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Workspace Automation

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Abstract - *In today's fast paced world, automation is playing a crucial role in making our lives more efficient. Bringing in Automation into the workspace will help build a more secure, easily controlled and a more efficient environment.*

This project aims at building a smart workspace environment using electronics and computer technology. We are using Arduino to control a set of relays which are connected to various appliances like fan, lights and power plugs.

This project not only aims at providing basic automation, but also provides security for the staff. Using this system, we can restrict access to the workspace so only authorized personnel can enter the room making the workspace a perfectly secure and protected environment.

The Bluetooth paired Arduino is controlled with an android application designed for this system. The Bluetooth pairing provides additional as it is authenticated by google firebase authentication. We also use an encrypted database for storing credential information.

In case the user misplaces his/her smart phone, they can still get authorized access into their workspace with a fingerprint scanner placed outside the room. After a successful authentication, the controller will send SMS to the registered mobile number for extra measures of security. Additional features of this system include smart power saving mode and a smart fire extinguisher as well.

***Key Words*: Arduino, google, firebase, encrypted database, credential information ,smart phone, fingerprint scanner, smart fire extinguisher**

1. INTRODUCTION

Its 21st century, and the most important requirement for humankind is security and privacy. Security can easily be easily implemented in a private space, but an office space being accessible for more people, makes that's quite hectic.

We have found a solution to automate the workspace for the employees to use without any hesitation of security. We call it WorkSpace Automation.

WorkSpace Automation is an area of the office which is controlled and accessed by only authorized individuals. First, it first authenticates the users by google authentication on a smartphone application, or a hardware alternative of fingerprint scanner. Once authenticated, the registered number of the individual will receive message regarding successful authentication attempted, to save from any fraud in the system.

Not provides automation along with security. The user can control lights, fan and any other peripheral devices that are connected to the Workspace. We have also included a smoke detector which is triggered when it detects smoke hence providing safety from any fire hazards as well. To avoid false triggers, there is a temperature sensor as well which sends signals to the microcontroller to determine the right cause.

This system also comes with voice assistant by AI. We can control Workspace with google voice assistant. We used deep link and Machine learning to understand the person's command and triggering features.

Keeping in mind of our current environmental situation, we have also implemented power saving mode, which is activated automatically when there is no Bluetooth connection established. It will dim the lights, if there's enough sunlight in the room. If the room temperature is lower than a point, it will automatically turn off the fans.

1.1 Aim & Objective

This project's primary aim is to manage the electronics around the workspace by collecting valuable environmental data and improvising accordingly without any human input.

The aim can be achieved through following functions in the project

-By collection environmental data using different sensors

-Able to give access to authorized individual using bio metric

-Keep data of individuals encrypted and stored on firebase

1.2 Motivation

The existing automation systems which are available in public are quite expensive and also have limitation in function. Also, they lack of privacy which is essential in 21st Century.

Our project will make the functioning of different electronics in a workspace. The individual can control the functions through android app designed for this task.

2. LITERATURE SURVEY

2.1 Related Work

Android application in mobile sends the signal to the Wi-Fi module which is connected to same network. Android application has all the GUI buttons for each appliance. Wi-Fi module receive the signal from the mobile application and give this signal to the Arduino board for processing.[1]

The fundamental downside of Bluetooth based home mechanization can be defeat utilizing IOT innovation. In this segment, Ethernet module is utilized for interfacing Arduino board from any piece of the world. Arduino is associated with IOT and Port number can be utilized to find remote gadget associated with the Internet in a brilliant home condition.[3]

It uses the cell phone and Bluetooth technology It is secured and low cost. An Arduino Bluetooth board is used for the Bluetooth technology. The user interface in the cell phone is provided using python program. The Bluetooth board and relays of the I/O ports are used to interact with the devices to be controlled.[4]

HC-06 Bluetooth Module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Its communication is via serial communication which makes an easy way to interface with controller or PC. HC-06 Bluetooth module provides switching mode between master and slave mode which means it able to use neither receiving nor transmitting data.[9]

2.2 Problem Statement

Security at workspace are very vulnerable. Any individual without authentication can trespass and make other staff uncomfortable. Its 21stcentury, voice assistant is not available at places. its easier to control with a AI voice assistant. Currently, our environmental condition is quite critical. Because of excessive use of energy which is mostly wasted. Fire hazard at a workspace is another problem. There are no proper anti-fire measures around workspace, making it unsafe for the employees. To overcome this problem we are developing "**Workspace automation"**

3. PROPOSED SYSTEM

The project WorkSpace automation aims at improving quality of the life for the employees. It basically consists of Board 1, Board 2 and android application. We first authenticate the user by using firebase authentication, which is provided by google. After successful authentication, user get to the control panel of the workspace. But, just in case the user forgets or misplaces his mobile phone and needs to access the workspace, we have provided fingerprint scanner, to authenticate the user with his fingerprint. After the authentication is successful, the registered mobile number will receive the SMS informing the same. This measure is to avoid any kind of malpractice. On the control panel, which is accessible both physically and through application designed in the android, there are 5 switches, 2 for lights, 2 for power plug(to connect peripheral devices) and 1 for Fan. All the features can be manipulated through the app and the physically accessible board. Board 1 has all the required features listed above. Board is implanted with Bluetooth device, to communicate with the mobile application. The board and mobile application communicate in real-time. I.E, changes made on the app will be made on the board and vice versa.

