FRAUD DETECTION IN CONSUMPTION PATTERN OF CONSUMER USING BEHAVIOURAL TECHNIQUE

Navaneethakrishnan P [1], Mohanraj K.R [2], Sathish G[3]
[1]Assistant Professor / CSE, Velammal Engineering College -Chennai.
Email: kpnavanee@gmail.com,
[2]Assistant Professor /CSE, Velammal Engineering College- Chennai.
Email:mohanraj.k.r@gmail.com,
[3]Assistant Professor /CSE, Velammal Engineering College- Chennai.
Email: gsatcse@gmail.com

***Abstract*— In today's world, without electric current nodeviceruns. Electricity is the source for every working device in this world. There are many systems designed that is used for analysis of consumed power. There exist many drawbacks in the existing systems. The System which we are developing overcomes all the drawbacks that existed in earlier systems. In Earlier systems, the analysis was done on a 2-month basis which summed up to a minor amount. With the advent of big data in to field, every new technology grew and scaled up. Previously, fraud was minimum and eradicating it was not that tedious. Officers found it easy to remove it. But as no. of customers increased and no. of devices per home increased, the consumption reading got hugely increased. Due to this fraud increased widely and it was very difficult to minimise it. We have proposed an algorithm for matching up the consumption values from a particular grid (Area Wise). The Consumption coming out of the DT will be matched up with the household meter reading and by this way fraud can be detected. The existing system consisted only of a micro level, but our proposed system is dedicated to a macro level. In our proposed system, a variety of smart meters have been accepted into usage, with the help of the smart meters, a series of reading values are sent to the server directly. Unlike the earlier meters a smart meter uses a timestamp value based on which readings are sent periodically say for every day.**

***Keywords* —** Fraud Detection, Bigdata, Analysis, Smart grid, Smart meter, Consumer Consumption.

I. INTRODUCTION

Tamil Nadu electrical energy power distribution companies often have to deal with the commercial losses, mainly resulted from consumer's frauds. To minimize this problem, the companies visit some consumers and realize in loco inspections to try to detect frauds. However, it is not viable to inspect all the consumers because the number of consumers fraudulent is small compared to the total number of clients. In this way, the revenues do not recoup the costs. This problem is present in all consumer classes, from residential to industrial. Smart-Grid technology utilizes GSM Communication to record the daily electricity consumption. It then transmits the recorded units to the main server station.

Fraud detection is a well-known problem, however there are few works about fraud detection for electrical energy.

Our Paper deals about identifying the fraudulent consumers and faulty meters using the daily consumption data. The problem comes only when the no. of consumer count is very large. Storage problem arises when traditional databases are used. Here we use bigdata storage containers. Big data analytics is the process of examining large datasets to uncover hidden patterns, unknown correlations, market trends, customer preferences and other useful business information.

In smart grid, the smart meter generates meaningful data every 15 minutes and transmits it to the main server. Reading per day sums up to 96 and weekly reading adds up to 480. This is the case for a single customer, imagine for an entire smart city. Big data comes into action at this point.

In few words, the methodology for those works is: a) generate a sample database of normal and fraudulent consumers (detected by inspection); b) Pre-process the data to the data analysis tools; c) apply the tools to create patterns; d) verify which consumers fit the rules with "fraud" decision and inspect them.

II. LITERATURE SURVEY

José E. Cabral proposed in the above mentioned paper that it includes two systems for High Voltage Consumers and Low Voltage Consumers. The data is retrieved from the smart meter for on a 15 mins' period which gives 96 registers per day and 480 registers per week.

Self-OrganizingMap (SOM) tool is being used for Mining of the data retrieved. The Data is converted into patterns. Using SOM the similar register value data's are grouped into clusters.

Behavioural Analysis technique is used and using that consumption drop is identified. If the Consumption drop is below minimum level (30%) that particular customer is marked into the Suspect List. SOM is an Artificial Neural Network model of non-supervised knowledge that maps a time variant input according to its graphical representation, allowing the identification of clusters or patterns comparable to the inputs. In other words, given a set of registers that can be graphically visualized, the SOM identify groups of registers that are similar (clusters). It can be used as identification tool for standard profiles on data without classification (or decision), like the one here.

