Smart Home Security System

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Abstract

Security through continuous video surveillance and Home automation becomes necessary for people in day-to-day life. As a separate systems they are costly and needs more usage of power. To overcome this, both of these services can be computed into single system which is highly efficient. A Voice recognized automation through Google Assistant can be used to industrialize tasks performed by human which can be done through Internet of Things (IoT). Also bringing the house under video surveillances for the security purpose through live video streaming by connecting raspberry pi Camera which is cost efficient and requires less storage space than Closed Circuit Television (CCTV).The live streaming can be viewed anywhere in the world from any web browser or even in mobile app. Hence, Smart Home Security System that computes voice recognized Home Automation using Google Assistant and live video streaming for the security purpose can be designed and constructed in which overall cost and power usage is less when compared to existing model.

Keywords— Google Assistant, live video streaming, PI camera, Raspberry Pi, Speech Recognition, Video surveillances

I. INTRODUCTION

Home automation using voice via Google Assistant and continuous Live Video Streaming for the security purpose plays major role in day-to-day life. A Voice recognized automation through Google Assistant can be used to industrialize tasks performed by human and continuous video surveillance which can be done through Internet of Things (IoT) are needful for the people in the efficient way. The integration of various smart devices and appliances and their control through a central panel, sometimes accessible remotely via the Internet. This is related to the Internet of Things (IoT) – a vast network of smart objects which work together in collecting and analyzing data and autonomously performing certain actions. The Internet of Things (IoT) is the network of devices such as vehicles and home appliances that contain electronics, software, sensors, actuators and connectivity which allows these things to connect, interact and exchange data. An IoT system consists of sensors/devices which "talk" to the cloud through some kind of connectivity. Once the data gets to the cloud, software processes it and then might decide to perform an action, such as sending an alert or automatically adjusting the sensors/devices without the need for the user.

II. LITERATURE SURVEY

In the paper titled Arduino Based Home Automation Using Internet of Things proposed by Lalit Mohan Satapathy and Nihar Mohanty [1], demonstrates a low cost flexible and reliable home automation system with additional security using Arduino microcontroller, with IP connectivity through local Wi-Fi for accessing and controlling devices by authorized user remotely using Smart phone application. Home Automation Using Arduino Wi-Fi Module ESP8266 proposed by Ilyas Baig and Chiktay Muzamil [2] describes a design and prototype implementation of new home automation system that uses WiFi technology as a network infrastructure connecting its parts. This system consists of two main components; the first part is the server (web server), which presents system core that manages, controls, and monitors user's home. Nur Syaira S. Amran, Waheb A. Jabbar and Samiah

K. Mahayadin [3] had proposed Design and Implementation of IoT-Base Automation System for Smart Home which illustrates a low-cost Wi-Fi based automation system for Smart Home (SH) in order to monitor and control home appliances remotely using Android based application. Smart Home Automation By GSM Using Android Application developed by Shubham Magar, Varsha Saste and Ashwini Lahane [4] proposes that Home automation plays an important role in modern lifestyle because of its access in using at different places with high quality which will intern save time by decreasing human work automatically. In the paper titled A Bluetooth Based Sophisticated Home Automation System Using Smartphone proposed by Sukhen Das, Sanjoy Ganguly and Souvik Ghosh [5] describes a reliable, compact, fast and low cost smart home automation system, based on Arduino (microcontroller) and Android app. Bluetooth chip has been used with Arduino, thus eliminating the use of personal computers (PCs).Various devices such as lights, DC Servomotors have been incorporated in the designed system to demonstrate the feasibility, reliability and quick operation of the proposed smart home system. Design of a Home Automation System Using Arduino proposed by Nathan David, Abafor Chima and Aronu Ugochukwu [6] presents a low cost and flexible home control and environmental monitoring system. It employs an embedded micro – web server in Arduino Mega 2560 microcontroller, with IP connectivity for accessing and controlling devices and appliances remotely. A.Z.Jusoh, Norun Abdul Malek and S. Noorjannah Ibrahim [6] has proposed "Development of Voice Control and Home Security for Smart Home Automation" which describes a remote development of voice control and home security for smart home automation system using Arduino mega, GSM SIM900A, Bluetooth module, and HC-SR04 ultrasonic sensor. A microcontroller is programmed to control up to four home appliances via Bluetooth technology and transmit the received signal from sensor to user smartphone.

III. EXISTING SYSTEM

This system is expected to recognize human voice using voice reader android application to turn on and off home appliance. Another important feature developed in this project is on the detection of movement, using ultrasonic sensor, in which the signal is converted to message and forwarded to the mobile user via GSM module. This project takes on an approach to develop a wireless remote control for home gadgets which can be controlled with voice. Another important feature of this project is the movement detection by using ultrasonic sensor. With the advent of this project the users can turn on and off their home appliances using voice which will bring more comfort in their everyday lives and increase the quality of their lives. This method presents the design and implementation of user friendly voice control and home security smart home automation system using Bluetooth and GSM technologies. The design of this method is based on Arduino mega, GSM SIM 900A, Bluetooth module, Sensor, Relays and android

AMR_voiceapplication. Bluetooth module HC-05 is connected to Arduino mega board and home appliances (ex.: TV, LED, CFL and fan) have interfaces with Arduino board via four module relays. