Research Article

Home Automation using Genetic Mean Algorithm

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Abstract

There are so many monitoring systems available in market. But this controller based system has one limitation; the sensor detection is real time and not predetermined that means in summer season the cooling system on only when user interfere either by physically switching the system or by some wireless means (like Android App) therefore we proposed machine learning (ML) technique to predetermine some repetitive activities. Data of the person's activities (like when he when needs to switch on different appliances) is stored in MySQL as datasets and this data is used as input for the Geometric Mean algorithm. User control Appliances by means of Android App interfaced with Node MCU via cloud (firebase server).

Introduction

During festive holiday, we are exhorted not to turn on the light constantly. So why we are not prudent to go out with the light switches on constantly? This sort of activity could pull in thief to coming into our home. At the point when we are away from our home, regardless of whether on the job or having occasion, it is difficult for us to screen our home particularly for the electrical machine; light and enthusiast obviously we don't need this to occur. Besides that, in term of cost, it's anything but a decent practice as it will make our month to month electrical bill going up, on the grounds that we can't control the electrical apparatus during our vacation. If we feel something not being switch off, we could not even know the real situation and cannot going back just to switch it off. So people will buy or install additional device such as timer switch. But this kind of switch may have some disadvantages. One of the disadvantages is it only work with one profile. Means, we cannot set for several different timing. Normally this device allow up to one appliance. A home automation system is a technological solution that enables automating the bulk of electronic, electrical and technology-based tasks within a home. It uses a combination of hardware and software technologies that enable control and management over appliances and devices within a home. Home automation is also known as domestic, and a home with an automation system is also known as a smart home.With the development of new electronic technologies and their integration with older, traditional building technologies, smart house is at last becoming a real possibility. Smart home is a house that uses information technology to monitor the environment, control the electric appliance and communicates with the outer world. Smart home is a complex technology, at the same time it is developing. A smart home automation system has been developed to automatically achieve some activities performed frequently in daily life to obtain more comfortable and easier life environment. A geometric mean is helpful in AI when contrasting things and an alternate number of properties and numerical reaches. The geometric mean standardizes the number reaches giving every property equivalent load in the normal. This appears differently in relation to math mean where a bigger number range would more extraordinarily influence the normal than a more modest number range. In the proposed system Python fetches data from firebase and stores in MySQL database. Geometric Mean uses this data to study behaviour of user. After some fix time, there is no need of human interference in switching of appliances. Python based system automatically switches status of appliances.

B. Motivation

There are so many monitoring systems available in market. But this controller based system has one limitation; the sensor detection is real time and not predetermined that means in summer season the cooling system on only when user interfere either by physically switching the system or by some wireless means (like Android App). Therefore we proposed machine learning technique to predetermine some repetitive activities. Data of the person's activities (like when he when needs to switch on different appliances)

is stored in MySQL as datasets and this data is used as input for the Geometric Mean algorithm. User control Appliances by means of Android App interfaced with Node MCU via firebase server.

C. Objectives

1. To control, manage and co-ordinate home appliancesin a comfortable, effective and secure way.
2. To implement a low cost, reliable and scalable homeautomation system that can be used to remotely switch on or off any household appliance, using a microcontroller to achieve hardware simplicity, using Machine learning for automatic switching of appliances without interference of human

Review of Literature

Several methods have been proposed for Home Automation. Literature survey of these methods is presented here: Paper [1] delineates a philosophy to give a minimal effort Home Automation System (HAS) utilizing Wireless Fidelity (Wi-Fi). This takes shape the idea of internetworking of shrewd gadgets. A Wi-Fi based Wireless Sensor Network (WSN) is intended to screen and controlling natural, wellbeing and electrical parameters of a shrewd interconnected home. The client can practice consistent power over the gadgets in a shrewd home by means of the Android application based Graphical User Interface (GUI) on a cell phone.The proposition of framework [2] is to build up an IoT based Interactive Industrial Home remote framework, Energy the board framework and implanted information procurement framework to show on site page utilizing GPRS, SMS E-mail alert. This gadget is fundamental for sensor information assortment and controlling of the modern Home Wireless Sensor Networks (WSN) in the Internet of Things (IoT) condition.

