Home Adaptation Security

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Abstract—As several home appliances, such as air conditioners, heaters, and refrigerators, were connecting to the Internet, they became targets of cyber-attacks, which cause serious problems such as compromising safety and even harming users. We have proposed a method to detect such attacks based on user behaviour based on adaptive learning capabilities of system. This method models user behaviour as sequences of user events including operation of home devices and other monitored activities. Considering users behave depending on the condition of the home such as climatic temperature, our method learns event sequences for each condition. To mitigate the impact of events of other users in the home included in the monitored sequence, our method generates multiple event sequences by removing some events and learning the frequently observed sequences. In this project, we also discuss the effectiveness of our method by comparing with a method learning users' behaviour by Hidden Markov Models. We have utilized tools such as Arduino IDE and Pycharm those which provided software support for the project and helps us to process real time data with more resolution and accuracy incorporated convincingly.

Keywords: Cyber Attacks, Hidden Markov Model, Adaptive Learning.

I. INTRODUCTION

HOME APPLIANCES such as refrigerators, heaters, and air conditioners are being increasingly integrated with Internet connections to expand connectivity beyond personal computers and smartphones. These devices are collectively devices. Users can obtain information from devices and operate them using smartphones, tablets, or smart speakers. Currently, seven billion devices are connected to the Internet, with a substantial increase to 215 billion devices expected by 2025 As the number of devices connected to the Internet increases, the risk for these devices to be targeted by cyberattacks also increases In fact, direct attacks Manuscript received July 2, 2019

II. LITERATURE SURVEY

"Design and implementation of microcontroller based assistive robot for person"- by Abu Tayab Noman , M A Mahmud Chowdhury , Humayun Rashid ,S. M. Saifur Rahman Faisal .Blindness is a more severe problem among the disabilities of Human. It is difficult to lead a normal life for blind like a sighted person. Because they cannot feel their surroundings. So, most of the blind peoples require travel aids to travel freely in an unknown environment. The device eliminates the requirement of human assistance for blind while traveling outside. It is made of reliable parts and has a relatively low cost compared to industrial bots. Every part of the device are simulated and tested. The device can run by any operator and requires low power. The device will follow a predefined line and will follow the wall, will detect an obstacle, hole and stair and gives sound notification to the user. The device will act as an assistant to the blind peoples

"Alternative Product Label reading & Speech conversion: an Aid for blind person" - by Rajendrasing Rajput , Rushikesh BorseAn aid to help handicap people is proposed in this paper for reading text labels in their day to day life which can be executed ,isolating the object through cluttered backgrounds or either surrounding object in the camera view. This paper establishes a productive and efficient motion based technique for defining a region of interest (ROI) in the video by shaking the object in the image. Text localization and recognition is done by using extracted ROI; since it is useful for retrieving text information. Learning gradient features based algorithm is used for text localization in an Adaboost model. Optical Character recognition technique is used for recognizing text characters in localized text regions. These text codes are then recognized and then converted into speech signal as output for visually impaired people.

"Optimal Home Energy Management System with Demand Charge Tariff and Appliance Operational Dependencies" - by Fengji Luo,Gianluca Ranzi,Zhao Yang Dong.Two-way communication facilities and advanced metering infrastructure enable residential buildings to be capable of actively participating in demand side management schemes. This paper proposes a new home energy management system (HEMS), which optimally schedules the operation of home ener_x0002_gy resources, with the aim to minimize the home's one-day elec_x0002_tricity cost charged by the real-time pricing while taking into account the monthly basis peak power consumption penalty, charged by the demand charge tariff. To better ensure the user's lifestyle requirements, the HEMS also models lifestyle-related operational dependencies of household appliances. Numerical simulations and case studies are conducted to validate the rea_x0002_sonability of the proposed method.

"Smart Energy Efficient Home Automation System using IOT" - by Satyendra K. Vishwakarma, Prashant Upadhyaya, Babita Kumari Advancement in IoT based application has become the state-of-the art technology among the researcher due to the availability of Internet everywhere. In this paper, smart energy efficient home automation system is proposed that can access and control the home equipments from every corner of the world. For this system, Internet connectivity module is attached to the main supply unit of the home system which can be accessed through the Internet. For wireless connectivity, the static IP address is used. Home automation is based on multimodal application that can be operated using voice recognition command of the user using the Google Assistant or through a web based application.

Thus, main objective of this work is to make our home automation system more secure and intelligent.

III. EXISTING SYSTEM

During the last few years with the development in Science and Technology, life has become much comfortable and easier that we don't even move our hand for any kind of work. But here we miss some part of the world which also should be given the equal importance as a common man. They are no other than the deaf, dumb, blind and other physical disabled persons. They are always deprived of the rapid advancements in the technology. Science has not always given that much of flexibility to feel them as a common man. Communication is the process of exchanging the thoughts, ideas and feelings in the form of some verbal or non-verbal messages. They also have the equal rights to walk par with the common man. In our existing system call bell can hearing and responding deaf/dumb person but the blind person cannot identified a person near in home door, so we overcome this existing system in our proposed system.