We have developed a motorized fire extinguisher system, which is trigged if smoke detector on the board 2 detects any smoke. Board 1 and board 2 communicate with each other through I2C protocol. This protocol uses sda/scl ports to communicate. This is how the boards communicate. Using google assistant, android deep linking and machine learning, we trigger actions on the system by the voice command by the user. This just makes user to simply control the workspace with voice. Board 2 consists of fingerprint scanner, along with its database(to verify fingerprints with existing records). After successfully authenticating an individual, the microprocessor has 2 jobs to do.

1. To send single to the servo motor to unlock the door.
2. To trigger GSM module to send SMS to the registered person.

Board 2 also has temperature sensor, smoke sensor, light sensor. It also provides with the real time clock. Real time clock is provided with the help of RTC module. Temperature sensor on the board is used to display current temperature of the room, which also helps in controlling the speed of the fan in power saving mode. Smoke sensor is originally used to detect smoke in the room and trigger the fire system. Light sensor is used to find the light density of the room, which helps in dimming, turning off and turning on the light while being in power

saving mode. All the above details are displayed on the LCD which is attached to the micro controller.

4. WORKING METHODOLOGY

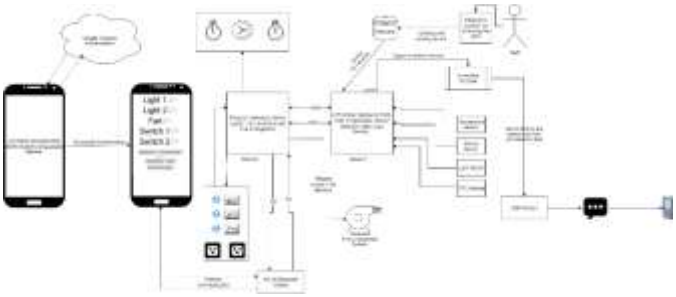

Chart -1: Name of the chart

4. WORKING METHODOLOGY

4.1 User registration

The user first needs to reach to the admin to enrol himself with username and password. After this process, the user can login into the application

4.2 Login

User will have to login into the application using its correct username and password. Incorrect combination will result in login Error.

4.2 Control Panel

The control panel has 5 switches. These switches can be used to control the lights, fan and power plugins. There is option to unlock the door using just button on the panel, and voice control feature. Pre-defined dialogue will be needed to activate the action on the board.

4.4 Features

This system has smart power saving mode. It will detect if unnecessary power is used by lights, fans by the embedded sensors on board, and turn it off if necessary.
It also provides with fingerprint sensor, to enter the room without any cell device.

There is smart fire extinguisher, to combat with fire hazard by getting automatically activated after detecting fire/ smoke.

Smart Screen is also installed to display time and date, including smart fire extinguishers status, temperature, light density.

it has encrypted database for the users to store their credentials and fingerprint.

After successfully authenticating the fingerprint with the stored record, to make it safer, our system sends SMS to the registered mobile number to inform them about the success of the authentication.

5. MODULE IMPLEMENTATION

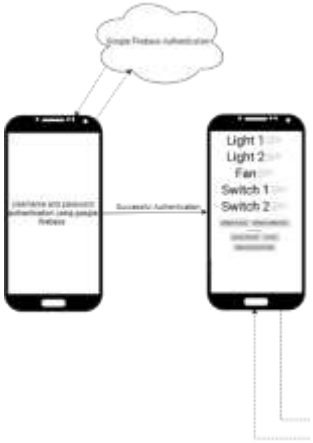

Fig 5.1.User Authentication through Firebase

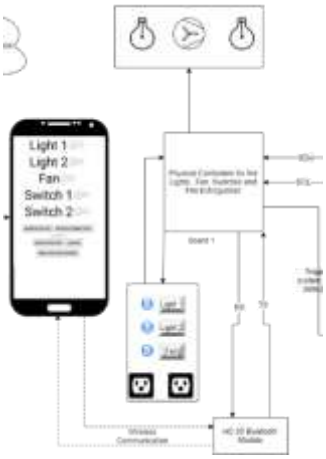

Fig 5.2. Controlling the appliances through Android app

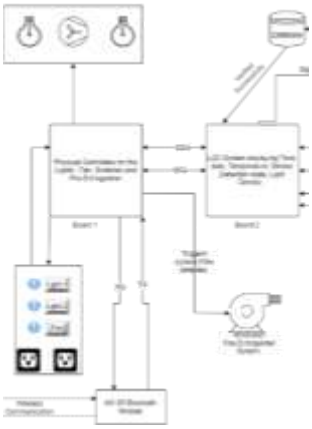

Fig 5.3. Communication between Board 1 & Board 2

Fig 5.4 Security features and environmental control system

6. FUTURE SCOPE

-There more room left for future improvement. Our current system works on Bluetooth technology.
-Due to which, system might face latency issue (Delay in receiving commands)
-This can be overcome by using new generation Wifi Enabled systems which can get the commands through internet.
-We can also add attendance system to keep track of attendance of employee using bio metric
-Moreover, iris scanner can be used to authenticate the individual which cannot be tempered in any other way.

7. CONCLUSION

This paper explains the concept of Workspace automation which is useful for todays generations employee. The main board is controlled by android app via Bluetooth technology. The user can only access the app through username / password authentication. Without which the main control panel will not be activated. The system also includes security systems like fingerprint scanner, mobile message sender. It also contains environmental control system. For safety, it include smart fire extinguisher which is activated if heat in the room increases and also checks if the smoke sensor is triggered or no.

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