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A Review on Different Quicksort Algorithms

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Abstract:
Sorting is nothing but arranging the data in such a sequence that represent ascending or descending order. The term sorting is needed to search quickly a related data from small or huge amount of data. The two main criteria's to judge which algorithm is better than the other have been: 1) Time taken to sort the given data.2) Memory Space required to do so. There are many different techniques available for sorting based on time and space complexity. Quick sort is one of the sorting algorithms based on its time complexity. Because it has the best performance in the average casefor most inputs, quick sort is generally considered the "fastest" sorting algorithm. With the development in parallel processing many parallel sorting algorithms have been investigated. Based on quick sort parallel quick sort algorithm has been proposed. In this paper we have discussed about quick sort algorithm with its complexity and parallel quick sort algorithm with its speed and time complexity.

Keywords:*Quick sort, pivot, parallel quick sort.*

1. Introduction

An algorithm is a series of operations to solve a specific problem in calculation efficiency, data processing, and automatic reasoning. An algorithm is an effective method, which can be represented in a finite amount of time and space. An algorithm represents the best way to solve a particular problem in a very simple and efficient manner. If we have an algorithm for a particular problem then we can implement it in any programming language, which means the algorithm is independent of any programming language.

A finite set of instructions describing a sequence of operation is to be done to solve a specific problem, or an algorithm is called a class of problems. When processing speed increases, efficiency is often said to be less important than other quality features of the software (e.g. protection, extensibility, reusability, etc). Nevertheless, large problem sizes in the field of computational science are prevalent, making efficiency a very important factor. That's because longer computation time, to name a few mean slower results, less through analysis and higher computation costs (if an external party buys

CPU Hours). Therefore, the analysis of Algorithm gives us a language to express output as a function of problem size.

Sorting is only organizing the information in rising or plunging request. The term sorting came into picture, as people understood the significance of looking rapidly.

There are such huge numbers of things in our genuine that we have to scan for, similar to a specific record in database, move numbers in merit list, a specific phone number in phone index, a specific page in a book and so on. This would have been a wreck if the information was kept unordered and unsorted, however luckily the idea of sorting appeared, making it simpler for everybody to mastermind information in a request, thus making it simpler to look. Sorting organizes information in an arrangement which makes looking through simpler. The types of sorting can be isolated into two classes. These are:

- Internal Sorting
- External Sorting

Internal Sorting: The internal sorting method is done if all the data to be sorted can be changed at a time in the main memory.

External Sorting: When the data to be sorted cannot be accommodated simultaneously in the memory and others must be stored in additional memory such as hard disk, floppy disk, magnetic tapes, etc., then additional sorting methods are carried out.

The complexity of the sorting algorithm measures the runtime of a function where the number of items to be sorted in is' n.' For different problems, the choice of which sorting method is appropriate for a problem depends on several dependency configurations. Among these factors the most notable are:

1) The length of time spent by the programmer in programming a specific sorting program
2) Amount of machine time necessary for running the program
3) The amount of memory necessary for running the program

To get the amount of time it takes for a particular method to process an array of' n' elements, the normal approach is to evaluate the method to find the number of comparisons (or exchanges) it requires. Most of the sorting techniques are sensitive to data, and so their metrics depend on the order in which they appear in an input sequence.

In different cases, different sorting methods are analyzed, and these cases are called as follows:

- Best case
- Worst case
- Average case

There are different sorting method like bubble sort, quick sort merge sort, insertion sort, heap sort and selection sort etc.

Bubble sort, sort of insertion, and sort of selection are sluggish sorting algorithms and O(n2) has a theoretical complexity. These algorithms are very slow to sort large arrays but they are not useless because they are algorithms that are very basic. Parallelism to the execution of the sorting algorithms called parallel sorting algorithms is applied to speed up the efficiency of the sorting process.

The fundamental issue in designing parallel sorting algorithms is to collectively sort data owned by individual processors in such a way that it utilizes all processing units performing sorting work, thus reducing the costs of redistributing key between processors. There are two places in parallel sorting algorithms where the input and the sorted sequences can reside. They can be stored on only one processor, or distributed among processors.

2. SEQUENTIAL QUICKSORT

Sequential quick Sort is a recursive sorting algorithm developed by Tony Hoare in-place, divide and conquer. Sorting algorithms in-place plays an important role in many fields such as very large database systems, data warehouses, data mining, etc. These algorithms optimize the size of data that can be processed without input / output operations in the main memory. It requires comparisons to sort n objects on average by O(nlogn). It makes comparisons of O(n2) in the worst case scenario, though this is a rare occurrence. In fact, it is mostly faster than other algorithms of O(nlogn). It is also known as a sort of partition-exchange, because that term captures the method's basic idea. This algorithm has divided the list into three main parts:

1. Elements less than the **Pivot** element
2. Pivot element(Central element)
3. Elements greater than the pivot element

Sequential Quick sort algorithm

```
QuickSort (array, leftmostIndex,
rightmostIndex)
  if
(leftmostIndex<rightmostIndex)
PivotIndex<-
partition(array,leftmostIndex,
rightmostIndex)
QuickSort (array, leftmostIndex,
pivotIndex)
QuickSort (array, pivotIndex +
1, rightmostIndex)

Partition (array, leftmostIndex,
rightmostIndex)
  Set rightmostIndex as
pivotIndex
StoreIndex<- leftmostIndex - 1
  for i<- leftmostIndex + 1 to
rightmostIndex
    if element[i] <pivotElement
      swap element[i] and
element[storeIndex]
StoreIndex++
  Swap pivotElement and element
[storeIndex+1]
return storeIndex + 1
```

Sequential Quick sort algorithm

On the basis of Divide and conquer approach, quicksort algorithm can be explained as:

- **Divide**
  The array is divided into subparts which take pivot as the point of partitioning. The elements smaller than the pivot are placed to the left of the pivot and the elements greater than the pivot are placed to the right.
- **Conquer**
  By choosing pivot elements for them, the left

and right subparts are again partitioned. This can be achieved by recursively passing the subparts into the algorithm.

- **Combine**
  This step does not play a significant role in quick sort. At the end of the phase of conquest the list is already sorted.

3. COMPLEXITY ANALYSIS OF QUICK SORT ALGORITHM:

In general, the time taken by QuickSort may be written as follows.

$$T(n) = T(k) + T(n-k-1) + \quad (n)$$

For two recursive calls, the first two terms are the last term is for the partition process. K is the number of elements that are smaller than pivot. The amount of time QuickSort takes depends on the input sequence and partition strategy. Three cases follow.

Worst Case: The worst case happens when the cycle of partitioning often chooses the biggest or the smallest factor as pivot. If we consider above partition strategy where the last dimension is always key, the worst case is when the array is already sorted in increasing or decreasing order. For worst case, recurrence occurs.

$$T(n) = T(0) + T(n-1) + \quad (n)$$

Which is equivalent to

$$T(n) = T(n-1) + \quad (n)$$

The solution of above recurrence is (n^2).

Best Case: The best case comes when the cycle of partitioning always selects the middle dimension as pivot. Following is the recurrence for best case.

$$T(n) = 2T(n/2) + \quad (n)$$

The solution of recurrence above is (nLogn). This can be solved using Master Theorem case 2.

Average Case: In order to do an average case analysis, we need to consider all possible array permutation and measure the time taken by any permutation that does not look easy. We can get an idea of average case by considering the case when partition places elements O(n/9) in one set and elements O(9n/10) in another set. For this scenario the following is recurrence.

$$T(n) = T(n/9) + T(9n/10) + \quad (n)$$

Solution of the above recurrence is also O(nLogn) While Quick Sort's worst-case time complexity is O(n2) which is more than many other sorting algorithms such as Merge Sort and Heap Sort, Quick Sort is faster in practice because its inner loop can be implemented efficiently on most architectures, and in most real world data.Quick Sort can be enforced by modifying the pivot option in different ways, so that the worst case happens rarely for a given type of data.

4. PARALLEL SORTING ALGORITHMS

With the emergence of parallel processing, parallel sorting has become a significant area for research into algorithms. A large number of algorithms for the parallel sorting were suggested. Some parallel sorting algorithms can be put in one of two rough categories: Merge-based sorts and partition-based sorts. Merge-based sorts consist of several processor-wide merge stages, and only perform well with a small number of processors. The overhead of scheduling and synchronization also increased as the number of processors used became large, which reduces the speed-up. Partition based kinds are composed of two phases: Partitioning the data set into smaller sub-sets so that all elements in one sub-set are no larger than any element in another sub-set and sorting each sub-set together.

Partition-based sorts output depends primarily on how well the data can be partitioned uniformly into smaller ordered subsets. Finding pivots which partition the data to be sorted into ordered subsets of equal size without first sorting the data seems to be a difficult problem. The simple result is that initial splitting of data limits the speed up to a maximum, no matter how many processors are used. For partition-based kinds, the ability to partition the data equally into ordered subsets is essential.

Parallel sorting algorithms are necessary to speed up data processing. The parallel implementation of the divide and conquer approach-based rapid sorting algorithm improves its efficiency, but the fastest sorting is not always guaranteed in the case of poor load balancing of the concurrent tasks. In order to increase the performance of the parallel implementation of the fast sort algorithm based on ideas used for the parallel implementation of a variety of sorting algorithms, many optimization techniques are suggested.

The current trends in hardware development and innovation are directed towards the widespread use of high-performance multi-computer-based computing and Software Multiprocessor systems.

Grid and cloud computing also recommend distributed data processing specifications. Two parallel sorting algorithms are considered here for analyzation i.e. Quick sort of parallel and Hyper quick sort.

4.1 Parallel quick sort

Not only is quick sort considering a better performing sorting algorithm, it is also considered one of the successful algorithms that can be parallelized. Parallel Quick sort's main feature is parallel partitioning of the files.

For a network of processing elements, the parallel generalization of the quick sort algorithm can be obtained in the simplest way. Network-adapted topology is a hypercube of D dimensions (i.e. number of processing elements p=2D). Let the initial data be distributed among the processors in blocks of n/p data values of the same size. The resulting block position will correspond to each processor in the hypercube. One logical way to perform the parallel method's first iteration is as follows:

- Pick and transmit the pivot element from the subsequence to all processors
- Subdivide the data block available for each processor into two sections using the pivot element.
- Processor pairs are generated, for which the number representation of the bit differs only in position D. The sections of the blocks with the data values smaller than the pivot dimension will appear on the processors with bit position D equal to 0 as a result of these data transmissions. The processors with the bit location D is equal to 1 will collect all the data values exceeding the pivot element value accordingly.

The initial data is subdivided into two parts after performing this iteration. One of them (values smaller than the pivot value) is located on the processors, whose numbers keep 0 in the Dth row. These processors are only used in p/2. So the original D-dimensional hypercube is also subdivided into two D-1 dimensional sub-hypercubes. These sub-hypercubes also have the method above applied. After executing D such iterations, to terminate the method it is necessary to sort the data blocks that were created on each separate processor.

