Padlock System

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Abstract- *Modern sophisticated thieves pose a persistent threat to home security systems requiring the creation of creative strategies to guarantee complete protection for houses and different other areas. With this project, door access control will be improved and face recognition technology is used to increase security, and real-time sensors are used to detect water, fire, and smoke levels. The project aims to build a smart living environment that serves both residents and visitors by including these crucial components.*

Two main categories—one created expressly for the homeowner and the other for visitors—are used to categorise the project. Through automation, this approach unifies multiple systems into a single, understandable, and safe framework, resulting in a better way of living.

It is projected that more people will choose smart home solutions in the future, drawn to the wealth of advantages they offer, with safety and comfort being the top priorities

This concept creates a futuristic home environment that seamlessly merges security and comfort by enabling remote management of home equipment and offering sophisticated security measures. Along with the above described characteristics, this initiative emphasises the value of an open technology strategy. It creates inclusion and encourages a greater adoption of smart home solutions by making sure that the new technology employed are accessible to everyone.

The initiative also acknowledges the value of real-time notifications and monitoring. It enables households to receive prompt notifications about any potential security concerns or dangerous circumstances by utilising cutting-edge sensors and data processing, empowering them to take appropriate action. A smart home environment's seamless integration of multiple systems improves security while also enabling a more practical and effective way of life. Intelligent automation allows homeowners to remotely manage and control their home equipment, maximising energy efficiency and minimising environmental impact.

Keywords*- Matlab, RC232, L293D, relay, sensors, Arduino board, Adafruit io*

I. INTRODUCTION

Whether it's safety for his possessions or safety for his priceless life, every living thing wants to be safe. To achieve that and lead a worry-free life, we have been making a number of efforts. In this project, we suggest a smart locking system that relies on the Internet of Things to function in order to stop trespassing and unauthorised access. By utilising face recognition technology, this project seeks to improve door access management and security.

It also incorporates real-time sensors for detecting smoke, fire, and water levels. The project aims to build a smart living environment that serves both residents and visitors by including these crucial components.

Conceptual security has always been a major concern for the general population, whether in the context of families or the workplace. To solve these difficulties, various techniques have been established up. The door will be unlocked using face recognition thanks to the padlock system. In order to unlock the door, it uses biometric identification, such as face recognition, and compares it with database photographs. The issue with conventional door locks is that nearly anyone can pick them and gain entry into the house. To solve these issues is therefore a huge challenge.

As a result, the padlock system is made to help people live safe and secure lives.

Along with the padlock system, home automation is also possible with this concept, where it is managed via a mobile cloud platform using a smart device. It has the ability to operate various home equipment, including smart security locks, fans, smoke detectors, and others.

Remote control of the devices will be accomplished using Bluetooth or Wi-Fi technologies. Many individuals were considering how much of our lives are being impacted by technology. It does. In order to make our lives easier and significantly better, smart and intelligent systems must be present everywhere we are. For instance, we can complete various tasks faster, better, and with greater accuracy.

A domestic, often known as home automation, is home-building automation. Lighting, climate, entertainment systems, and appliances are just a few examples of the house features that a home automation system may monitor and/or regulate. It could also include of elements of home security like access control and alarm systems.

Devices for home automation with internet access are referred to as "smart homes" in this context. Any device that can be monitored or controlled wirelessly via radio signals is included in the broader category of "home automation," which extends beyond only those with internet connectivity. Home sensors and activation devices are an essential component of the Internet of Things ("IoT") when they are connected to the Internet.

Typically, a home automation system links managed devices to a central smart home hub (sometimes referred to as a "gateway"). Wall-mounted terminals, tablet or desktop computers, mobile phone applications, or Web interfaces that may also be accessed off-site through the Internet are all used as the user interface for controlling the system. Utilising this approach could result in more effective and clever energy-saving techniques.

Additionally, there is a lot of promise for home automation in terms of the security and safety of families. Numerous sophisticated security and surveillance installations are a part of home automation. Customers are able to do this to keep an eye on their properties while they are away and to provide trusted family members access to that information in case something untoward occurs.

