. Therefore the signature recognition procedure parallels this learning method. There are several methods to structure the NN training, but a very modest approach is to initially extract the feature set representative the signature (details like length, height, duration, etc.), with numerous samples from different signers. The subsequent step for the NN is to study the relationship stuck among a signature and its class (either "genuine" or "forgery"). Formerly this association has been erudite; the network can be accessible with test signatures that can be categorized as fitting to a particular signer. NNs consequently are highly appropriate to demonstrating global features of handwritten signatures. Edson [7] offered another method for off-line signature recognition uses hough transform to notice stroke lines from signature image. The Hough transform (general Radon transform) is used to get rid of the parameterized Hough space from signature skeleton as distinctive characteristic feature of signatures. In this method, the Back Propagation Neural Network is



used as a tool to estimate the performance of the proposed method. The system has been experienced with 70 test signatures from different persons enlightening the recognition rate of 95.24%. Velez [8] presented the robust offline signature recognition using compression networks and positional cuttings. Each signature class was tested using the compression NN. The benefit of using compression networks is that they can take steps as auto-associative or the content addressable memories.

### 3.3 Hidden Markov Models

Hidden Markov Model (HMM) is solitary the most commonly used models for serial analysis in signature recognition. Handwritten signature is a order of vectors of values linked to each point of signature in its path. Coetzer [9] established a system that mechanically authenticates offline handwritten signatures via the discrete Radon transform (DRT) and a hidden Markov model (HMM). It specified the heftiness of the algorithm and the fact that simply global features are considered, the system achieves an equal error rate (EER) of 18% when only high-quality forgeries (skilled forgeries) are measured and an EER of 4.5% in the case of only casual forgeries. Justino [10] in his effort obtainable a robust system for off-line signature recognition using simple features, diverse cell resolutions and manifold codebooks in a HMM framework. The simple and random forgery error rates have been shown to be low and close of each other. A FRR of 2.83% and a FAR of 1.44%, 2.50%, and 22.67% are reported for random, casual, and skilled forgeries, correspondingly.

### 3.4 Statistical

The statistical knowledge is used to execute some of the statistical concepts like the relation, deviation, etc between two or more data substance to discover out a specific relation among them. Generally, it follows the proposal of Correlation Coefficients which refers to the departure of the two variables from self-determination. In signature recognition system, regular signature (template) is considered from earlier collected signatures, stored in knowledge base data, when novel input signature is recited, correlation concept is followed to find the distance between the test signature and average signature, then to make a decision If it is accepted or rejected. Debnath [11] obtainable a Statistical Approach for offline handwritten signature recognition. The algorithm projected has the elasticity of selecting the number of signatures, i.e., no-of-Sign for testing determination to generate a signature as a Avg-Sign containing the particular mean features set from the test signature set. After collecting signatures for testing, the algorithm converts them into a set of 2D arrays of binary data values-0 and 1. From these binary arrays by means of statistical methods of calculating the predictable mean an average data set. The recognition system is based on an extensive Statistical Analysis of Correlation Coefficient between bivariate data set. In implementation of projected algorithm to constant factors carry major impact on the validity of the method and the strength of the recognition lies in the efficiency of selection of these constant parameters, namely AvgSign, Threshold Value and decision value.

### 3.5 Structural

The chief idea in structural pattern recognition is the demonstration of patterns by means of symbolic data structure such as trees, graphs and strings. Once a forged signature comes, its figurative expression is equated with prototypes stored in database. In other librettos, Structural approach is grounded on the interpersonal group of the low-level features into



higher-level structures, and then these structures are harmonized with replicas stored in database. Structural features usage modified direction and transition distance feature (MDF) which abstracts the transition locations and are grounded on the relational organization of low-level features into higher-level structures. Nguyen [12] presents the novel technique in which structural features are extracted from the signature's contour using the (MDF) and its extended version, the Enhanced MDF (EMDF) and further two neural network-based techniques and Support Vector Machines (SVMs) are investigated and compared for procedure of the signature verification. The classifiers were skilled using genuine specimens and extra arbitrarily chosen signatures taken from the liberally available database of 3840 genuine signatures from 160 volunteers and 4800 under attack forged signatures. A distinguishing error rate (DER) of 17.78% was obtained with a SVM whilst keeping the false acceptance rate for random forgeries (FARR) below 0.16%. Ferrer [13] calculates geometric features of the signature in fixed-point arithmetic for offline verification. The proposed features are then checked with different classifiers, such as the Hidden Markov Models, the Support Vector Machines, and the Euclidean distance verifier. The results show that HMM works slightly better than SVM and the distance Euclidean verifier, but, behavior in mind that the SVM and Euclidean distance-based verifiers can be programmed in a fixed-point microprocessor, the outcome give confidence us to follow the SVM research line in arrange to built a smart card competent of detecting a simple forgery.