Pseudo code of Parallel quick sort algorithm

1. Divide the values of n data into parts equal to p, [n / p] data values by processor.
1. Randomly select the pivot factor on the first P0 processor, and send it to each processor.
3. Take regional sorting

3.1 Divide the data into two sets according to the pivot (smaller or larger) locally in each processor

3.2 Divide the processors into two groups and share the data pairs wisely between them, so that all processors in one group get data less than the pivot and the others get data greater than the pivot.

4. For every half repeat recursively 3.1-3.2.
5. Each processor can sort the items they have, using quick sorting.

5. COMPLEXITY ANALYSIS FOR PARALLEL QUICK SORT ALGORITHM

Let the input size be ' n ' and the number of processing elements taken as ' p.'

– The general estimation of speedup and efficiency:

$$S_p = \frac{n\log_2 n}{(n/p)\log_2(n/p)+\log_2 p\cdot(2n/p)},$$

$$E_p = \frac{n\log_2 n}{p\cdot\left((n/p)\log_2(n/p)+\log_2 p\cdot(2n/p)\right)}$$

Time of parallel algorithm execution, that corresponds to the processor calculations:

$$T_p(calc) = [(n/p)\log_2 p + (n/p)\log_2(n/p)]\tau,$$

6. CONCLUSION:=

In this paper, sorting algorithms were described with its complexity analysis. The basis is the average running time, number of comparisons and speedup achieved by parallel sorting algorithms over sequential quick sort. It is observed that parallel sorting algorithms i.e. parallel quick sort having better complexity analysis in with respect to sequential quick sort. The better performance is obvious because parallel sorting algorithms take the advantage of parallelism to reduce the execution time.

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Comparative Study of Apriori Algorithm and Frequent Growth algorithm

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ABSTRACT
Association Rule Mining in Data Mining is a standard and well-researched technique for locating fascinating relationships among variables in large databases. The rule of association is used as a reference to various Data Mining techniques such as grouping, clustering, and prediction. The paper's goal is to direct the output of the growth algorithm Apriori and Frequent Pattern (FP) in Comparing its capabilities. FP-growth algorithm is more efficient than the Apriori algorithm.

Keywords: Apriori, FP-growth, Support, Confidence

1. INTRODUCTION

Data Mining could be a fruitful and growing field of data analysis, and the findings of the research have several applications as well. Data Mining, also popularly referred to as Knowledge Discovery from Data (KDD), is the machine-driven or convenient extraction of patterns that indirectly maintain or catch knowledge in vast databases,Data warehouses, the Web, data repositories and streams of information.

Data Mining could be a multidisciplinary field, drawing from areas such as IT, machine learning, statistics, pattern recognition, data recovery, neural networks; knowledge-based systems, artificial intelligence and data visualization.

Association Mining aims to extract attention-grabbing associations, repeated patterns, and association structures in transaction data-based relational databases or different data repositories between set of things or artifacts. Support and confidence are two statistical measures which govern Association Rule Mining. Support should be measured as to how often this in the database should occur.Confidence may well be gaged in pursuit of the rule's power. The rules of the Association are important if they meet a minimumthreshold of support and a minimum threshold of confidence [1].

This paper aims to present a performance assessment of the algorithms Apriori and FP-growth. The difference between the two algorithms is that the Apriori algorithm generates regular element sets for candidatesTherefore, the FP-growth algorithm escapes the generation of candidates and grows a tree through an economic and effective strategy of ' dividing and conquering. '

2. ASSOCIATION RULEMINING

The Association rule is an expression of the X / Like Y form meaning that Y always tends to appear while X appears. X and Y are Sets of products. An itemset is nothing more than a list of elements from the database. X is generally stated as the precedent of the rule, and Y as the result of the rule.

Association rules are laid down as Boolean rules for support and trust. Support is the proportion of transactions that meet the rule in an exceedingly informed manner.

Confidence denotes the probability that Y will be a true subject under X or P (Y).

As stipulated below, association rule mining is usually split into two separate steps.

1. Consider all regular itemset: an itemset that occurs as frequently as a minimum number of items as expected.

2. Generate strong association rules from the frequent itemset: minimum support and minimum confidence should be satisfied by the rules.

This paper is arranged according to the following. Section 2 introduces Association Law Mining concept and addresses the Apriori and FP-growth algorithm aspects.Section 3 provides a comparative analysis of the algorithm Apriori and the development algorithm FP-. The experimental results are explained in section 4.Section 5 defines the results and the conversations.The interpretation is provided for in section 6.

3. RELATED WORK

Despite being very simple, the priori algorithm has some limitations [1]. The main advantages of the FP-Growth algorithm are that it uses compact data structure and removes repetitive FP-growth database analysis is faster than other mining algorithms of association and is also faster than tree study.According to [2] feasibility of identifying "What classes or sets of products are likely to provide quality services to customers is crucial to the well-being of the economy. Market basket circles cover all major aspects of the market analysis that can be conducted on consumer transaction retail data.According to [3] in situations with a large number of frequent patterns, long patterns or relatively low minimum support thresholds, an Apriori like algorithm may suffer the following two non-trivial costs, i.e. it is costly to manage a huge number of candidate sets and it is tedious to search the database repeatedly and test a large set of candidates by matching patterns,which is especially true for mining long patterns. This is the inherent cost of candidate generation, no matter what implementation technique is applied.

4. METHODOLOGY

The proposed technique focuses on optimizing transactional dataset runtime through the use of the Simulated Annealing technique.

In this paper two methods used:
1. Apriori method.
2. Frequent-pattern method

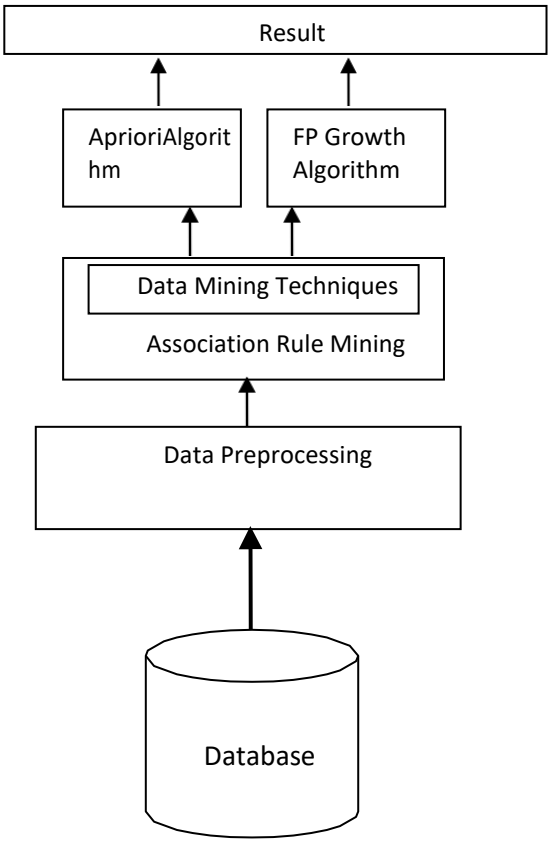

Figure 4.1: Association Rule Mining in Mining

4.1 Apriori Algorithm

Apriori algorithm projected by Agrawal et al. in 1993[3] was one of the first and best algorithms for mining all frequent item sets and Association Rule Mining. The idea of the Apriori algorithmic system is to form multiple passes over the database. The priori (level wise algorithm) is based onAnti-monotonic set theory property states that each set of the frequent itemset is frequent in addition.Apriori could also be an algorithmic system and problem for candidate generation in an extremely level-wise manner. It uses first search scope and tree structure to efficiently count candidate itemset.The proprietary Apriori follows two steps:

Join step: - Ck is generated by combining lk–1 with itself.

- Prune Step: - Any (k – 1) item set that's not frequent cannot be a set of a frequent k itemset.

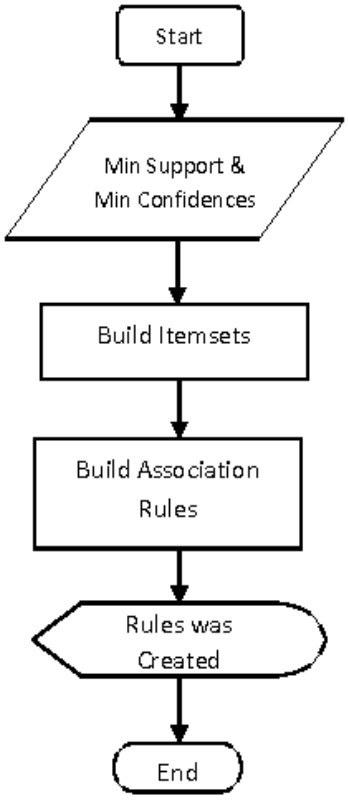

Figure 4.1.1: Association Rule Mining in Mining

4.1.1Apriori Algorithm Pseudocode
Procedure Apriori(T, mSupport) {//T is the database andmSupportis that the minimum Support

L1 = {frequent items};

For (k= 2; Lk-1! =∅ ; k++) {

Ck= candidates generated from Lk-1

For each transaction t in database do {
Increment the count of all candidates in Ck that are contained in t

Lk = candidates in Ck with mSupport

}//end is for every statement
}//end is for

ReturnUkLk;
}

4.1.2 Benefits of Apriori Algorithm

- Large itemset could beutilized.
- Itisextremelyconvenientand simple for implementation.

4.1.3 Drawbacks of Apriori Algorithm

- The Apriori algorithmic program takes longer time for candidate generationtechnique.
- The Apriori algorithmic program needs manyscans
- of thedatabase.
- Many trivial rules are derived and it will be hardtoextract the most interesting rules.
- Rules can be inexplicable and finegrained.
- Redundant rules aregenerated.

4.2 FP GrowthAlgorithm

The algorithmic software Apriori is based on the Anti-monotonic property. The two main issues are frequent inspection of the database, and high time of execution. Compact data structure is required for frequent object set mining.

FP growth algorithm program is an efficient algorithm to produce frequent item sets without candidate item sets being generated.It adopts a strategy of divide and conquer, which needs two database scans to look for the help count. By defining a minimum threshold, it can mine the products by using lift, leverage and conviction. [2]

4.2.1 Generating FP-TreesPseudocode

The algorithmic program works as follows:

1 As in the Apriori algorithmic program, scan the transaction database once to seek out all the frequent items and their support.
2 Sort the frequent items in their Support in descending order.
3 At first start creating the FP-tree with a "0" root
4 Get the primary transaction from the database for transaction. Take away all unusual items, and list the remaining items among the regularly sorted items in accordance with the order.
5 Use the transaction to create the tree's primary branch with each node corresponding to a frequent element, and show the frequency of that item that is one for the primary transaction.
6 Get the next transaction from Database Transaction. Take away all unusual items, and list the remaining items among the commonly sorted items in accordance with the order.
7 Attach the transaction with any specific prefix that may appear inside the tree. Through the count of objects.
8 Continue with Step 6 until all transactions among the database furtherprocessed.