It is wanted to style a re-con?gurable reasonable gadget interface for mechanical WSN in IoT climate, during which ARM is received as the center controller. Along these lines, it will check data in equal and continuously with fast on numerous totally extraordinary gadget data. Clever gadget interface speci?cation is received for this style. The gadget is joined with the latest ARM programmable innovation and keen gadget speci?cation. By distinguishing the estimations of sensors it very well may be effectively ?nd out the Temperature, Smoke, and Fire present in the modern condition on the Website and we can deal with any circumstance from anyplace on the planet through IOT. With the goal that basic circumstance can be maintained a strategic distance from and preventive measures are effectively actualized.

In [3], Maninderpal Singh et al proposed a framework for Smart Home Automation strategy with Raspberry Pi utilizing IoT and it is finished by incorporating cameras and movement sensors into a web application. To plan this framework, we are utilizing a Raspberry Pi module with Computer Vision procedures. Utilizing this, one can control home machines associated through a screen based web. Raspberry Pi works and controls movement sensors and camcorders for detecting and observation. For example, it catches interloper's personality and recognizes its essence utilizing basic Computer Vision Technique (CVT). At whatever point movement is distinguished, the cameras will begin recording and Raspberry Pi gadget cautions the proprietor through a SMS and alert call. Without the individual setting off to each house so probably the manual meter examining will be avoided. Customers will get step by step invigorate the force usage by techniques for SMS. Force theft can be avoided completely by this paid early robotized power meter and moreover gives information about the amount of units overpowered by cost per unit.

System introduced in [4] supports making practical usage of intensity thusly it will restrain the force crisis in our country and upgrades the economy of power board. In [5], Avani N. Chaudhari et al executes and build up an Android application for power estimating and installment a bill utilizing a remote attachment. This framework is intended to screen the vitality utilization and sent the utilization to the advanced mobile phone and furthermore power office. We can cover our tab of utilization of intensity utilizing android application without setting off to the bill installment of?ce. Clients can screen utilization of vitality units and its bill at anyplace and any purpose of time utilizing android application. This framework comprises of three fundamental parts which incorporate information social event and information preparing and advanced cell.

Another implanted innovation based methodology for mechanized vitality meter perusing framework is proposed in [6] which empowers the meter readings to be refreshed onto the web server consequently on a standard interim premise and sends bills to clients every month. It gives an office of reviving the vitality meters remotely. Clients can take care of tabs of postpaid meters and can energize the prepaid meters by making an impression on the specialist co-op. The meter readings are sent to close by found focal station (entryway) utilizing RF connect and from that point to web server utilizing GSM. It additionally gives the office of power alter discovery. The remote controlling of meter perusing framework is basically done utilizing ARM 7 microcontroller. Installed C is utilized for ARM coding and web server is planned utilizing HTML. Database is made utilizing MySQL.

In paper [7], Tianyi Song et al proposes an improved vitality ef?cient, secure, and protection saving correspondence convention for the brilliant home frameworks. In proposed conspire, information transmissions inside the keen home framework are made sure about by a symmetric encryption plot with mystery keys being created by disorderly frameworks. Then, we consolidate Message Authentication Codes

(MAC) to our plan to ensure information respectability and legitimacy.

We additionally give itemized security investigation and execution assessment in examination with our past work as far as computational unpredictability, memory cost, and correspondence overhead. In paper [8], Apriori calculation for a brilliant home computerization and metering framework utilizing IoT is introduced. The fundamental reason for this framework is to control the home machines and electronic gadgets with the assistance of a supervisory framework. The supervisory framework is planned so that everybody can get to it. The framework gives clients the capacity to control, deal with the electronic gadgets, can screen the utilization of power, and to take care of the power tabs, safely and dependably. The provider can likewise screen and in like manner and keep up the issues in an efficient way.