SOM is able to identify which week profiles that a consumer has in a given time interval and also can classify new weeks according to pre-

Computed clusters. Based on this, the behaviour of a HVC is analysed as follow:

1. Verify if there is a consumption drop (negative variation) between current and anterior month of the analysis (30% drop, for example);

2. Select the last 12 months of data (historical) and organize them into weeks;

3. Compute the weeks clusters with the SOM;

4. Attribute each new week of the current month to one of the clusters found by the SOM (4 or 5 weeks per month);

5. Verify if each new week adequately fits into the cluster that it was attributed (fitness), or if this week probably represents a new profile unknown until now;

6. Verify if the unknown profile is expected due to contract's modification, keeping constant the rate between monthly registered power demand and contracted power demand (RPD/CPD = k).

III. EXISTING METHODOLOGIES

Analog Meters are being utilized by consumers all over Tamil Nadu. In this, the consumed units are summed up and recorded as a bi-Monthly tariff plan.

The recorded readings are noted by Electrical Engineers to the place where the meters are being set up.

This is a major drawback when the no. of consumers are increasing gradually. Consumers are directly proportional to the population of the country, and its definitely impossible to record it in that basis.

Similarly, detecting fraud with respect to the Analog meters is not a proper way of fraud detection and for detection a whole numbered count of values are required, which means the engineers have to record the daily sum from the consumers meter box, which is not possible.

Fraud detection in Analog meters is possible, but as a long-term process it takes huge time to bring out a whole count value.

Using this technique the Consumer consumption pattern cannot be generated and further analysis cannot be processed using this.

There are chances for the meters to become faulty, in such cases identifying the faulty meters is a bit difficult since it can be only verified and checked from the meters location.

If suppose a meter has become faulty, anterior tariff will be reposted as the consumers current bi-monthly bill.

Considering the drawbacks of this existing system, we have proposed our concepts and tried to suppress the drawbacks and come up with our ideas.

IV. PROPOSED METHODOLOGIES

Overcoming the drawbacks caused using Analog meters, usage of Smart-Meters and implementing Smart-Grid technology is a good idea to the modern world. Using this technology, IOT will be spread out globally and each and every device in the surrounding will be interconnected.

Smart-Grid is one containment grid, where the buildings present inside the grid utilizes Smart-Meters. The Smart-Meters is a device similar to the Analog Meter which is used for recording Consumption of any Energy Unit. Smart-Meters can be used for Water, Gas, and Electricity as well. Smart-Meters are small scale devices to which is attached a GSM Comm. Module. Using GSM module, the recorded values are transmitted directly to the Server and stored in the appropriate users' db.

Smart-Meters can be used with a time-period based transmission. The time of upload can be decided by the user. In our Methodology, we have used Daily Sum-up and upload, which adds up to 31 values a month.

Using this, analysis can be performed easily and fraudulent consumers are picked out and even faulty meters can be identified.

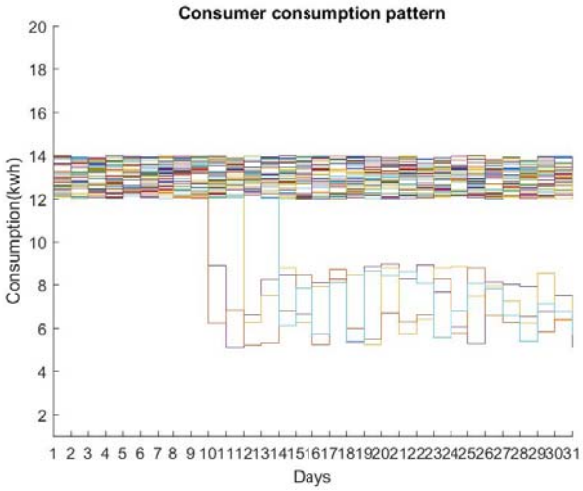
Algorithm

In our system, we use an behavioural analysis technique.