4.2.2 FP-Tree AlgorithmicApproach

The algorithmic FP-growth system for the mining of frequent patterns with FP-tree by pattern fragment growth is: Input: an FP-tree generated with the above algorithm;

D – Transaction database;

S – Minimum Support threshold.
Output: The full set of frequent patterns.
Method: decision FP (FP-tree, null).
Procedure FP (Tree, A)
{
If Tree contains a one path P then for each combination (denoted as B) of the nodes among the trail P do generate
pattern B∪A with sup=minimum Support of nodes in B else for each ai among the header of the Tree do
{
Generate pattern B = ai∪A with sup = ai.Support;
Construct B's cond pattern base and B's cond FP-tree Tree B;
if Tree B≠θ
then decision FP(Tree B, B)
}
}

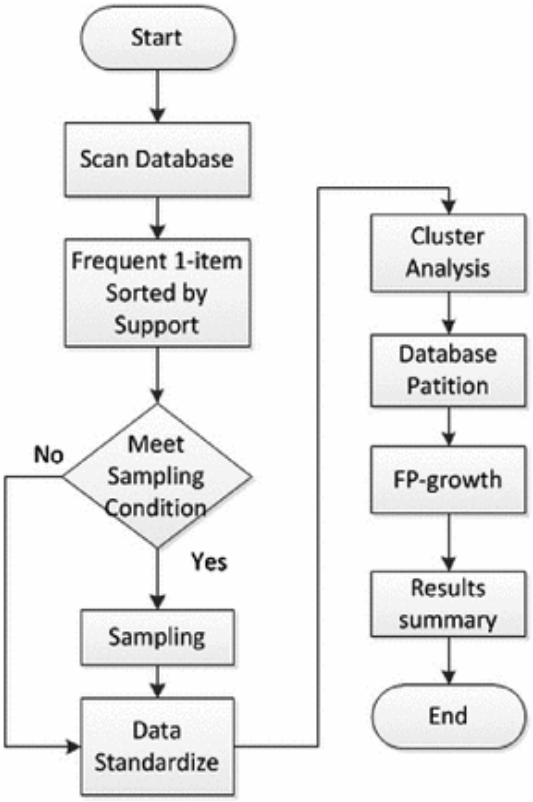

Figure 4.2.1: Association Rule Mining in Mining

5. COMPARATIVE ANALYSES

Table 1 Apriori an FP-growth comparisons

S.No	Parameters	Apriori	FP-growth
1	Storage structure	Array based	Tree based
2	Search type	BreadthFirst Search	Divide and conquer
3	Technique	Join and prune	Constructs conditional frequency pattern treewhich satisfy minimum Support
4	Number of Database scans	K+1 scans	2 scans
5	Memory utilization	Largememory (candidate generation)	Less memory (No candidate generation).
6	Database	Sparse/dense datasets	Large and medium data sets
7	Run time	More time	Less time

6. RELATED PROCESS

Datasets used in the Apriori and FP algorithms should be transparent and preprocessed to manage missing or redundant attributes. To get the best outcome from the Data Mining process, the data must be managed efficiently.
Two data-sets will be used for the experimental study.
The datasets were collected from the Machine Learning database UCI server.The details of datasets are

Table 6.1: Attributes and data

Datasets Name	Number of Instances	Number of Attributes
Dengue	100	05

The two datasets were checked with the program RapidMiner4.1.The software package consists of an array of open source Data Mining and algorithms for machine learning.

7. RESULTS ANDDISCUSSIONS

As a result of the experimental study of the Dengue data sets, the efficiency of the FP-growth algorithm is clearly shown to be betterThan the algorithm Apriori. The execution time is for the regular item sets to be mined with completely different transactions.

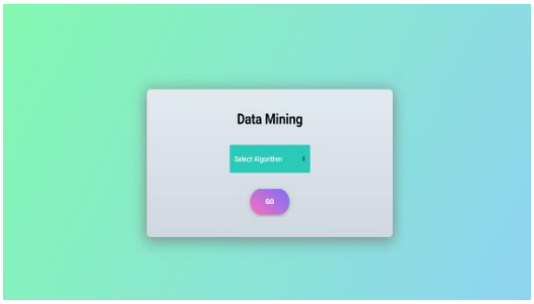

Figure7.1: First Page for Select Algorithm

+ Options

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Edit Copy Delete	1	20	0	0	15	5	8
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Edit Copy Delete	8	20	10	20	10	20	16
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Edit Copy Delete	10	20	10	10	10	10	12
Edit Copy Delete	11	10	15	5	20	20	14
Edit Copy Delete	12	10	10	20	20	20	16

Check all With selected: Edit Copy Delete Export

Figure7.2: Database.

In Association rule worksupport data set to analysis data as well Database this paper use database related mining.

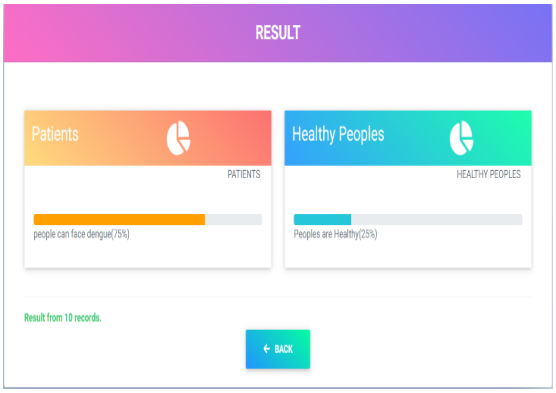

Figure 7.3: Apriori Transactions for Denguedata (support=0.5)

The Apriori transaction for dengue data its support of 0.5

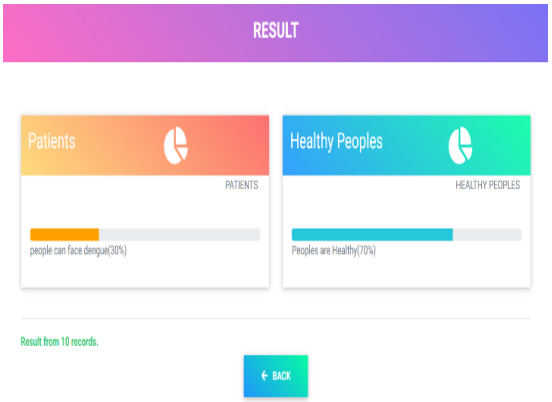

Figure 7.4: FP-Growth Transactionsfor Dengue data (support=0.5)

Figure 7.3 to 7.4 shows that when the number of transactions Increases; the execution time for both the algorithms are increased by the minimum support level. That type result shows the fp-growth algorithm require only less execution time than the Apriorialgorihm.

8. CONCLUSION

It concludes that Association Rule Mining is an interesting problem about pattern mining. The algorithms used are conceptually transparent and the tests which follow are perceptible.It is inferred from the conferred experimental data that the FP-growth algorithm performs better than the Apriori algorithm. In the future, the work can be expanded by using the various clustering techniques and also the Association Law Mining for a large number of databases.

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Strengthening Business Resilience: A Study of Hero Motocorp Ltd in Jalgaon District.

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ABSTRACT:

Building a strong brand is essential part of the marketing strategies of any firm in the era competition. There are four building blocks of any brands viz. Brand awareness, brand association, brand attitude and brand loyalty. Firms basically adopt communication strategies to enhance the brand awareness among customers. This study tried to examine whether brand awareness is associated with brand attitude with reference to Hero Motocorp Ltd. Analysis reveals that brand awareness is not associated with brand attitude neither it causes significant variation. Results of this study have important implication to streamline the branding strategies of business firm.

Keywords: ***Brand, Branding, Brand Equity, Brand Awareness, Brand Attitude etc.***

I. INTRODUCTION:

The inception of two-Wheeler industry in India dates back to 1945 before independence of India from British rule. Initially Indian firms used to import two wheelers from British and European continent. Until 1981, industry grew at very slow pace and not many choices were available to customers. But during the period of 1981-90 many new firms were established in India through technology partnership with many Japan based companies like TVS, Hero-Honda, Bajaj Auto Ltd, Escorts Ltd etc. In 1991, India adopted liberal economic policies and opened its market to world. This resulted in mass production of two wheelers in India. As a result India became 2nd world's largest producer of two-wheelers after China. As the production increased, completion pressure was increased on two-wheeler industry compelling them to adopt the branding practices.

Brand is defined as reputation of product or producer in market place. The act of creating a strong brand is called as branding. The strength of brand is measured in terms of customer based brand equity. According to David Aaker (1996), it is assets and liabilities associated with product. It measures positive or negative consumer mindset.

Brand Equity is composed of four components.

a) Brand Awareness: this refers to familiarity of brand among customers.
b) Brand Association: The relevance of products attributes with needs of customers
c) Brand Attitude: the perception of customer about quality of product.
d) Brand Loyalty: The willingness of customers to purchase the brand repeatedly [1].

Firms adopt communication strategies to build the strong brand. Firms aim communication strategies to increase the awareness, familiarity and customer's ability to recall the brand. Increased brand awareness results in positive perception of customers about quality of product which subsequently increases the probability of brand being considered by customer for purchase. But, communication strategies are subject to huge monetary allocation on advertisement and publicity expenses. Hence, it is necessary to justify whether communication strategies results in positive quality perception with reference to two-wheeler brand in India.

II. REVIEW OF LITERATURE:

Brands essentially do the functions of identification i.e. to identify a seller's offerings and to distinguish it from others. It is also a discriminator to distinguish products from one another by means of distinct attributes and benefits that attempt to convey differences that

make it appear superior. It is also a set of meanings and beliefs associated with the name[2]. The practice of branding helps business firms in effective planning and implementation of marketing strategies. The brand is the guiding force that can integrate the general strategies of the company, the human resources, the operationaliation of production and the marketing policies & procedures [3].

Branding produces intangible outputs to business firms which include greater customer satisfaction, reduced price sensitivity, fewer customer defections, a greater share of customer wallet, more referrals, and a higher percentage of repeat business [4]. Strong brands enjoy customer loyalty, the potential to charge premium prices and considerable brand power to support new product and service launch. Companies need to have thorough understanding of customer beliefs, behaviors, product or service attributes and competitors [5]. According to Kotler, brand provides more trade leverages in bargaining with business partners, can charge higher price than competitors, can extend the existing product line, provide defense against price competition and reduces the marketing cost of business [6]. According to Clamor Gieske; share performance of strong brands outperforms against those of weak brands in stock market and ensures good performance of company in competitive liberalized market [7].