A. Disadvantages

− Depending on the number of systems that are connected, when transferring a large amount of data, the network can become congested and decrease the transmission speed, causing the functions to slow down.
− In the event of some type of breakdown, its repair can be complex and expensive.
− In addition to this, it is possible that an important part of the system will be blocked and more functions will be canceled.
− Therefore, the cost of any type of breakdown can be very high.

IV. PROPOSED SYSTEM

In this proposed, we introduce a method to detect the anomalous operation of home devices attributed to attackers. The proposed method considers specific patterns of user behavior depending on diverse conditions. For example, when users return home it will check for a climate condition, it is summer or winter based on that loads will be operated. In a family each person has separate rooms which are allocated by them and loads will be operated using that. Each room has a camera using that persons will be recognized and loads will be turn on using there access of room loads. In this section, we describe the proposed model of user behaviour. Then, we explain the learning of user behaviors and the detection of anomalous operations.

A. Requirements

1) Hardware Requirements
− Arduino ATMEGA 328
− GSM Module
− UART
− USB Camera
− Relay Board
− DC Motor
− Power Supply

2) Software Requirements
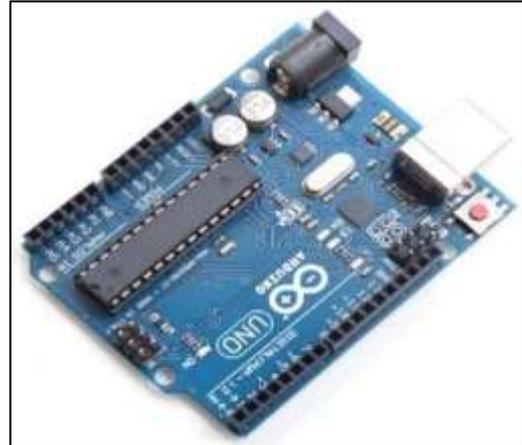− Pycharm IDE
− Arduino IDE
− 6 GB RAM

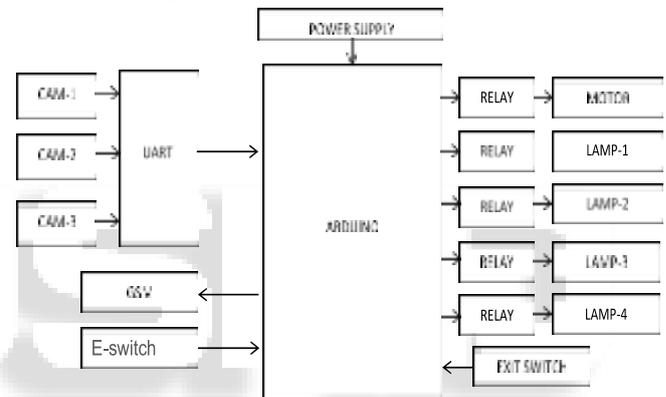Fig. 1: ATMEGA328P Microcontroller

B. Block Diagram

Fig. 2: Block diagram of proposed system

C. Interfacing

1) Interfacing GSM with Arduino
The GSM is interfaced with Arduino module in order to facilitate message alerting services to users in emergency situations by sending SMS to concerned authority to whom the emergency situation has to be acknowledged. When emergency switch is pressed interrupt turns on and GSM sends a message.

2) Interfacing Web cam with Arduino
Webcam is used to retrieve data as images for housemates to get access into house as part of entry allowance mechanism. As a part of the process live feed image from webcam is compared with image in the database to check if face matches with any of housemate's face for security entry purposes.

3) Interfacing UART with Arduino
Universal Asynchronous Receiver-Transmitter is a device for asynchronous serial communication in which the data format and the transmission speeds are configurable. It sends data bits one by one, from the least significant to the most significant, framed by start and stop bits so that precise timing is handled by the communication channel. The electric signaling levels are handled by a driver circuit

external to the UART. Two common signal levels are RS-232, a 12-volt system, and RS- 485, a 5-volt system.

D. Working Principle

The Home Adaptation security mechanism that we designed first learns the user based load preferential pattern and then adapts to operate these loads accordingly rather using internet connectivity (IOT) to command the load operation. Then it understands the user presence in the rooms of house from webcam and perceive the load operation manuals to compensate needs of different housemates within the house. Also as part of load balancing system we take data from user presence in a room to decide if load should turned off completely there or not. By this we also manage to save electricity run here. Further as a part of security mechanism we incorporated GSM services along with load operation pattern under crisis or emergency situations to support entire system.

1) Door Entry Mechanism

The main purpose of door entry mechanism is to ensure security to allow only the housemates enter inside the house. It also serves for the purpose to have a count over number of people entered inside the house. We take this count just to notify the system internally so that it turns off all loads if count is recognized as zero by the end of door exit mechanism process.

2) Learn User Preferential Load Operation:

The system tries to understand from given data about load preferential operation pattern for different users. Then it tries to manipulate actions from the learnt aspect to assist load operations for various conditions and scenarios that are possible to occur.