### 3.6 Wavelet- Based

In general, the multi-resolution wavelet transform can decompose a signal into low pass and high pass information. The high pass information usually represents features that contain sharper variations in time domain. Hou and Feng proposed [14] the process uses a wavelet-based transformation to extract the inflections of the signature curves via various scale wavelet transforms in the curving signature signals transformation. Following analysis, the appropriate scale is chosen. The zero-crossings points are mined and they are in use as the inflections of the signature. Then this signature curves are alienated into a number of parts, i.e. the strokes, according to the above inflections. The distance between the two corresponding strokes can be measured with Dynamic Time Warping algorithm. In the end, the training algorithm of the signature recognition system also the recognition method of the signatures is also introduced. The experimental result shows that this method is superior to those methods that match the whole signature curves. Samaneh and Mohsen [15] presented a method for offline Persian signature identification and recognition based on image registration and fusion. Discrete Wavelet Transform (DWT) is applied on the preprocessed signature to get high frequency sub-images, then an image reduction and fusion methods are used to create a feature matrix from sub-images. In recognition phase, for test signature; the feature matrix is compared with all feature matrixes stored in knowledge base using Euclidian distance. And then upon the specified threshold, the test signature would be accepted or rejected Larkins and Mayo [16] presented an offline signature recognition method based on adaptive feature thresholding (AFT). They converted the signature image to binary feature vector; by using the above conversion, the comparison was more accurate. That vector was based on gradient direction for each pixel from across a signature. Gradient direction gave a global features level; Spatial Pyramids were used to express a signature at deep levels, Equi-mass sampling grid with Spatial Pyramids were combined to improve the structural features. In classification phase, DWT and graph matching methods were used.

### 3.7 Support Vector Machine

Vahid and Hamid [17] projected an offline signature recognition using LRT and SVM. They used the LRT locally for line segments detection for feature extractions and SVM for classification. The proposed system consisted of the two models (1) Learning genuine signatures and (2) Recognition model. Preprocessing phase was shared between learning and recognition models. Feature extraction phase included the line segment detection, line segment existences validation, feature vector extraction and summarization, and feature vector normalization. Classification: in the classification phase they used SVM with Radial Basis Functions (RBF) kernel to achieve the best results. In the best case, they achieved the same 96% identification rate. Shailedra Kumar Shrivastava, Sanjay S. Gharde [18] Support Vector Machine is supervised Machine Learning technique. Support Vector Machines (SVM) is used for classification in pattern recognition widely Moment Invariant and Affine Moment Invariant techniques are used as feature extractor. Emre and Karshgil [19] presented an offline signature recognition system based on the SVM. Feature extraction phase which consists of global features, mask features, and grid features.

### 4. DISCUSSION

From Different recognition approaches, feature extraction & recognition rates used by different authors. It shows the details of the Feature extraction, recognition approaches of diverse authors all along with their recognition rate. Following the proportional study of various recognition approaches from signature recognition approaches, it is pragmatic that average accuracy for template matching signature recognition 56.41% which is minimum and average accuracy for statistical approach is 89.47% which is upper limit in all signature recognition approaches. In case of SVM approach signature recognition rate is 96% which is superior as compared to other approaches. SVM approach is immobile appropriate for skilled forgeries and appropriate for simple and random forgeries.

### 5. CONCLUSION

This system holds factual as of the amount of perspectives i.e. easiness of use, stumpy execution cost and the effortlessness of embedding the system in an organization, with no excessively disrupting or touching the obtainable operations. In this paper we present a high-tech newest method used in offline signature recognition systems. We categorize the offline signature recognition systems in terms of extracted features kind into local and global features and also we categorize local features into statistical and geometrical features. On the other hand, we recapitulate the approaches used in offline signature recognition systems, then we discuss these approaches depending on forgery type it detect, even there are many approaches used in this crisis but the accuracy motionless desires to be amplified for especially skilled forgeries.

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