The brand avoids losing customer by ensuring that, its potential customers being unable to find a substitute. Further, communications are more effective if the customer can correctly identify the brand. Having an easily identifiable brand also reduces risk in message strategy. It lets a brand communicate a message or value proposition that is highly relevant to consumers but not unique, as distinctive elements reduce the likelihood of the advertisement being attributed to the wrong brand [8]. Distinctive qualities benefit the consumer because they reduce cognitive effort by aiding search and information processing. Distinctiveness reduces the need to think, scour and search – thus making life simple for consumers. This is a very different consumer benefit that is offered by differentiation with intrinsic value. Consumers do not buy Commonwealth Bank because they value the colour yellow, but seeing yellow allows people to easily identify that this branch / advertisement / piece of direct mail / sponsorship is by Commonwealth Bank [9]. Distinctive qualities also represent a considerable competitive advantage to brands. Unlike “meaningful” differentiation, these qualities can be trademarked and legally protected [10]. There is also a natural disincentive for competitors to use the same elements in advertising, as their advertising is then likely to be misattributed [11].

III. RESEARCH METHODOLOGY:

A. Research Type:

It was diagnostic in nature based on sample survey research method[12] to test the correlation of brand awareness and brand attitude. Similarly, regression analysis was used to analyze the impact of brand awareness on brand attitude.

B. Source of Data:

This research was based on primary as well as secondary data. Primary data involves Opinions of customers of Hero Motocorp Ltd collected through structured questionnaires. And secondary data was collected from previous research papers and web articles available on internet to define the scope of research.

C. Sample Size & Sampling Method:

Primary data was collected from 254 customers of Hero Motocorp Ltd. Sample respondents were selected conveniently situated around Jalgaon and nearby Cities of Sub-districts namely Bhusawal, Chopada, Pachora, Dharangaon, Erandol and Chalisgaon.

D. Data Variables:

Quality Perception was selected as measure of Brand Resilience. It was used as dependent variable. Brand Recall, Model Recognition, Brand Familiarity and Knowledge of Product Features were measured as Independent Variables. All variables are measured using five point likert scales from Strongly Disagree to Strong Agree.

E. Hypotheses: (Null)

1. The relationship between Brand Recall (X_1) and Quality Perception (Y_1) is not statistically significant.

2. The relationship between Model Recognition (X_2) and Quality Perception (Y_1) is not statistically significant.
3. The relationship between Brand Familiarity (X_3) and Quality Perception (Y_1) is not statistically significant.
4. The relationship between Knowledge of Product Features (X_4) and Quality Perception (Y_1) is not statistically significant.
5. Brand Recall (X_1) does not cause significant variation in Quality Perception (Y_1).
6. Model Recognition (X_2) does not cause significant variation in Quality Perception (Y_1).
7. Brand Familiarity (X_3) does not cause significant variation in Quality Perception (Y_1).
8. Knowledge of Product Features (X_4) does not cause significant variation in Quality Perception (Y_1).

IV. RESULT & DISCUSSION:

A. Correlation Analysis:

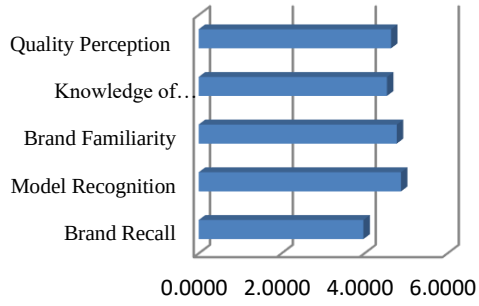
Research was aimed at to test the correlation of brand awareness and brand attitude. Brand awareness was measured in terms of Brand Recall, Model Recognition, Brand Familiarity and Knowledge of Product Features. Similarly, Brand Attitude was measured in terms of quality perception and Brand Relevance. Table 1 below indicates descriptive statistics and Table 2 indicates correlation coefficient (R) and Test statistics for hypotheses H1 to H4.

Table 1: Descriptive Statistics

Particulars	Mean	Std. Dev.	Samples
Independent Variable			
Brand Recall (X_1)	3.97	1.01	254
Model Recognition (X_2)	4.88	0.32	254
Brand Familiarity (X_3)	4.77	0.58	254
Knowledge of Product Features (X_4)	4.54	0.84	254
Dependent Variable			
Quality Perception (Y_1)	4.64	0.71	254

(Source: Primary Data)

Figure 1: Descriptive Statistics



The customers of Hero Motocorp Ltd rated all independent and dependent variable positively i.e. Brand Recall with mean value of 3.9767 (Close to Somewhat Agree), Model Recognition with mean value of 4.8819 (Close to Strongly Agree), Brand Familiarity with mean value of 4.7795 (Close to Strongly Agree), Knowledge of Product Features with mean value of 4.5433 (Close to Strongly Agree) and Quality Perception with mean value of 4.6417 (Close to Strongly Agree).

Table 2: Correlation Analysis

		X_1	X_2	X_3	X_4	Y_1
X_1	Pearson Correlation	1	.124*	.025	.034	.059
	Sig. (2-tailed)		.049	.697	.595	.348
	N	254	254	254	254	254
X_2	Pearson Correlation	.124*	1	-.097	-.039	-.013
	Sig. (2-tailed)	.049		.123	.534	.839
	N	254	254	254	254	254
X_3	Pearson Correlation	.025	-.097	1	.044	-.048
	Sig. (2-tailed)	.697	.123		.487	.444
	N	254	254	254	254	254
X_4	Pearson Correlation	.034	-.039	.044	1	-.004
	Sig. (2-tailed)	.595	.534	.487		.953
	N	254	254	254	254	254
Y_1	Pearson Correlation	.059	-.013	-.048	-.004	1
	Sig. (2-tailed)	.348	.839	.444	.953	
	N	254	254	254	254	254

(Source: SPSS, Primary Data)

Table 2 indicates the t-statistics computed at 0.05 level of significance along with sample size.

- Pearson Coefficient of correlation between Brand Recall (X_1)and Model Recognition (X_2) is 0.124 with P Value 0.049 at 0.05 level of significance. It is is less than 0.05 level of significance. Hence, correlation between Brand Recall (X_1) and Model Recognition (X_2) is statistically significant.
- But, Correlation of Quality Perception (Y_1) with those of Brand Recall (X_1), Model Recognition (X_2), Brand Familiarity (X_3) and Knowledge of Product Features (X_4) is not

statistically significant. The corresponding P Values are greater than 0.05 level of significance.

B. Regression Analysis

Table3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Sig. F Change
1	.082[a]	.007	-.009	.716	.797

(Source: SPSS, Primary Data)

Table 3 indicates F statistic for Quality Perception (Y_1) as dependent variable and Brand Recall (X_1), Model Recognition (X_2), Brand Familiarity (X_3) and Knowledge of Product Features (X_4) as independent variables. 0.007 value of R-Square indicates very marginal total variation in Quality Perception (Y_1) as dependent variable due to variation in Brand Recall (X_1), Model Recognition (X_2), Brand Familiarity (X_3) and Knowledge of Product Features (X_4) as independent variable. This variation is not statistically significant as P Value is greater than 0.05 level of significance.

Table 4: Regression Coefficient

Model		Un-standardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.066	.850		5.957	.000
	X_1	.045	.045	.064	1.001	.318
	X_2	-.057	.141	-.026	-.405	.685
	X_3	-.064	.078	-.052	-.821	.413
	X_4	-.004	.054	-.005	-.072	.943

(Source: SPSS, Primary Data)

Table 4 indicates individual coefficient of determination of all independent variables. Coefficients of determination (R^2) of Brand Recall (X_1) are 0.64, Model Recognition (X_2) -0.026, Brand Familiarity (X_3) -0.052 and Knowledge of Product Features (X_4) -0.05. Brand Recall (X_1) causes positive variation in dependent variable but Model Recognition (X_2), Brand Familiarity (X_3) and Knowledge of Product Features (X_4) causes negative variation in dependent variable. But these coefficients are not statistically significant as corresponding P Values are greater than 0.05 level of significance. Hence, null hypotheses H5 to H8 are accepted and alternative hypotheses are rejected. According, it is concluded that Brand Recall (X_1), Model Recognition (X_2), Brand Familiarity (X_3) and Knowledge of Product Features (X_4) does not cause significant variation in Quality Perception (Y_1).

V. DISCUSSION:

Literature suggests that brand equity is a passive concept which is not beyond the control of marketer. Brand equity is segmented into four parts viz. Brand Awareness, Brand Association, Brand Attitude and Brand Loyalty. Brand Awareness refers to knowledge and popularity of brand. This helps to induce customer to consider the product for purchase. Brand Awareness helps when it involves less risk for customer. After brand awareness, 2nd component of brand equity is referred as Brand Association. After the knowledge of product / brand, customers develop feelings of likeness towards product. Brand association is linked with product features. Brand association plays important role when customer feel high risk with purchase decision. Next to this develop the positive attitude and loyalty of customers towards product strengthening the brand resilience.

Purchase of two-wheeler is subject to high risk for customer. Obviously, merely brand awareness does not work to lead customers to consider the product. The results of study indicate that merely brand awareness is not associated positive perception of product quality. Neither has it caused significant variation in it. Indicating that brand needs to enhance the brand association in terms of quality perception, feelings of superiority and higher relevance of the product to fulfil the customer needs. This imply that brand needs to streamline the publicity and advertisement cost on one hand and think to improve the product quality, superiority and relevance through product related strategies.

VI. CONCLUSION:

The study was expected to test the correlation of brand awareness with that of brand attitude. Analysis reveals that brand attitude is independent of brand awareness. The relationship of Quality Perception (Y_1) with those of Brand Recall (X_1), Model Recognition (X_2), Brand Familiarity (X_3) and Knowledge of Product Features (X_4) is not

statistical significant neither these variable causes significant variation in Quality Perception (Y_1). This has important implications about promotional strategies adopted by business firms. It can streamline the advertisement and publicity expenditure on one hand and enhance the research & development expenditure to improve the brand association.

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Review of kVAh (Kilo Volt Ampere Hour) Billing- Pros and Cons to Utility and Consumers

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ABSTRACT

In this article the disadvantages of kWh/kVARh based tariff and the benefits of kVAh metering &billing are studied from the viewpoint of suppliers. And new formulae for electricity billing calculation are innovated as new billing standards. Industrial load is mainly inductive and needs reactive power in addition to active power for its functioning. Active power is consumed by the loads to perform intended work like motion, heat or light whereas reactive power is used to provide electromagnetic field in the inductive equipment. The reactive power consumption for a resistive load is nil as no electromagnetic field is needed for its operation. Reactive power also regulates voltage, improves voltage profile and enhances system stability. Some of the grid failures occur due to insufficiency of reactive power in the system. The reactive power needs can be met either locally at consumer end by installing reactive power system or else it has to be imported from the grid. If the electricity tariff is based on active energy kWh (kilowatt hour) alone then the utility bears the burden of supplying reactive power free of cost. The measures by utilities such as power factor incentives are not very effective in curbing reactive power import from grid by consumers. Alternatively, kVAh (kilo volt ampere hour) billing is more effective and is preferred by utilities. It takes care of both active power consumption as well as reactive power consumption.