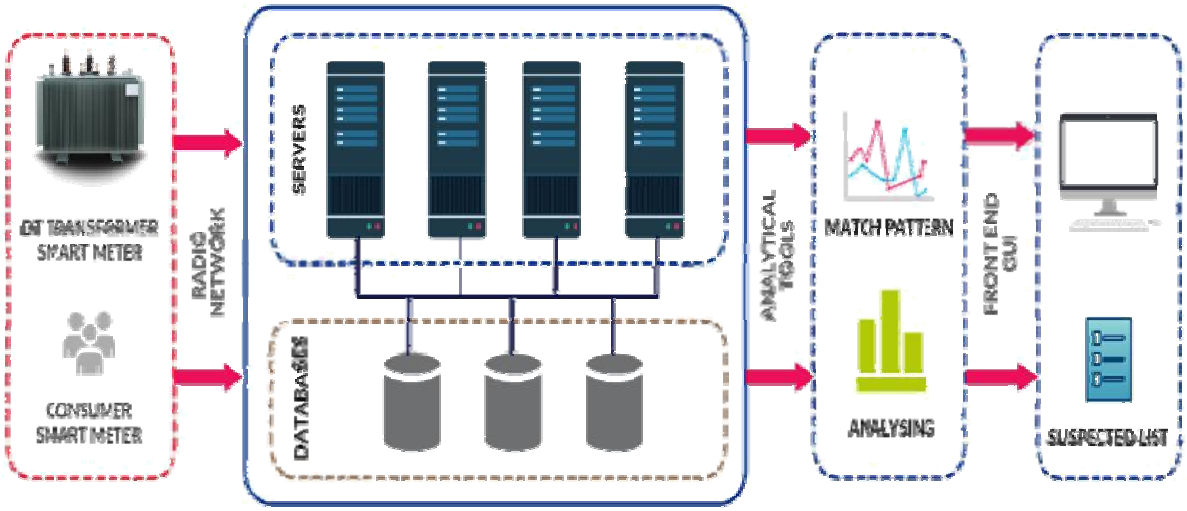
1. Area-wise transformer readings are summed and grouped for analysis. Analysing the total consumed units of all areas' Early Drop is checked to identify in which area the fault occurs.

2. After isolating the area under which drop occurs, the same process is performed to the DT's which fall under the particular area.
3. Suspected DT is picked out and in depth analysis is performed using the consumers' readings.
4. Consumption values of all the consumers are compared and an SOM analysis is performed. The value which deviates from the normal range is visualised and picked out as a suspected consumer.

The above technique can be performed only if monthly readings are available.



Result Output – after Analysis



Architecture Diagram – Consumer Consumption Pattern using SOM Algorithm

```
for d = 1:c_cons
    differences = diff(con_read(s_days:days, 1));
    bigDrops = differences < -2;
    s_days = days+1;
    days = days+31;
    if any(bigDrops == 1)
        sus(i) = d;
       i=i+1;
       %fprintf('big drops detected %d\n',d);
    else
        %fprintf('No drops detected\n');
   end
end
```

Algorithm Snippet

To identify the faulty meters, same process can be commenced. If in case there is any faulty meter, communication of GSM with the main server also indicates it. If communication wears out, fault can be effectively identified.

V. CONCLUSION AND FUTURE WORK

In this paper, we have performed an analysis method using the consumer data and proposed an output which splits the Fraud Consumers from the normal consumers. Using the Pattern Matching mechanism, the fraud consumers are put to the suspected list. Later using the graph we can identify which consumer is fraudulent using the drop that is being detected. This is the most effective and efficient technique in the case of Smart-Grid technology. Using the Live Feed data, accurate results can be gathered. Behavioural analysis using SOM is used to perform analysis using consumer data and transformer's sum. Further improvements are to be made. In the near future, this tool will be made as an android application and the suspected consumer details will be sent to the application owners as a notification along with the GPS tagging feature. The GPS location will be sent to the administrators mobile.

V. REFERENCES

[1] Jian Liu, Jiakui Zhao, Yan Chen, Hongfa Li, Qiucen Huang, Hong Ouyang, Qingli Hao, Yaozong Lu "Analysis of Customers' Electricity Consumption Behaviour Based on Massive Data"

[2] Jose E. Cabral, Joao O. P. Pinto,Alexandra M. A. C. Pinto "Fraud Detection System for High and Low Voltage Electricity Consumers based on Data Mining.''