Alexandra Moraru et al [9] introduced vertical framework coordination for foreseeing the measure of people in lab. System stepped sensor information with extra information and made an extended dataset and associated AI ?gurings. In the wake of isolating the check comes to fruition because of the basic and the all-inclusive datasets, structure presumes that the measure of people can be predicted in context of sensor information. Also, the longing can be improved while including extra data for all of the three ML estimations. Structure used additionally displayed the overhauls in precision of want when obliged the estimations of the class of 0 or no people. Picking the correct ML framework to apply on sensor information relies upon the application and upon the commonplace results. Decision trees and Bayesian structures give best outcomes over direct lose the faith, meanwhile, to make general closures; more assessments on more prominent datasets are required.

It has been found that the model settled on by choice trees to be the most immediate to interpret and well performing. The outcomes gotten are drawing in for advance expansion of the structure, by causing a course of action of sensors with the target that more data to can be picked up. Moreover considering improving the present framework with semantic movements for redesigning, the information for increasingly extended and exceedingly careful wants [10].

Proposed Methodology

Home automation is becoming popular due to its numerous benefits. Home automation refers to the control of home appliances and domestic features by local networking or by remote control. User will control output devices through mobile App. if a user wants to Switch ON/OFF output appliances, then simply he/she has to press button associated with that appliance. Android App updates this new value of button on firebase server and Node MCU (inbuilt Wi-Fi enabled, ESP8266 based Module) continuously fetches

data from firebase server. According to command from user, Node MCU switches status of appliances.

Advantages of Proposed System:

1. It minimize network bandwidth and device resource requirements while trying to ensure reliability and a certain degree of security of delivery.
2. It also provide the predication of the information.

A. Architecture

Home automation is becoming popular due to its numerous benefits. Home automation refers to the control of home appliances and domestic features by local networking or by remote control. User will control output devices through mobile App. if a user wants to Switch ON/OFF output appliances, then simply he/she has to press button associated with that appliance. Android App updates this new value of button on firebase server and Node MCU (inbuilt Wi-Fi enabled, ESP8266 based Module) continuously fetches data from firebase server. According to command from user, Node MCU switches status of appliances.
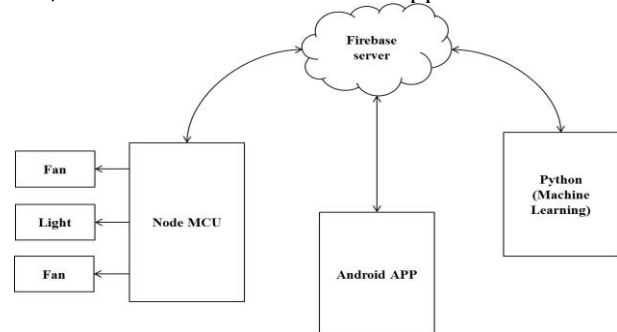

Fig. 1. Proposed System Architecture

Python fetches data from firebase and stores in MySQL database. Geometric Mean uses this data to study behaviour of user. After some fix time, there is no need of human interference in switching of appliances. Python based system automatically switches status of appliances.

B. Algorithms

Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves. Machine Learning is the field of study that gives computers the capability to learn without being explicitly programmed. ML is one of the most exciting technologies that one would have ever come across. As it is evident from the name, it gives the computer that which makes it more similar to humans: The ability to learn. Machine learning is actively being used today, perhaps in many more places than one would expect.

The process of learning begins with observations or data, such as examples, direct experience, or instruction, in order to look for patterns in data and make better decisions in the future based on the examples that we provide. The primary aim is to allow the computers learn automatically without human intervention or assistance and adjust actions accordingly.