3) Weather Assisted Load Operation:

From the data in the cloud, system retrieves information about the weather for the particular day. If weather so found is "Sunny" it follows with normal preferential load operation pattern observed for various housemates. If weather found be is "Rainy" then the system follows slightly varied load operation (hybrid) just to maintain right ambience within the house with respect to outside environment conditions such as temperature, light.

4) Emergency Mechanism Operation:

When emergency switch is turned on the system facilitates user to use all loads by turning them all ON in the room where the housemate is. Apparently it also sends an alert message to the authority for whom the emergency situation of the housemate has to be conveyed. Finally the system suffices to provide inner security for housemate if needed further any by performing faster load operations.

5) Exit Mechanism Operation:

Exit Mechanism complements the same way as Entry - Mechanism works. When the housemate inside the house has to go outside then a push button has to be pressed ,so that system knows the count of people inside the house in order to shut down all the loads if the count descents to zero.

V. ADVANTAGES

− Home automation manages control elements that contribute to electricity. That is, we can program all the devices to turn on or off at the necessary time.

− Home automation control of lighting and air conditioning controls the management of 70% of energy consumption.

− It is possible to guarantee that all the lights in the house are turned off and that the reference temperature of the air conditioning is in saving mode when nobody is in the house.

− Detecting the presence or not in each area of the home can activate other savings policies.

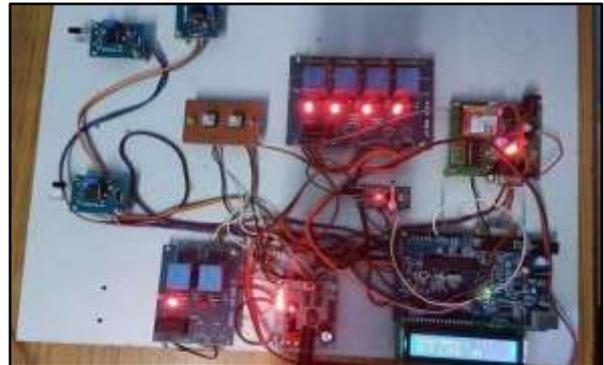## VI. EXPERIMENTAL RESULTS

Fig. 1: Person 1/2/3 when detected and emergency button is turned on and all loads gets turned on.
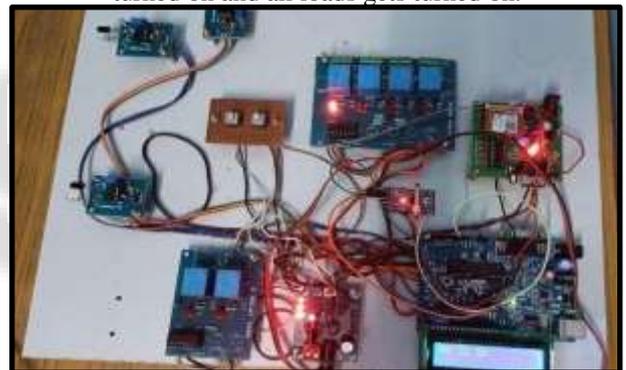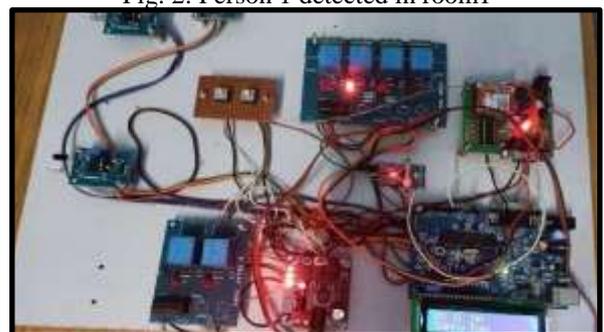

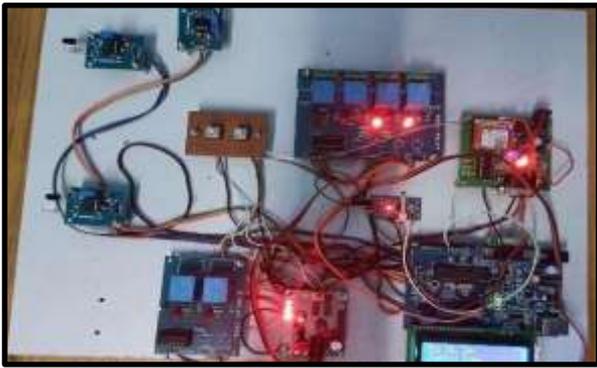Fig. 2: Person 1 detected in room1

Fig. 3: Person 2 in room1

Fig. 4: Person 3 in room1

VII. CONCLUSION

We validate the effectiveness of our method for detecting anomalous operations of home IoT devices by comparing it with an existing method and some of its variants. The proposed method can learn sequences of user behaviors according to conditions such as time of day. The proposed method achieves a higher accuracy by learning sequences executed multiple times than by using only condition information. High level of perception of both user behaviour pattern and the correlation information with climatic changes could possibly help security systems detect any abnormal artifacts in functioning of system. learning sequences executed multiple times than by using only condition information.

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