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SMART LAB

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Abstract- Electricity, being one of the most important resources, must be utilized carefully. We often forget to switch off lights or fans when we leave a room. By using this system, we can intentionally forget about the lights as the system will automatically take care of them. The digital World we are living in allows us to use different technologies to automatically perform certain tasks. Such automation is very useful in certain areas like energy consumption, reducing human efforts, improving standard of living etc. Smart Lab is a project consisting of different systems. It uses Camera for capturing user faces and recognizing them to open door automatically using Solenoid Lock for registered users. It also comprises of system having Google Assistant on mobile and other applications which will help to turn on and off lights, fans, etc.

I.INTRODUCTION

1.1 Brief Description

Lab automation system is a computerized, intelligent network of electronic devices, designed to monitor and control the appliances and lighting systems in an apartment. It allows users to remotely operate, monitor consumer electronics through the external network such as Internet. Automation is an emerging field that has grabbed the attention in both the commercial and research field. Although wired home networks were famous at the early developments of home automation systems, nowadays wireless communication is taking the place of wired system which are very messy and also difficult to setup.

Our project is divided majorly into 3 parts

1. Automated Door lock System
2. Google assistant system
3. Digital Attendance system

With the rise in security issues faced by people at workplaces, houses and elsewhere, it has become a major concern of people to use the best door lock system that can provide the most security, is pocket friendly and is less prone to wear and tear i.e. less cost for maintenance of the system.

In the Automated Door Lock System, we are using Pycharm (library of python) along with Solenoid Lock for automation opening of door for authorized person for authentication of person we use the AWS (Amazon Web Service). Amazon Web Services (AWS) is the world's most broadly adopted cloud platform, offering more than 200 fully featured services from data centers globally. One such feature available i.e S3 bucket which are used to store information for the Automated System. Upholding attendance is very essential in all the institutes for keeping check on the reliability in education. In depth of the institutions, student mark up attendance is being standardly taken by creating the use of attendance file or notes issued by the departmental arch. The teacher takes the attendance manually by calling out each student's name to check whether he or she is present in the class or not. This procedure is boring, time consuming and false as students often gives wrong calls for their absent classmates. This process also makes it hard to change the attendance of each and every student in a large classroom. We have integrated our Door Lock System along with Attendance System the same camera is used to mark the attendance once the person is authorized even here AWS system is used.

We live in an exciting era where more and more items "things" are becoming smart day by day. "Things" have sensors, actuators and can communicate with other "things" and can provide control to more "things". The concept of Internet of Things is based upon a huge way and people are rapidly inventing various gadgets that enhance our daily lifestyle. Controlling multiple electronics devices by means of Google Assistant remotely from anywhere in the world and also monitoring sensors data from anywhere in the world automating electronic Gadgets like light, fans, ac etc. The Internet of Things (IOT) is a novel paradigm move in the Industrial arena. This term Internet of Things which is also known as IoT is combined from two words firstly "Internet" and the second word is "Things". The Internet is a global mechanism of interconnected computer or peripheral networks that uses the standard Internet protocol (TCP/IP layer) to serve billions of users.