C. Mathematical Model

A geometric sequence is a sequence such that any element after the first is obtained by multiplying the preceding element by a constant called the common ratio which is denoted by r. The common ratio (r) is obtained by dividing any term by the preceding term, i.e.,

$$r = \frac{a_2}{a_1} = \frac{a_3}{a_2} = \ldots\ldots = \frac{a_n}{a_{n-1}} \quad (1)$$

where r common ratio a_1 first term a_2 second term a_3 third term a_{n-1} the term before the n th term a_n the n th term

The geometric sequence is sometimes called the geometric progression or GP, for short.

For example, the sequence 1, 3, 9, 27, 81 is a geometric sequence. Note that after the first term, the next term is obtained by multiplying the preceding element by 3.

The geometric sequence has its sequence formation:

To find the nth term of a geometric sequence we use the formula:

$$an = a1rn-1 \quad (2)$$

where r common ratio a_1 first term a_{n-1} the term before the n th term n number of terms

Sum of Terms in a Geometric Progression Finding the sum of terms in a geometric progression is easily obtained by applying the formulas: nth partial sum of a geometric sequence

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad (3)$$

sum to infinity

$$S_\infty = \sum_{n=1}^{\infty} ar^{n-1} \quad (4)$$

where S_n sum of GP with n terms S_∞ sum of GP with infinitely many terms

a_1 the first term r common ratio n number of terms

Result and Discussion

Actual hardware module of proposed system is shown in figure below. This figure shows Node MCU (main controlling unit) is interfaced with 4 channel relay. A relay is an electrically operated switch. Here we are using SPDT (Single Pole Double Throw) relay. It has one common terminal and 2 contacts in 2 different configurations: one can be Normally Closed and the other one is opened or it can be Normally Open and the other one closed.
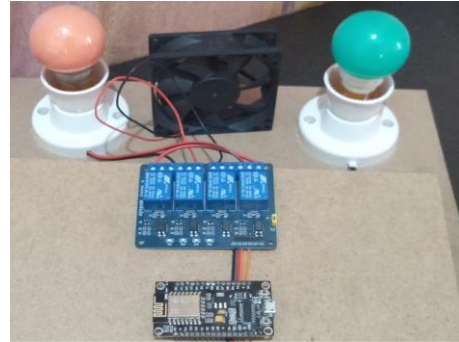

Fig. 2. Hardware module of proposed system

Relay controls switching of output devices (Light, Fan and Light) as per commands from Node MCU. Real-time status of output devices of firebase server is shown in figure3.
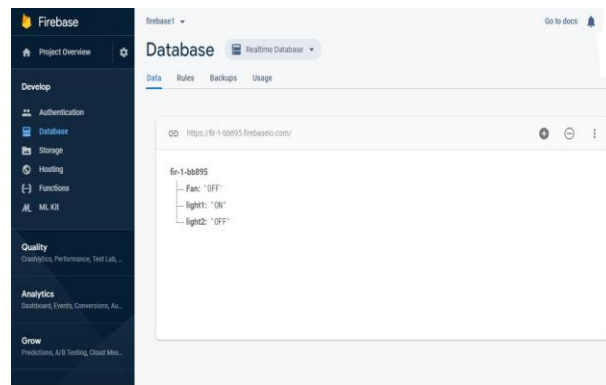

Fig. 3. Firebase server

Conclusion

This section should include short overview on the The prime objective of our project is to use the Smartphone to control the home appliances effectively. A Mobile App is designed to ON/OFF appliances; receiver will be a Node MCU which is connected to home appliances. A pair of switch is interfaced with appliances each to ON and OFF a particular appliance. Geometric Mean is used to train algorithm and after studying user's behaviour automatically switch output appliances. The design principles are to minimize network bandwidth and device resource requirements while trying to ensure reliability and a certain degree of security of delivery. The user interface would be created for desktops or laptops and applications for mobiles. Our system would also provide the predication of the information. We use the machine learning algorithm for provide the accuracy of the system.

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