Despite the fact that there are numerous rival vendors, open source solutions are receiving more attention. The current state of home automation, however, has drawbacks, such as an absence of standardised security measures and the deprecation of older devices without backwards compatibility techniques.

Homes can operate independently by combining information and communication technologies (ICT) with renewable energy sources like solar electricity or wind power, decide whether to store energy or use it for a specific device, resulting in overall favourable environmental effects and cheaper electricity costs for the system's users. Researchers suggest leveraging sensor data on consumer activities in the home to forecast consumer needs and balance them with energy consumption in order to achieve this.

Users can handle a variety of different appliances with the use of this technology, which also makes controlling household equipment simpler and saves energy. Home automation is becoming more and more popular today. On the other side, it offers more comfort, particularly when everyone is preoccupied with their jobs.

Installing home automation in a home not only makes it more comfortable, but it also enables centralised control of the lighting, ventilation, heating, and air conditioning systems. Thus, they aid in lowering total costs and are also helpful in reducing energy consumption, which is undoubtedly the biggest issue at hand right now.

Wi-Fi and Bluetooth are two wireless networking technologies that have become increasingly popular in recent years. Additionally, employing wireless technology in home automation offers a number of benefits that are not possible with a wired network alone.

Home automation is made possible by a network of gadgets that are linked to the Internet via Bluetooth, Wi-Fi, ZigBee, and other wireless communication technologies. These devices allow for remote management via controllers and an app.

Many of these Internet of Things (IoT) gadgets feature sensors that keep track of changes in motion, temperature, and light so the user may learn more about the environment around the device.

In PADLOCK SYSTEM, the following three stages are taken:

1. Monitoring: This entails maintaining system control through a mobile app on a device.
2. Operate: This means that the user can utilise the app to remotely operate the system from any location.
3. Automation: Making practically all devices automatic would improve the system and reduce the amount of labour that must be performed by humans.

The following are some of the most popular uses for home automation:

- HVAC stands for heating, ventilation, air conditioning.
- System for controlling lighting.
- Leak finding.
- Smoke detectors.
- Home automation for people who are ill or disabled.
- Air quality management

II. LITERATURE SURVEY

[1]　A REVIEW OF THE LITERATURE ON HOME AUTOMATION SYSTEMS

Yogita Bodwade and Neha Malik**.** Home automation system is one of the subjects gaining prominence as a result of its tremendous benefits. Remote monitoring and management of household equipment is referred to as home automation. There is a lot of potential and scope for remote access, control, and monitoring of such network-enabled appliances due to the Internet's and its applications' unending growth.

This essay discusses several intelligent home automation systems and technologies from the perspective of distinct features. The focus of the effort was on the idea of home automation, where monitoring and controlling tasks were accelerated by smart gadgets. Wide-ranging home automation systems and technologies are reviewed, including those that are performance-based, cloud-based, Bluetooth-based, SMS-based, ZigBee-based, mobile-based, RF Module-based, web-based, and Internet-based (based on an Arduino or Raspberry Pi central controller).

[2]　A COMPARATIVE ANALYSIS OF THE LITERATURE SURVEY FOR IOT-BASED SMART HOME AUTOMATION

Ranjeeta Kaur, Rajkumar Garg, Siddhartha Sankar Biswas, Manju Mandot, and Prashant Vats. The "Internet of Things" refers to any technology that enables a device to connect to the Internet. The gathering of data is essential for these systems. The information is then used for internet-based monitoring, control, and information transmission to other devices.

The purpose of smart house technology is to deliver and distribute a variety of services both within and outside the home using networked devices that integrate all of the various applications and intelligence they contain.

Due to the constant availability of a broadband internet connection, these smart devices are able to communicate with one another. The Internet of Things (IoT) increasingly includes smart home technology as a result. In this research study, we reviewed the literature on smart home automation, which enables homeowners to monitor and secure their homes while they're away, giving them peace of mind.

[3]　A USER PERSPECTIVE ON A SYSTEMATIC REVIEW OF THE LITERATURE RELATING TO SMART HOMES

Eleftherios Alamanos, Savvas Papagiannidis, and Davit Marikyan. A smart house is a building outfitted with cutting-edge technology that offers users specialised services. Smart technologies make it feasible to keep an eye on, manage, and assist inhabitants, which can improve life quality and encourage independence. Examining the user's perspective and the existing state of smart homes is crucial to facilitating their implementation and adoption.