1.2 General Overview

Ibrahim Mohammad Sayem et al. [1] presented face recognition security system using IOT in which raspberry pi is used with camera module for input taking images and is compared to dataset, OpenCV library is used in python for feature extraction. The proposed system was able to recognize person from poor image quality. Awais, Muhammad. et al [2] proposed continuous monitoring security system through face acknowledgment by using HOG and neural system in which data is obtained through video dataset. Face, foreground and background are extracted from captured video data and compared to available database in case of no face is found the alarm rings for action alert. Waseem, M., Khowaja, S. A., Ayyasamy, R. K., & Bashir, F. [3] presented a paper of low-cost smart door locking system which is capable of making decision based on facial recognition technology. The system operates on a combination of Arduino UNO and Android-based smartphone. Which is capable of performing all the facial recognition stages on its own such as face detection, features extraction, face recognition applying OpenCV libraries. The recognition is fast and non-contact, providing an increase in comfort for users. Moreover, the system has a secondary protection system, such as the conventional pin-code based, and RFID based security levels that extends the functionality. The main advantage the system is its autonomous function; once the system is installed, there is no need to supervise it. The system is easy to use, and the system Android OS allows to update the database for face recognition easily. A.Nag, J. N. Nikhilendra and M. Kalmath[4] proposed the system which mainly consists of subsystems namely image capture, face detection and recognition, email notification and automatic door access management. Face Recognition supports openCV is brought up because it uses Eigen faces and reduces the scale of face images without losing vital features, facial images for many persons can be stored in the database. The doorlock can be accessed remotely from any part of the world by using Telegram an Android application. The captured image from pi camera will be sent to the authorized person through email for safety purposes. E. Varadharajan, R. Dharani, S. Jeevitha, B. Kavinmathi [5] In this paper attendance without human interference is described. In this method the camera is fixed in the classroom, and it will capture the image, the faces are detected and then it is recognized with the database and finally the attendance is marked. If the attendance is marked as absent the message about the student's being absent is send to their parents. There are different methods for comparing the faces. The Eigen face is the one of such method. Eigen face is set of Eigen vectors which are used in computer vision problems of face recognition. Gomes, Clyde; Chanchal, Sagar; Desai, Tanmay; Jadhav, Dipti; Patil, M.D.; Vyawahare, V.A. [6] In this proposed project an automated attendance marking, and management system is proposed by making use of face detection and recognition algorithms. This proposed system developed an automated system that records the student's attendance by using facial recognition technology. The main objective is to make the attendance marking and management system efficient, time saving, simple and easy. Here the faces will be recognized using face recognition algorithm. The processed image will be then compared against the existing stored record and then attendance will be marked in the database accordingly. Compared to existing system, which is traditional attendance marking system, this system reduces the workload of a person. This proposed system is implemented in 4 phases such as Image Capturing, Segmentation of group image and Face Detection, Face comparison and Recognition, Updating of Attendance in database. Sanjay Badhe et al. [7] proposed a fingerprint-based attendance system which uses a Fingerprint module to take the fingerprint of the student. The data is wirelessly transmitted to a microcontroller via a Zigbee wireless communication module. The fingerprint data is stored in a computer wherein the Fingerprint is recognised based on the data obtained from the Microcontroller. Although the model automates the process a little bit, students still have to wait for their turn to register their fingerprint to mark their attendance, which is time consuming. Vishal Bhalla et al. [8] proposed a Bluetooth based attendance system that uses mobile phone's Bluetooth to pair with a computer to send student's unique track ID, which is used to mark attendance. Authors concluded that their Bluetooth attendance system is a good option in complexity of the overall system. Kim, Tae Kook [9] proposed a voice control system based on artificial intelligence (AI) assistant. The AI assistant system using Google Assistant, a representative service of open API artificial intelligence, and the conditional auto-run system, IFTTT (IF This, Then That) is designed. It is cost-effectively implemented system using Raspberry Pi, voice recognition module, and open software. The proposed system is to be applied to various control systems based on voice recognition. Isyanto, H., Arifin, A. S., & Suryanegara, M. [10] The aim of their research paper was to compare the performance of three Smart Personal Assistant (SPA) applications: Google Assistant, Amazon Alexa, and Apple Siri. Experiments designed using smartphones, smart speakers, and control system devices show that the pronunciation performance has the highest success rate with Google Assistant (95%) for responding to voice commands and the lowest with Apple Siri (80%). The Performance test of the SPA voice command features shows that Google Assistant has the fastest response time (0.62 seconds) for answering questions on common tasks while Apple Siri has the slowest (2.58 seconds). Performance test of the system devices show that Google Assistant has the fastest response time for controlling home appliances using IoT-based voice commands (1.03 seconds) while Apple Siri has the slowest (5.96 seconds). Therefore, the Google Assistant application is the best of the three SPA voice commands. A. Berdasco, G. López, I. Diaz, L. Quesada, and L. A. Guerrero [11] Currently available voice command devices include Google Assistant, Amazon Alexa, Apple Siri, and others. All these products allow users to send voice commands and ask questions to smartphones and computers in their natural language, while the devices use voice interaction, answer questions, provide real-time information, send messages, set reminders, create calendar entries, dial calls, set timers, show weather forecasts, set alarms, play music, send texts, open apps on the user's phone, provide real-time spoken translations, and control smart devices using home automation systems. This expansive use means that these interactions will need to be improved and that possible confidentiality issues will need resolution in the future for these SPA devices. the future to meet the growing technological demands. But the method still requires hardware components which will increase the cost.

II.METHODOLOGY

Smart Labs enable safe and highly efficient world class science to occur in laboratories through high-performance methods. A Smart Labs employs a combination of physical, administrative, and also management techniques to access, optimize, and manage high performance laboratories. The main objective of the paper is to enhance the security of the door locking system, have automated attendance of the students present in the class and controlling of appliances in the room with the help of google assistance.

