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A Novel Smart Energy Theft System for IoT Based Smart Home

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ABSTRACT: In the modern smart home, smart meters and Internet of Things have been massively deployed to replace traditional analogue meters. It digitalizes the data collection and the meter readings. The data can be wirelessly transmitted that significantly reduces manual works. However, the community of smart home network is vulnerable to energy theft. Such attacks cannot be effectively detected since the existing techniques require certain devices to be installed to work. This imposes a challenge for energy theft detection systems to be implemented despite the lack of energy monitoring devices. This paper develops an energy detection system called Smart Energy Theft System (SETS) based on machine learning and statistical models. There are 3 stages of decision-making modules, the first stage is the prediction model which uses multi-model forecasting System. This system integrates various machine learning models into a single forecast system for predicting the power consumption. The second stage is the primary decision making model that uses Simple Moving Average (SMA) for filtering abnormally. The third stage is the secondary decision-making model that makes the final stage of the decision on energy theft. The simulation results demonstrate that the proposed system can successfully detect 99.96% accuracy.

KEYWORDS: Smart Meters, Internet OfThings, Smart Energy Theft System (SETS), Simple Moving Average (SMA)

I. INTRODUCTION

In the modern smart grid, massive deployment of advanced metering infrastructures (AMI) facilitates the efficient and reliable information exchange[1]. The AMI can be divided into different sectors depending on the location which is crucial to end consumer. AMI includes smart meters and Internet of Things (IoT) monitoring devices that were able to collect data in large volumes and fast speed. This paper is developed for the energy detection system called Smart Energy Theft System (SETS) based on statistical models and machine learning[2]. There are three stages of decision-making modules, the first stage is the prediction model which uses multi-model forecasting system. This system integrates various machine learning modules into a single forecast system for predicting the power consumption. The second stage is the primary decision-making module that uses simple moving average (SMA) for filtering abnormally[3]. The third stage is the secondary decision-making module which makes the final stage of the decision on theft. Internet of Things is expected to produce high degree of human to machine communication along with machine-to-machine communication. This project proposes the security system using IOT, which prevents theft in home, bank etc.

II. RELATED WORK

This paper provides an overview of current sensor technologies and describes the paradigm of multi sensor fusion and integration as well as fusion techniques at different fusion levels[2]. In this paper, an innovative Smart Energy Theft system (SETS) is proposed for energy theft detection a multi model forecasting system based on the integration of machine Re-current Neural Network (RNN) Long Short Term Memory (LSTM) and Gated Re current Unit (GRU) was developed as part of SETS Additionally a statistical model called Simple Moving Average (SMA) was also further developed into SETS[6]. There are three stages of decision-making modules, the first stage is the prediction model which uses multi-model forecasting system[7]. This system integrates various machine learning modules into a single forecast system for predicting the power consumption[8]. The second stage is the primary decision-making module that uses simple moving average (SMA) for filtering abnormally. The third stage is the secondary decision-making module which makes the final stage of the decision on theft. Internet of Things is expected to produce high degree of human to

machine communication along with machine-to-machine communication[9]. This project proposes the security system using IOT, which prevents theft in home, bank etc[9].

III. PROPOSED ALGORITHM

This system will find energy theft easily. This IOT electricity meter is consisting of Atmega 328 microcontroller with a WIFI module for IOT connection and GSM module for mobile connection, on which users will receive information via SMS. This smart electricity meter also consists of a current sensor that sends the current reading to the microcontroller. We have to connect cell phones with the system via SMS which will help to configure with the system. It collects information from monitoring devices and analyses the data to detect energy theft.

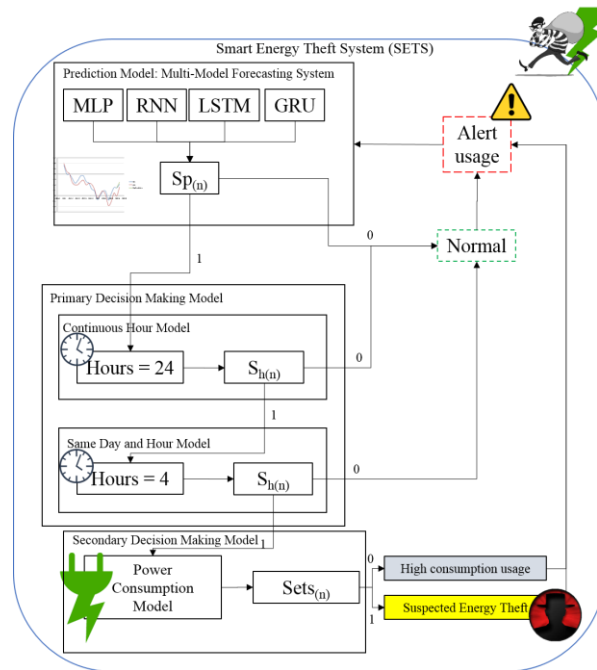


Figure 1 Smart Energy Theft System

Data Collection Module

Demand Side Management System (DSMS) collates the information from various real-time monitoring smart devices in the house. The data collection module for setting up Smart Energy Theft System (SETS) is to get the real-time monitoring ready. Data collection module used a set of smart plugs called Aeon Labs Z-Wave UK Plug-in Switch plus Power Meter and the main controller was a Vera Edge Home Controller. The advantages gained through the use of redundant complementary or more timely information in a system can provide more reliable and accurate information. This paper provides an overview of current sensor technologies and describes the paradigm of multi sensor fusion and integration as well as fusion techniques at different fusion levels.

IV. SIMULATION RESULTS

Energy theft has become a serious issue in the smart grid community. It has caused massive losses for many countries that exceed billions of dollars. Nowadays, a smart meter will be placed at the end of every distribution network to record power consumption and generates the energy reports remotely. An example of the home distribution network



Figure 2 Simulation Output

V. CONCLUSION AND FUTURE WORK

In conclusion, SETS enhances the security of the Internet of Things (IoT) based smart home systems from energy theft and can be further implemented in commercial and industrial sectors. This project is implanted as prototype model This paper is developed for the energy detection system called Smart Energy Theft System (SETS) based on statistical models and machine learning. There are three stages of decision- making modules, the first stage is the prediction model which uses multi-model forecasting system. This system integrates various machine learning modules into a single forecast

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