There is a critical need to review the literature because of how quickly it has been developing in this field. The purpose of this study is to conduct a thorough assessment of the literature on smart homes and to examine the existing situation as seen by the users. Following a discussion of the systematic methodology, the review offers a thorough analysis of the definitions and traits of smart homes. The study then shifts to an examination of the many types of smart homes, associated services, and advantages. The assessment covers the difficulties and obstacles to implementing smart homes after describing the benefits of smart homes as they stand right now. The assessment concludes with recommendations for additional study.

[4]　SYSTEMATIC LITERATURE REVIEW OF MONITORING TECHNOLOGIES FOR SMART HOMES IOT FOR THE ELDERLY-BASED

Norjihan Binti Abdul Ghani, Suraya Hamid, and Kholoud Maswadi. Implementing smart home technologies is still a crucial component of the Internet of Things (IoT). It offers senior members of society the convenience and living support they require.

Despite the impressive results of studies on smart home monitoring technologies, there hasn't been a systematic literature review (SLR) of the technology's application. There aren't many SLR studies available on smart home monitoring technology.

As a result, the current study evaluates the literature to gather data on studies on the implementation of smart home monitoring technologies. The publications published between January 2010 and December 2019 were examined using an SLR method that involved a manual search. We used certain quality assessment criteria to carefully categorise these publications in accordance. Only 3% of the 73 pertinent original studies were found to have used thorough SLR standards. 7% of the pertinent researches were 8% of the primary studies implemented the SLR guideline in a reasonably acceptable manner, whereas those studies were recognised to have applied the SLR criteria in a strongly moderately acceptable manner, though they were not entirely

comprehensive. This article consequently urges researchers conducting SLR studies on smart home technologies to use thorough SLR standards that take the quality standard into consideration.

[5]   SMART HOME ACTIVITIES: A REVIEW OF THE BOOKS

Muhammad Hassan Ahmed, Magdy M. A. Salama, and Ameena Saad al-sumaiti. A thorough literature review is required since smart home technologies are becoming more popular. This article discusses the objectives of a smart home energy management system, as well as associated definitions, applications, and details on the production of its parts. The issues with smart home energy management systems are reviewed, along with potential solutions, and the energy-related aspects that affect a customer's electricity cost are covered. A review of the literature on energy management system scheduling with regard to its control, automation, and communication, as well as a number of price schemes and the load models required for solving related scheduling optimisation problems, are also offered.

III. METHODOLOGY

A.   Hardware Part

- Arduino microcontroller ARM:

Arduino is an open source computer hardware and software company, project, and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world.

- Relay:

A relay is an electrically operated switch.

- Force sensor:

Force sensor is a component that converts the magnitude of force into related electrical signals. The force sensor can detect mechanical quantities such as tension, pressure, weight, torque, strain, and interior stress.

- Light sensor:

A light sensor generates an output signal indicating the intensity of light by measuring the radiant energy that exists in a very narrow range of frequencies basically called "light", and which ranges in frequency from "Infra-red" to "Visible" up to "Ultraviolet" light spectrum.

- Air quality sensor / Smoke sensor:

Air quality plays very important role in safety, security, and health of the mankind. Carbon monoxide sensor (MQ-7) is used for sensing carbon monoxide level in the air.

- IR sensor:

The IR Sensor module has excellent ambient light adaptation capabilities. It has a pair of infrared emitting tubes and a receiver tube. When the emitting tubes encounter an obstacle detection direction (a reflecting surface), the infrared is reflected back to the receiving tubes, which are then processed by a comparator circuit to produce a digital signal (a low-level signal) through a potentiometer knob.

- Moisture sensor / Water level sensors:

The sensor has 10 exposed copper lines, five of which are power traces and the remaining five are sensing traces. One sense trace lies between every two power traces thanks to the interlacing of these traces. When submerged in water, power and sensory traces—which are often not connected—are joined. The water level sensor works in a pretty straightforward manner.