Key words: kVAh (kilo volt ampere hour) billing, kWh (kilowatt hour), utility and consumer.

I. INTRODUCTION

Edison in 1892 starts up electricity metering by his first electric company for incandescent illumination. Initially he started out with a per-lamp rate. This was unsatisfactory so he developed a chemical ampere-hour meter that consisted of a jar holding two zinc plates connected across a shunt in the customer's circuit. Each month the electrodes were weighed and the customer's bill determined from the change in their weight. This meter was inefficient and error-prone. Thomson in 1989 by his Thomson-Houston Electric Company introduced his recording wattmeter. This was the first true watt-hours meter, and it was an immediate commercial success, many utilities adopting it as their "standard" model.

Since that time the kWh& kW has remained as fixed units for electricity energy&demand metering, although the pursuit of kVARh meters dates back to about 1915 and kVAh metering to about 1935. In spite of the fact that electricity metering technology has developed step by step, the kWh& kW remained as valid units for electricity energy &demand measuring through the century. By comparing the electricity billing and metering, it is noticed that the electricity tariffs and billing hasn't developed in proportion to metering devices technology. Hence it must be developed to agree with the new conditions such as: electricity marketing and networking, international electricity trade, power quality standards. The electricity charges must contain quantitative as well as qualitative components motivating the customers to improve their quality criterion.

The electricity meters are manufactured according to international standards. But there aren't any identified standards for electricity billing. So, it is necessary that the electricity-based tariffs and metering units be redefined and reproduced.

II. ELECTRICITY BILL COMPONENTS

The electricity billing commonly is consisted of three variable components plus at least one constant charge.

The variable components are as follows:

1- Active energy charge that is metered per kWh unit.
2- Reactive energy charge (power factor penalty) that is metered per kVARh unit.
3- Demand charge that is metered per kW unit in consecutive periods of time.

The electricity charges are two kinds: tariffs & penalties

Tariffs are those charges that are applied to quantitative components and are levied in any condition and by any amount, like active energy and demand.

Penalties are those charges that are applied to quantitative components and are suspended to the amount of quality criterion limited by ideal amounts (threshold limits). If the amount consumption of a qualitative component causes the quality criterion exceeds the threshold limit, the penalty will be levied, like reactive penalty that is limited by an ideal power factor (threshold limit) between 0.8-0.95.

III. SCENARIO IN CASE OF KWH-BASED BILLING:

1. Utilities supply both active and reactive power. In kWh tariff active power consumption is billed whereas the reactive power supplied by the utilities remains unbilled.
2. The PF incentives are normally available in this tariff regime and this encourages consumers to improve PF and reduce their reactive power consumption. In an ideal case when PF is maintained close to unity the PF incentive is highest and reactive power consumption is negligible. In such a case entire reactive power requirement of load is catered to by the consumer himself by capacitors or other means such as active compensation. The question of charging for reactive power consumption by utilities does not arise as they supply no reactive power lagging or leading to the consumer.
3. If load power factor at a consumer premises is poor and is not improved by consumer the utility has to cater to the reactive power needs of load which requires utility company to strengthen its reactive power installation. The utilities in India charge PF penalty for PF values below 0.9. Wherever the PF incentives are either negligible or non-existent the consumers target for achieving somehow 0.9 PF instead of an ideal value of unity. This leaves a very large chunk of reactive power needs of the consumers to be taken care by utility company.
4. The power factor incentive is based on average monthly value which is easier to achieve through a mix of fixed and auto compensation thus enabling consumers to get maximum incentive
5. Some utilities overlook leading PF values while computing average power factor. This tempts consumers to use capacitors indiscriminately for availing PF incentive but it does more harm than good to the installations of both utilities and of consumers.
6. The low power factor penalties to consumers do not adequately compensate the utilities for unaccounted consumption of reactive energy by consumers.

IV. SCENARIO IN CASE OF KVAH BASED BILLING

1. Utilities prefer kVAh billing wherein consumers need to maintain PF close to unity for optimum kVAh consumption. This encourages consumers to generate their own reactive power.
2. Reactive power consumption charges are built in the kVAh tariff regime.
3. PF incentive is built in the tariff structure thus no separate PF incentive is given.
4. Utilities maintain kVAh tariff cheaper than the kWh tariff.
5. The computation of kVAh is based on RMS current and thus Harmonics affect kVAh consumption. The distortion power factor increases with increase in harmonic content which reduces true power factor and increases kVAh consumption.
6. Some utilities have declared migration to kVAh billing but in actual practice they continue to treat leading power factor as unity and the billing remains same as that for kWh regime if the average PF is maintained unity or any leading PF value.
7. To optimise the billing consumers, need to have a relook at their reactive power installation. There has to be less reliance on fixed compensation. Automatic compensation both on LT and HT can only provide optimisation.

V. REDUCTION IN KVAH BILLING THROUGH HARMONIC MITIGATION

Conventional engineering terminology, which were as per linear load scenario are changing now with more non-linear loads being used by electricity consumers. This power system, where loads are dominated by non-linear loads, presence of harmonics generally will be considerable. Under

such environment, a conventional power triangle will not give correct apparent power as there will be presence of other harmonic current and voltage in the system that will add to the apparent power.

There are utilities who are billing to their consumers on kVAh basis instead of kWh basis. The customer must keep in mind that if utility is billing on kVAh basis, he is essentially charging for poor power factor often impacted by presence of heavy reactive load as well as non-linear loads causing severe harmonic distortion. So, addressing reactive load demand by reactive compensation in linaer load environment or harmonic filtering in non-linear load environment are the best ways to reduce your energy bill whether charged on two-part basis including power factor penalty or single part kVAh basis.

VI. UTILITY CHALLENGES:

Though Power Factor Incentive mechanism encourages the consumer to improve its lagging Power Factor and maintain it to unity, there are cases of over compensation causing leading PF. There is no clarity about leading Power Factor in existing Tariff Order. As is the case with lagging PF, higher magnitude of leading Power Factor is also not desirable. Therefore, the Commission introduces penalty for leading PF also. This penalty will be applicable from prospective effect. As a first step towards the implementation of kVAh billing system, which is devoid of any separate incentive / penalty for PF, the Commission has decided to reduce the existing Power Factor Incentive / Penalty by 50%. Accordingly, maximum Power Factor Incentive, which is 7% at Unity Power Factor, has been reduced to 3.5%. Similarly, Penalty for lower Power Factor has been rationalized." The Commission has further directed MSEDCL to compute PF by applying following methodology, while the average PF measurement is not possible through the installed meter, the following formula for calculating the average PF during the billing period shall be applied. $Average\ PF = Total\ (KWh)/\ Total\ (KVAh)$ Where KVAh is square root of the summation of the square of KWh and RKVAh).

The formula adopted by MSEDCL for computation of PF, which violates the formula directed by the Commission is reproduced as under. Average

$$P.F = \frac{kWh}{\sqrt{\sum kWh^2 + \sum(RkVAh\ lag + RkVAhlead)^2}}$$

VII. CASE STUDY

Now from above discussion it is necessary to have Automatic Power Factor Correction (APFC) unit with fine-tuned capacitor unit. Secondly the delay in operation of contactor play important role in reduction of total kVAconsumption. Following table shows the data and analysis of power factor with partial manual and partial by APFC control.

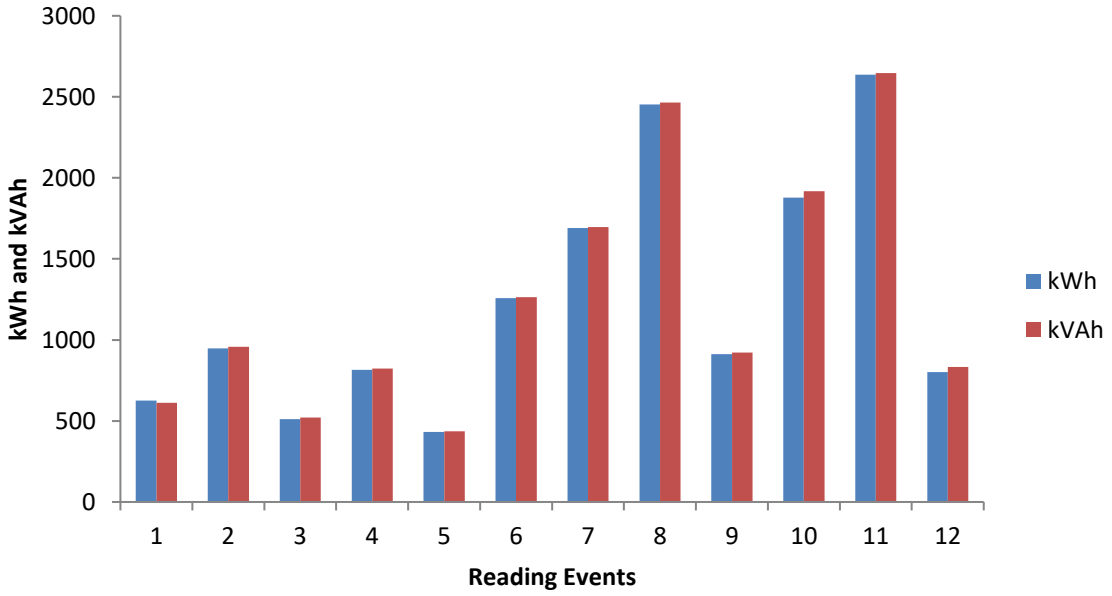
Table 1: Analysis of power factor, reactive power and kVAh by partial manual and partial automatic power factor correction

Date	kWh	kVArh (Lag)	kVArh (Lead)	kVAh	Difference (kWh)	Difference (kVArh Lag)	Difference (kVArh lead)	Difference (kVAh)	Power Factor	Power factor (Lag / Lead)
31/01/2019	136499	17182	4932	138505						
13/02/2019	139962	17371	6226	141997	3463	189	1294	3492	0.9193	Lead
14/02/2019	140355	17371	6507	142388	393	0	281	391	0.8135	Lead
15/02/2019	140809	17374	6857		454	3	350	-142388	0.7894	Lead
16/02/2019	141170	17408	6872		361	34	15	0	0.9909	Lag
18/02/2019	141763	17499	6881		593	91	9	0	0.9861	Lag
20/02/2019	142342	17560	6888	144409	579	61	7	144409	0.9932	Lag
21/02/2019	142812	17618	6890	144885	470	58	2	476	0.9919	Lag
22/02/2019	143247	17681	6891	145365	435	63	1	480	0.9893	Lag
25/02/2019	144641	17881	6892	146743	1394	200	1	1378	0.9898	Lag
26/02/2019	144946	17909	6892	147074	305	28	0	331	0.9958	Lag
28/02/2019	146000	18034	6942	148142	1054	125	50	1068	0.9865	Lag
					9501	852	2010	9637	0.9575	Lead
Total Feb 2019					**28503**	**2556**	**6030**	**28911**	**0.9575**	**Lead**

It is observed that power factor is leading on off peak period because of partial manual control. Average power factor calculated by old method $i.e. Total\ (KWh) / Total\ (KVAh)$ where KVAh is square root of the summation of the square of KWh and RKVAh) is good and beneficial for consumer but not to utility.