1. Automated Door Lock System and
2. Automated Attendance System

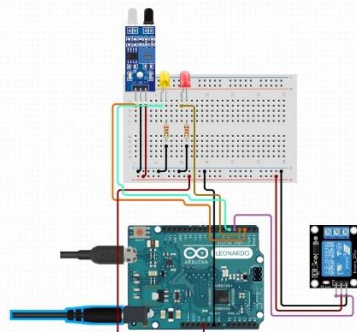


Fig 1. Circuit Diagram of Door Lock System

The automated Door Lock System permits clients to open or close naturally, remotely, and keyless. Programmed entryway locks can likewise be customized to close and open at pre-set particular circumstances without human intercession. The sensors sense the motion of the person wanting to enter the room it sends a signal to the web cam which turns on the web cam and picture has been captured this picture is matched with the registered pictures already been stored by the administrator using the AWS. If the face of the person wanting to enter the lab is matched hence, he or she turns out to be a registered person and the relays the sends power to the door lock actuators so that they can lock or unlock the door accordingly.

Similarly, automated attendance system is also integrated along with the Door Lock System, the AWS stores all the data of the students who visit lab in their S3 bucket S3 is Simple Storage Service which provides object storage through a web service interface. One can use Amazon S3 bucket to store and retrieve any amount of data at any time, from anywhere.

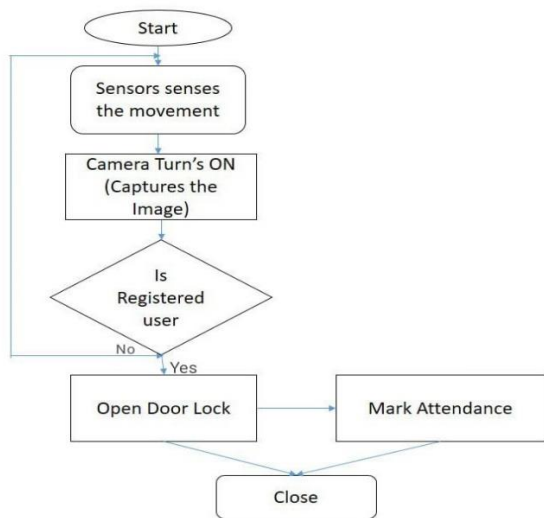


Fig 2. Flowchart for Automated Door Lock System and Attendance System

3. Google Assistant

Google Assistant is an artificial intelligence powered virtual assistant developed by Google that is easily available on mobile and smart home devices. User's primarily interact with the Google Assistant through natural voice, through keyboard input is also supported. In the same nature and manner as Google Now, the Assistant is able to search on Internet, schedule alarms and events, adjust hardware settings on the user's device, and show information from the user's Google account.

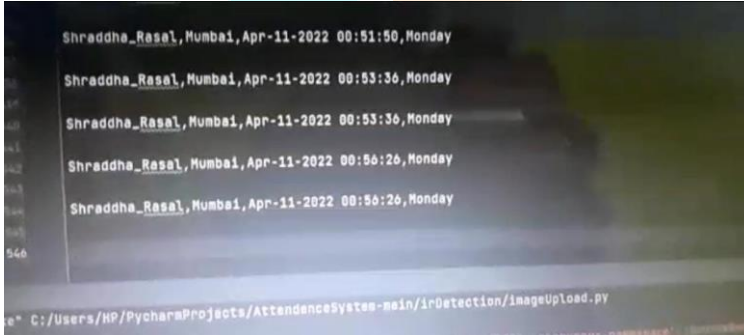
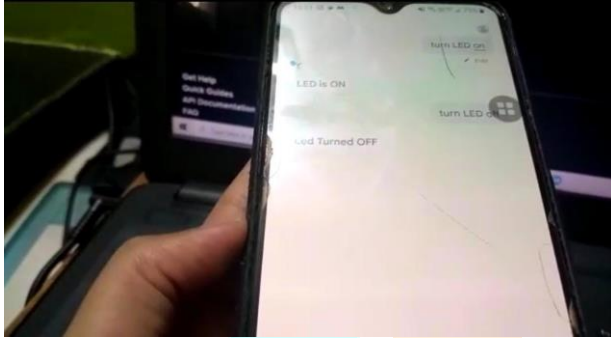
We use NodeMCU as a microcontroller and a relay is used to control the device connected to it. Numbers of device controlled can be increased by increasing the number of relays. The automation or the devices are controlled by giving commands using Google Assistant. Adafruit is used as a protocol for the same.

III.CONCLUSION

Automation is undeniably a resource which can make any environment automated. People can control their electrical devices via these Automation devices and set up the controlling actions. We think this product have high potential for marketing in the future. At the moment the components are sufficient to produce all the systems stated and work properly as specified. More additions can be done to cover other devices, appliances and gadgets within the same system. In this 21st century humans are creating different gadgets to reduce human efforts. There many companies/individuals implementing their ideas and they are participating in this race of making short-term and long-term projects for reducing human efforts. The system which we are making is going to help humans to reduce physical efforts.

IV.RESULT

The system works as per expectations. After detecting the face of person who wants to enter the lab, the door opens automatically using solenoid lock, and the attendance is noted in the database with the timing. We used android mobile to control fans and lights using Google Assistant.



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