- GSM Modem:

A GSM modem is a wireless modem that works with GSM wireless networks. The instructions used for controlling the GSM modem are called AT commands. GSM modems support a common set of standard AT commands.

- LCD display

LCD stands for Liquid Crystal Display, which is a flat-panel technology used for visually displaying information.

- Power supply
- Wi-fi
- Hard Disk : 40 GB
- Ram : 512 Mb

B.   Software Part

- Arduino IDE:

The Arduino IDE is an open-source software, which is used to write and upload code to the Arduino boards.

- Adafruit IO:

Adafruit IO is a system that makes data useful. The main focus is on ease of use, and allowing simple data connections with little programming required.

- Embedded C
- Operating system : Windows XP/ Windows 7
- Coding Language : Matlab

IV. ADVANTAGES

Our suggested solution has several benefits that make it a promising strategy for enhancing smart home automation systems. Here are some few advantages: -

- Enhanced Convenience: Using centralised interfaces or mobile apps, users of the padlock system can easily control and manage a number of elements of their houses. Users may change settings or operate equipment from anywhere thanks to automated scheduling and remote access, which saves them time and effort.
- Enhanced Security: Smart security systems offer remote access management, video surveillance, and real-time monitoring. Smart locks, door/window sensors, and motion detectors increase security and discourage break-ins. Users are alerted of any security lapses or shady activity by alerts and notifications.
- Energy Efficiency: Energy use is optimised by smart thermostats, lighting controls, and appliance management systems. Energy monitoring, occupancy sensors and automated scheduling all help to cut down on waste and save electricity costs. Integration with energy management platforms offers perceptions into trends of energy consumption.
- Remote Management and Monitoring: Padlock systems enable remote access and supervision. Users' convenience and peace of mind are increased by the ability to remotely check device status, receive notifications, and make changes.
- Customization and Personalization: The padlock system supports individualised preferences and settings. A connected and personalised home environment is made possible by integration with various smart devices and platforms.

- Improved Comfort and Ambience: Lighting control systems give programmable lighting settings, dimmer options, and color-changing capabilities to create desired ambiance. In order to increase comfort, climate control systems offer customised temperature settings that change depending on the number of occupants or the outside temperature.
- Remote Access for Visitors and Service Providers: The padlock system allows visitors or service providers to temporarily control access. Remotely granting time-limited access allows users to increase convenience by doing away with the need for actual keys.
- Increased Home Value: Adding a locking system can raise a property's value and appeal. Prospective homebuyers like the modern features, energy economy, security, and simplicity that smart home automation provides.
- Accessibility and ageing in place: A padlock system can help the elderly or persons with impairments keep their freedom in their homes. Interoperability is ensured through the design of padlock systems to integrate with a variety of platforms, devices, and protocols. Users may build a linked smart home ecosystem that is uniform and interoperable across all connected devices.

V. LIMITATIONS

Even though the solution we've proposed is quite reliable, it still has significant limitations. Those are described below: -

- Dependence on Internet Connection: Padlock systems are very dependent on consistent and dependable internet connection. Power failures or internet connectivity interruptions may momentarily impair the system's operation. Users may feel uncomfortable or have less control when there are connectivity problems.
- Potential Compatibility Issues: Smart device compatibility across several manufacturers, protocols, or generations may be difficult. It can be necessary to conduct research and troubleshoot in order to ensure smooth device integration and communication. Cloud-based services and third-party platforms are frequently used by padlock systems for remote access, control, and data storage. Dependence on these services could result in security flaws, service interruptions, or changes in the terms of service that could impair the system's functionality.
- Learning curve and user experience: In order to operate devices with padlock systems, users may

need to become familiar with new voice commands, apps, or interfaces. It could take some time and effort to become used to the new procedures and interfaces, especially for those who are less tech-savvy.

- Obsolescence and compatibility with future technologies: Due to the rapid evolution of technology, some smart devices or protocols may eventually become obsolete. Future-proofing the system and ensuring long-term compatibility may necessitate frequent updates or device replacements.

VI. RESULTS

This method mainly focuses on the automatic door unlock using face recognition. First the images of the person are captured by the web camera and stored in the processor for further comparison.