Table 2: Analysis of power factor, reactive power and kVAh by fully automatic power factor correction

Date	kWh	kVArh (Lag)	kVArh (Lead)	kVAh	Difference (kWh)	Difference (kVArh Lag)	Difference (kVArh Lead)	Differcen (kVAh)	Power Factor	Power factor (Lag / Lead)
01/03/2009	146000	18034	6942	148142						
02/03/2019	146625	18102	6946	148753	625	68	4	611	0.9934	Lag
05/03/2019	147572	18193	6952	149711	947	91	6	958	0.9948	Lag
06/03/2019	148083	18255	6954	150231	511	62	2	520	0.9922	Lag
08/03/2019	148898	18331	6961	151055	815	76	7	824	0.9949	Lag
09/03/2019	149331	18369	6963	151492	433	38	2	437	0.9958	Lag
12/03/2019	150588	18455	6981	152755	1257	86	18	1263	0.9966	Lag
15/03/2019	152279	18555	6992	154451	1691	100	11	1696	0.9979	Lag
20/03/2019	154732	18702	7004	156915	2453	147	12	2464	0.9979	Lag
22/03/2019	155644	18765	7006	157836	912	63	2	921	0.9975	Lag
26/03/2019	157522	19005	7018	159753	1878	240	12	1917	0.9911	Lag
30/03/2019	160159	19146	7031	162400	2637	141	13	2647	0.9983	Lag
31/03/2019	160961	19191	7034	163234	802	45	3	834	0.9982	Lag
					14961	1157	92	15092	0.9965	Lag
Total March 19					**44883**	**3471**	**276**	**45276**	**0.9965**	**Lag**



Graph 1: Comparison of kWh and kVAh

It is observed that same data is analyzed as directed by commission to calculate average power factor as

$$P.F = \frac{kWh}{\sqrt{\sum kWh^2 + \sum(RkVAh\ lag + RkVAhlead)^2}}$$

The power factor is poor and consumer has to take action to manage leading kVAR under peak and Off-peak period. It clear that technical and commercial benefits only when net reactive power become near to zero. Therefore, billing method would be better based on kVAh basis instated of kWh basis. [1]

A. The advantages of kVA/kVAh billing

1. *1-calculation of distortion component:*
   In a nonharmonic environment (sinusoidal waveform of current &voltage) the apparent power (kVA) is the vector sum of the active and reactive power and represents the complete burden on the electrical system.
   But in a harmonic condition that is produced by nonlinear elements and loads the kW/kVAR spectra do not contain many of the harmonics in current. So, true RMS, harmonic sensing meters still sense relatively few harmonics in W, VAR, only those that are common to voltage and current. The difference is present in D. The apparent kVA includes the kW / kVAR as well as the Distortion component that is disregarded now in kWh/kVAh separated metering& billing, while it would be considered and calculated in kVAh based tariff.

2. *The exemption of leading power factors is eliminated:*
   There is no difference between leading and lagging power factor in reduction of network capacity and increasing the energy and power losses. But traditionally the power factor penalty is calculated only for lagging power factor because in conventional electromagnetic meters, the rotating disk in lagging or leading states rotates in two different direction and measure net reactive power. So, it isn't permitted to rotate in leading state by a brake system.
   While in apparent based tariff there is no difference between leading and lagging reactive power and there would be no exemption for leading power factor.

3. *The exemption of p.f. threshold limit is eliminated:*
   An incentive threshold limit is defined for lagging power factor between 0.8- 0.95 varying in any utility according to regulation or contract. The power factors greater than the threshold limit are exempted from penalization. While the power factors less than the threshold limit are levied p.f. penalty. For example, by threshold limit of 90% the customer is permitted to reduce 10% of network capacity without levying penalty: kW $\geq$ 0. 9kVA$\rightarrow$p.f penalty = 0
   The incentive power factor motivates the consumers to improve their power factors achieving higher power factors. According to kVAh based tariff, the accepted threshold limit of p.f is just 1, therefore wouldn't be any penalty exemption for power factor neither lagging nor leading.

4. *The1phase customers will be levied p.f. penalty:*
   As a billing tradition the p.f. penalty is defined only for 3ph customers, therefore 1ph customers pay no charges for their reactive consumption. The pursuit of this tradition dates back to capability of conventional electromagnetic meters that were unable to measure 1ph reactive power consumption because the angle between voltage and current vectors could not be measured by them directly, unless the voltage and current coils of 1ph meter be fed by two different phases. This exemption is incentive for 1ph customers that load the most reactive power to the network by usage of poor power factor equipment and don't care about their power factor improvement. This is the sever harm that is loaded by electricity customers to suppliers because of kWh/kVARh based tariff and will be eliminated by kVAh based tariff. If so, all customers will pay their apparent energy consumption charges including reactive component either 1ph or 3ph consumer.[4]

VIII. Conclusion:

The electrical power in normal condition consists of two components; a. Active power (P) and Reactive power (Q). b. The active or real power (P) is actually consumed and converted into useful work for creating heat, light and motion and is measured in (kW) and is totalized by the energy meter as kWh. c. The reactive power (Q) is used to provide the electromagnetic field in inductive equipment and drawn from grid. Also, reactive power is supplied by consumer to grid in case of excessive capacitive load. It is measured in kVAr (Lag / Lead) and is totalized by the energy meter

as kVArh (Lag / Lead). d. Apparent Power (S) measured in kVA is the product of the Root Mean Square (RMS) values of voltage and current. The Vector sum of active power and reactive power is called apparent power. e. The ratio of active power to apparent power is called the power factor. Both Active (kWh) and Reactive (kVArh) energies are consumed simultaneously. Reactive Energy (kVArh) occupies the capacity of electricity network and reduces the useful capacity of system for generation and distribution & hence its consumption also needs to be billed. kWh based billing is associated with PF incentive /penalty mechanism. Considering that the kVAh based billing has an inbuilt incentive /penalty mechanism and separate mechanism for the same is no more required instead of billing two energies separately, billing of kVAh energy is preferred as a commercial inducement. kVAh billing has an inherent mechanism to incentivize or penalize consumers according to their power factor. The Prime Objective of the kVAh based billing is to encourage the consumers to maintain near unity Power factor to achieve loss reduction, improve system stability, power quality and improve voltage profile. At the national level, emphasis is being given to Energy Conservation, Energy Efficiency and Demand Side Management (DSM) to optimize the energy usage. Through kVAh billing, the consumers will be encouraged to adopt energy efficiency programs and will be benefited by reduced electricity bills.

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Cotton leaf disease detection and identification using Support Vector Machine and K-means Algorithm

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Abstract:
Cotton is one of the very important crops in our agricultural based country and if some diseases are identified then it become easier to farmer to get resolved otherwise economical condition of the farmer gets collapsed. Hence the detection of those diseases are very important. The various cotton leaf diseases are Red spot disease (Lalya), White spot disease (PandhariMashi), Crumple leaf disease (Kokada). SVM and K-means algorithm are used to detect the cotton leaf disease. K-means is clustering algorithm used for image segmentation and SVM algorithm is used for the feature extraction and classification of unseen data. Normally if disease is get detected by the farmer he contacts to the Experience person of that area and get solution for the same but if the detection and identification of disease are not up to the mark then it badly effect on the cotton plant. Farmer contacts to the owner of pesticide shop or so-called person who suggests some treatment with respect to his experience whether it works or not. Maximum farmers just go with nature they think that the diseases will get cleared automatically in some period of span. The main purpose of this is to identify the type of disease and quantify the damage of cotton crop thereby providing the treatment for the respective disease using K-means and Support Vector Machine algorithm. We are going to do this identification and detection of disease of cotton plant using different image processing techniques on the cotton leaf.
In this paper we will provide information of all possible disease on cotton leaves. After the detection of possible disease on cotton leaf as well as possible treatment, precautions, pesticides suggestion, remedies should be provided to the farmer. Farmer himself can provide cotton leaf to our system and get the details about cotton leaf diseases and treatment.

Keywords: cotton leaf, cluster, detect.

INTRODUCTION

India is agriculture country where in more than 65% population depends on agriculture. Cotton is one of the very important crops in our agricultural based country and if some diseases are identified then it become easier to farmer to get resolved otherwise economical condition of the farmer gets collapsed. Hence the detection of those diseases is very important. The various cotton leaf diseases are Red spot disease (Lalya),white spot disease (PandhariMashi), Crumple leaf disease (Kokada) . SVM and K-means algorithm are used to detect the cotton leaf disease. K-means is clustering algorithm used for image segmentation and SVM algorithm is used for the Feature extraction and classification of unseen data

Red spot disease is a key and potentially vicious bacterial infection caused by bacterium,Xan-thomonascampestrispymalvacearum. Red spot disease crop up on creeping bent grass during warm and wet weather in the spring, summer or fall. Red spot disease called angular spot because of the restriction of the spot by the fine veins of the cotton leaf and having red to brown border around it. The angular spot act as water-soaked region and after turn dark brown to black [1].It is also called lalya.

White spot disease act as circular spot. White spot diseases are scattered over the leaves, stems or pods of infected plants. Older spot can grow dark borders and the centers may fall out. The more prominent on lower leaves of the plant disease as compare to the greater part leaves of leaf [1]. The size of white spot disease is 1 to 15mm.It is also called pandharimashi. Cucurbit leaf crumple disease indications start in small spots in the field with new leaves screening yellow spots. The crumple spot diseases are affected by heavy whitefly feeding and transmission of the worm [1].It is also called kokada.

SVM
To analyze data used for classification and regression analysis called support vector machine. To construct a hyperplane or a set of hyperplane in

a high or infinite-dimensional speace, used for classification, regression in SVM. The SVM objectives to allocate labels to instances by using SVM, where the labels are drawn from a finite set of several elements [2].To separate the two classes of data points, there are many likely hyperplane that could be selected. Support vector are data points that are earlier to the hyperplane and impact the position and orientation of the hyperplane. First step of SVM is to divide plane in x and y axis and divides leaf in multiple segments. second step is divide segments in 0 and 1.If 0 then leaf is infected and if 1 then leaf is not infected.

K-MEANS

It is an interactive algorithm to partition the dataset into k-means pre-defined distinct non-overlapping clusters where each data point belongs to only one group. The vector quantization is a method of k-means clustering that is popular for cluster analysis in data mining. K-means tends to find clusters of comparable spatial extent and the expectation-maximization mechanism allows clusters to have different shapes. K-means is easy to apply large data sets, when using heuristics. Clustering representation using the input training data is basic approach of k-means. The objective of k-means clustering is to minimize total intra-cluster variance and squared error function.

LITERATURE SURVEY

Cotton is a primary cash crop in India .It affects India's economy in many ways. Large number of people depends on Cotton crop either by its cultivation or processing. The experts usually judge the symptoms with bare eyes. However, this imposes continuous monitoring by experts which is expensive in case of huge farms. On the other hand farmers judge the symptoms by their experiences, the incorrect identification leads to wrong control measurements, such as excess use of pesticides and at inappropriate time. Cotton leaf disease can be detected by pattern recognition techniques through which we can achieve the accuracy 85.52 percent [1]. Automatic detection of plant diseases is an essential research topic as it may be advantageous in monitoring huge fields of crops, and detect the symptoms of diseases as soon as they appear on plant leaves [3] [4] [5].image processing techniques and neural networks are used for implementation of automatic system that can detect the different plant diseases [6]. Initially Edge detection-based Image segmentation is done, and finally image analysis and classification of diseases is performed using our proposed Homogeneous Pixel Counting Technique for Cotton Diseases Detection (HPCCDD). The goal of this research work is identifying the disease affected part of cotton leaf sport by using the image analysis technique. This work find out the computer systems which analyze the input images using the RGB pixel counting values features used and identify disease wise and next using homogenization techniques Sobel and Canny using edge detection to identify the affected parts of the leaf spot to recognize the diseases boundary is white lighting and then result is recognition of the diseases as output. [3] in this paper detection of leaf diseases has been used method is threefold: 1) identifying the infected object based upon k-means clustering; 2) extracting the features set of the infected objects using color co-occurrence methodology for texture analysis; 3) detecting and classifying the type of disease using NNs, moreover, the presented scheme classifies the plant leaves into infected and not-infected classes. In details, a color transformation structure for the RGB leaf image is created, and then, a device-independent color space transformation for the color transformation structure is applied in next step. After that, the image at hand is segmented using K-Means clustering technique. Due to bacteria, insects and fungus, cotton leaves has a diseases nearly about 80-95% [7]. About 80-95% of diseases found on the cotton leaves are like Alternaria, Cercospora, Red spot, white spot and Yellow spot on the Leaf [8].

SYSTEM ANALYSIS

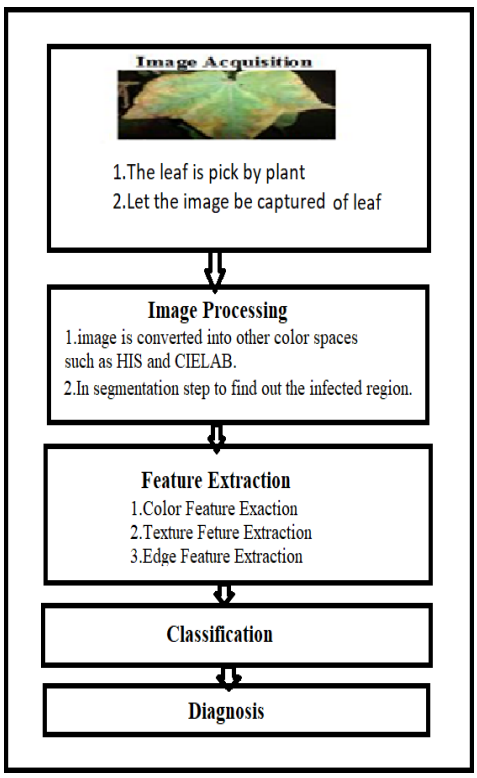

Fig No 1. Feature Extraction Image Acquisition

For good quality are RGB color image capture by used a digital camera. The availability of an image database is needed for the application. The image database is answerable for the well productivity of the classifier which agrees the strength of the algorithm.

Image Preprocessing and Segmentation

In preprocessing stage to progress image data that eliminates experience, sound and also suppress undesired misrepresentations. It increases image features for processing and enquiry. The effort RGB color image is new into other color places such as HIS and CIELAB. As RGB is color needy universe model but HSI and CIELAB are color free space model and this are also resultant from human view. In segmentation stair to invention out the infested region. Segmentation generally can be done by k-mean clustering, edge finding algorithm.

Algorithm Feature Extraction

Next segmentation the sick region several geographies are removed to call the infected region. Color, texture and shape-based features are customarily recycled for region picture.

Color features are main to logic image location, identify objects and send information Texture is any of the best important features which can be used to order and spot objects. It is a controlling regional descriptor that benefits in the image loss process. Contrast, Equality, Contrast, Energy and Entropy features are planned to call texture. Shape is one of the original features for image contented picture.

Classification

It is closing step in bug detection. It is finding a rule giving to certain features and conveying each bug to any one the fixed classes. The Artificial Neural Network and Support Vector Machine are mostly used as classifier.

DESIGN

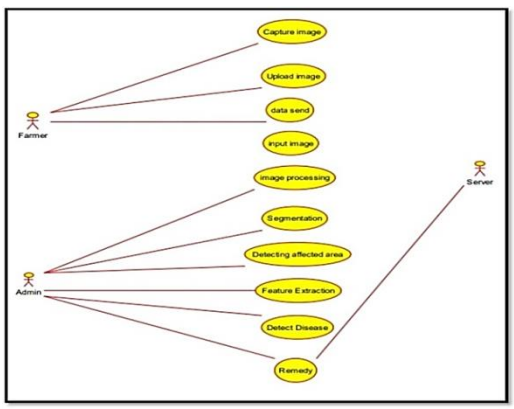

Fig No.2 Use Case Diagram

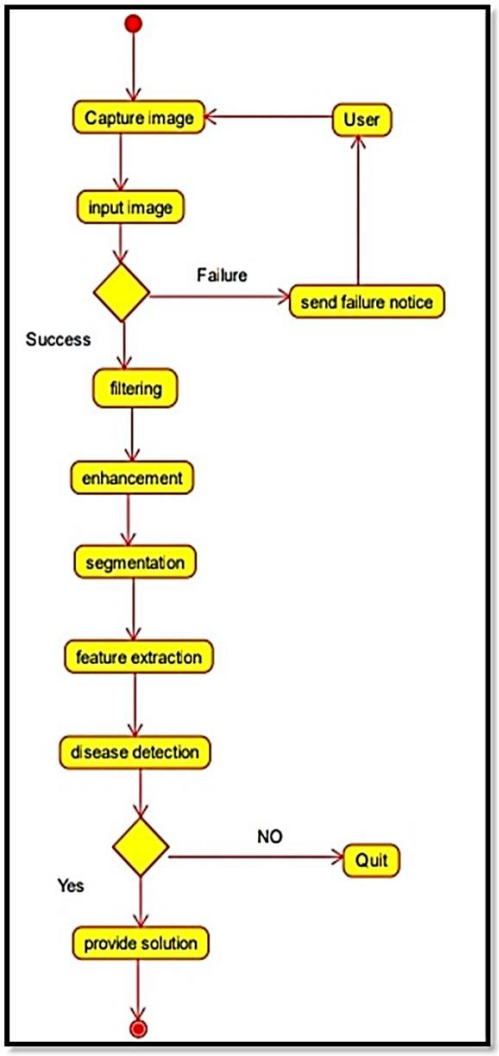

Fig No 3 Activity Diagram

IMPLEMENTATION DETAILS

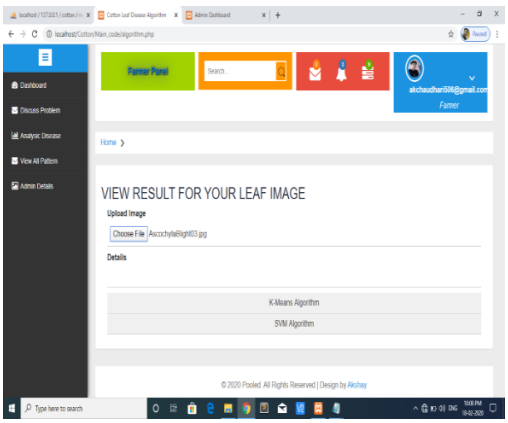

Fig No. 4 Selection of algorithm

Choose file of infected leaf and upload the image on this platform and go for algorithm for detection and analysis of diseases.

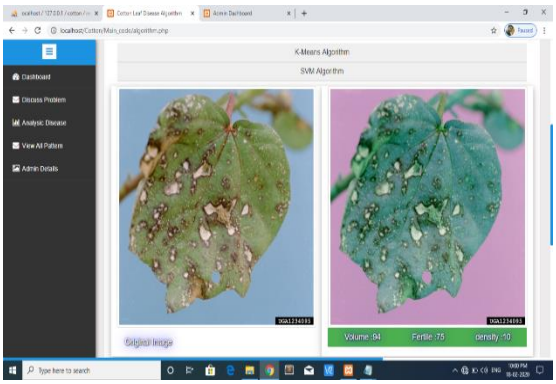

Fig No 5 Analysis of Diseases

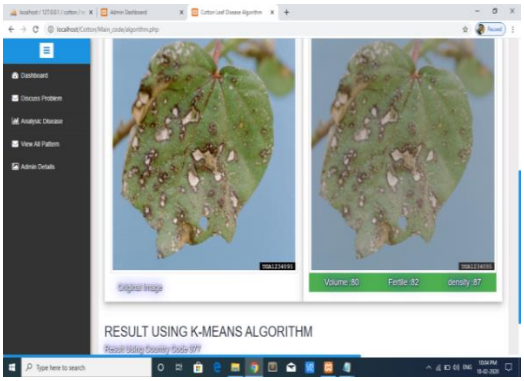

Fig No 6 Analysis of Diseases

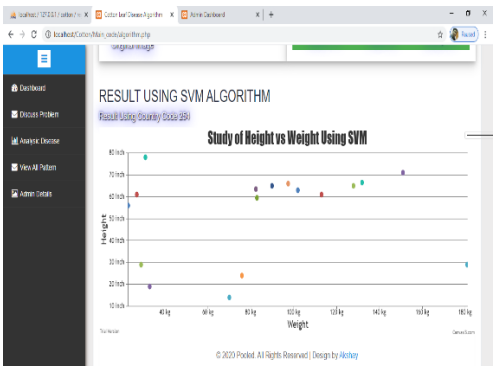

Fig. No. 7 Height and weight of infected spots using SVM algorithm

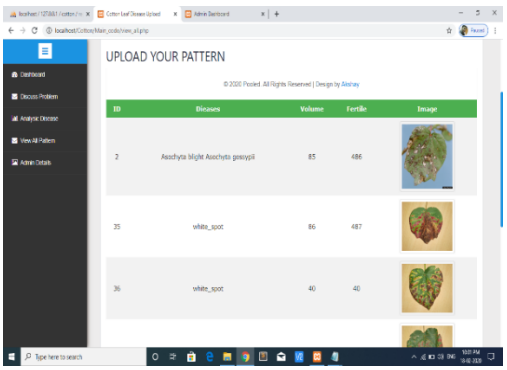

Fig No. 8 Patterns of leaf diseases

Input image infected by bacterial brown spot and as shown in above snapshot, we have found volume, fertility and density of infected spots.

Table 1: Diseases of plants with infected Percentage

Image ID No.	Disease	Fertile	Infected
2	Asochyta blight Acochyta gossypii	486	60%
35	White Spot	487	50%
36	White Spot	40	40%

In above table, according to ID no of images we can see the diseases and their fertile value and infected values.

CONCLUSION

After examining above methods we can say that there are number of ways through which we can detect disease and analysis the infected leaf of cotton. The important issue or characteristics of disease detection and analysis are speed and accuracy. The results indicate that proposed approach of K-means and SVM algorithm can detect and analysis the leaf diseases with a little effort. Besides, the farmers also need to access information accurately so they can use it for efficient cotton crop management and others way are not effective than providing service to them through their mobile phones. We have diagnosed the leaf diseases through image acquisition, image processing, feature extraction, classification and diagnosis. In order to improve disease identification, analysis and identification at different levels, the samples may be increased and shape and color features along with the different optimal features could be provided as inputs for different disease identification.
In future, other number of promising features may be added in feature extraction process for making this application more robust.

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Chemical Route Synthesis of Zinc Oxide Nanoparticles through Precipitation

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Abstract:-

Nanomaterials found extensive uses in diversified fields for specific and targeted applications. Due to remarkable characteristics zinc oxide nano particles finds extensive uses in variety of specialised applications. There are multiple synthesis techniques available for producing ZnO nanoparticles, which determine the dimensions and morphologies of the particles. Amongst various synthesis techniques, chemical route, especially direct precipitation method for preparing ZnO nanoparticles by employing zinc nitrate and potassium hydroxide as precursor finds extensive applicability in synthesizing ZnOnanopowder at laboratory scale and provides satisfactory results and ease of synthesis.

Key words: Zinc oxide, nanoparticles, precipitation

INTRODUCTION: -

Nanomaterials in recent years attracts the world of researchers due to their remarkable characteristics and founds extensive applicability in almost every field and having great potential to improve the quality of life, through inventing new product specific technologies based on nanomaterials. Nanomaterial concerns with natural and synthetic material in the size of ~1 to 100 nm. Nanomaterials are chemical substances or materials that are manufactured and used at a very small scale. Nanomaterials often have properties dramatically different from their bulk-scale counterparts; for example, nanocrystalline copper is five times harder than ordinary copper with its micrometer-sized crystalline structure. Nanomaterials are developed to exhibit novel characteristics compared to the same material without nanoscale features, such as increased strength, chemical reactivity or conductivity.

Due to remarkable chemical and physical properties such as high chemical stability, high electrochemical coupling coefficient, broad range of radiation absorption and high photo stability , anti-corrosion, anti-bacteria, low electrons conductivity, excellent heat resistance, low toxicity, biocompatible and biodegradable nature makes zinc oxide as a multifunctional material and makes its adaptability in various technological areas, such as optoelectronics, cosmetology, medicine, and industry [1, 2] and in photo catalysis for water treatment [3] and many more. One of the uses of ZnO nanoparticles is in sunscreen because they reflect ultraviolet light, but are small enough to be transparent to visible light.[4] ZnO nanoparticles are also being investigated to kill harmful microorganisms in packaging,[5] and in UV-protective materials such as textiles.[6] Zinc oxide is key element for many industrial processes like paints, ceramics, rubber, soap, textiles, and floor coverings.

There are multiple techniques available, such as sol-gel[7], direct and hydrothermal precipitation[8–10], aerosol process[11], sonochemical[12], microemulsions[13],mechanochemical process[14]for producing ZnO nanoparticles, which determine the dimensions and morphologies of the particles. In most synthesis techniques a considerable number of variables should be considered, and the evaluation of the effect of each on the final product would require a very large number of experiments. Research in the field of synthesis methodology of ZnO nanomaterials is mainly oriented in controlling their shape, size and composition. Each of these factors is a key factor in determining the properties of materials that lead to different technological applications.

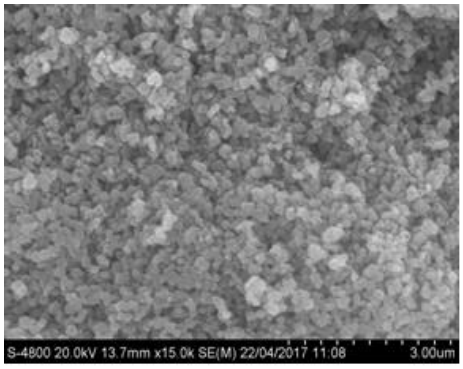
Method:

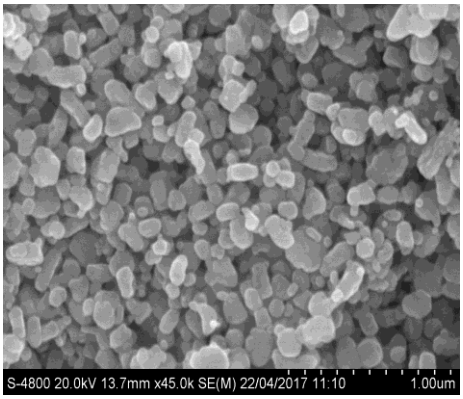
In the present work, chemical precipitation route was adapted for synthesizing zinc oxide nanoparticles, in which aqueous solution of zinc nitrate ($Zn(NO_3)_2.6H_2O$) of 0.2 M concentration was prepared with triple distilled water.

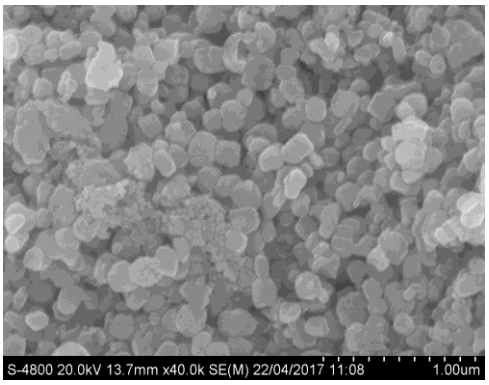
A precursor is necessary for the formation of zinc oxide nanoparticles, and for that potassium hydroxide (KOH) of 0.2 M aqueous solution was also prepared with triple distilled water. Then

under vigorous stirring potassium hydroxide solution is slowly added into the zinc nitrate solution with due care at room temperature.
Due to action of precursor potassium hydroxide on zinc nitrate, a precipitate of zinc oxide was formed which was centrifuged for separation of white mass. The product washed twice with triple distilled water and later on with high purity grade absolute alcohol for further purification. After drying the thermal treatment was carried out at about 450^0C in a muffle furnace for 2 hrs and the product is then characterized.

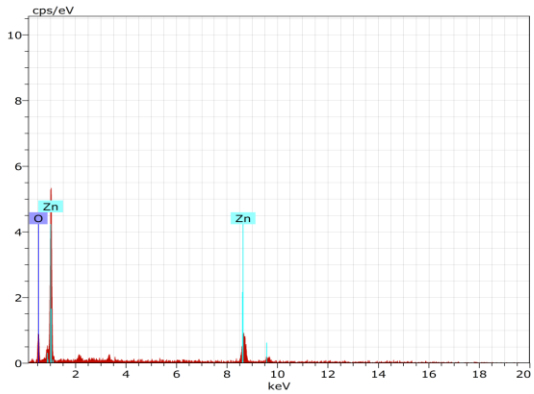
RESULT:
SEM Images: Sample1



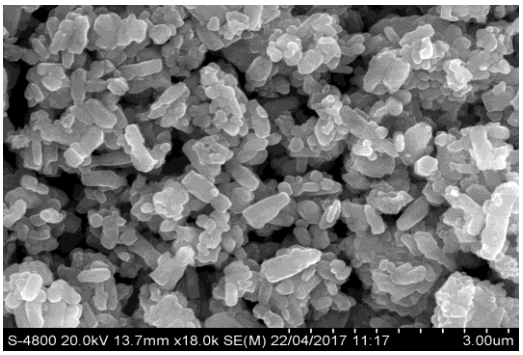


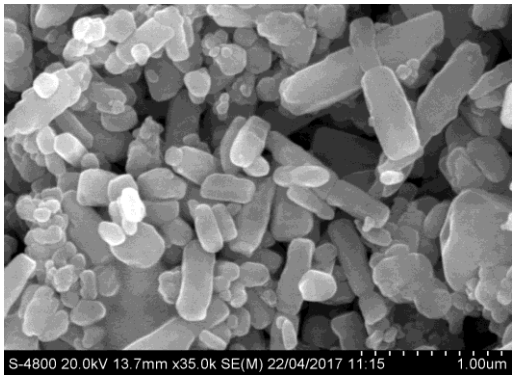


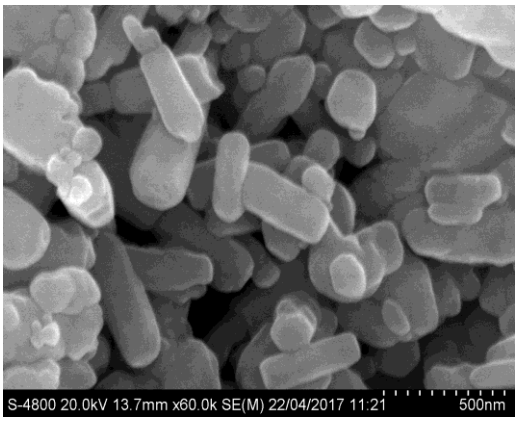
EDX Spectra Sample:1



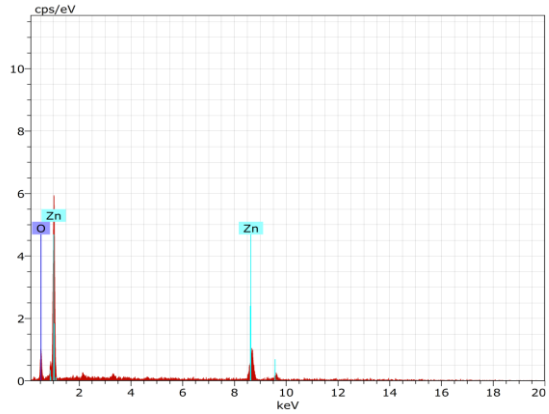
SEM Images: Sample2







EDX Spectra: Sample2



CONCLUSION:

The objective of this work was to synthesize zinc oxide nanostructured particles with the most practical ways. Energy-dispersive X-ray *spectras and* scanning electron microscope images prevails the formation of zinc oxide nanoparticles. Although multiple synthesis techniques are available for producing ZnO nanoparticles, chemical route, especially direct precipitation method for preparing ZnO nanoparticles using potassium hydroxide as an precursor and zinc nitrate as source of zinc found high level of adaptability as ease of synthesis, if taken into consideration.

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