The proposed system integrates firebase cloud messaging to such automation system to the need of GSM module and web application. The object senor will be at the door which sense the presence of the person and sends the SMS / Mail to owner ,owner will login to web page for LIVE streaming visual at the door, he recognizes the person and send the code key to embedded system at the door, the door become unlock the system by SMS communication. And also we providing Iot flat from Door Unlocking system, the owner need to login the web page and there by pressing the switch can control ON/OFF.

- Image of home members are store in database, whenever any member comes to home the camera takes the pictures and check in the data base if matches then opens the door.
- If not in the database SMS is send to the owner, the owner will see in the live using android app, for WIFI camera and member known person sends SMS to the device to open the door.
- Meanwhile the sensor network for home appliances, smoke, air quality, dust fire, parameter upload to the server (MQTT).
- For security we are using force sensor, if someone want to open the door forcibly sensor detects and send the alert to owner.
- By using object sensor, whenever such behavior happens the camera captures the image of present situation and sends the image to higher authority by mail for predefined email using the Raspberry pi with IOT flat from.

There is the toggle switch implemented as part of adafruit io. There are 3 toggle switches which controls light,

fan and door. Lights and fans can be toggled on and off. Door is monitored by driver L293D which is automatically controlled via matlab. The face of the person is captured either in online or in offline mode and the image is compared with the images stored in database. If the match is found the door is opened via drivers or it remains closed. Hence authorization is implemented like this.
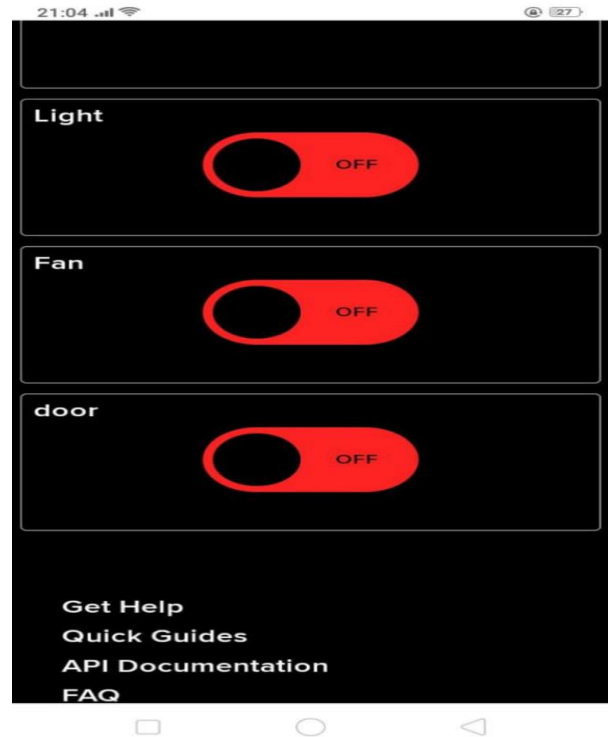

Fig 1: Application to control home appliances remotely

The monitoring of door is controlled in adafruit too. All the live updated is stored in the adafruit which is viewed by the user easily.
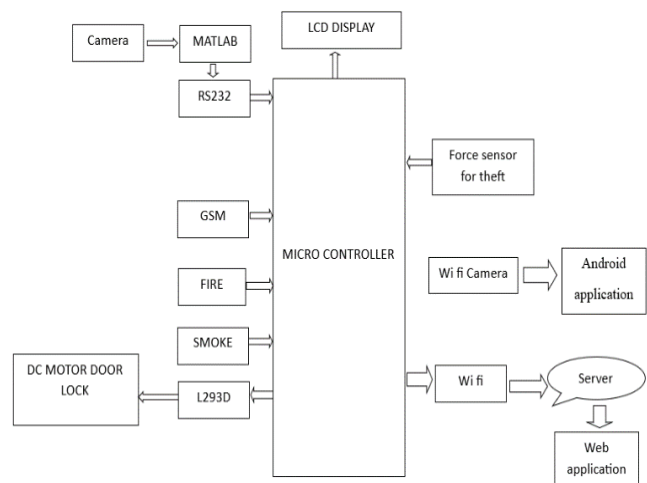

Fig 2: Implementation of Padlock System.

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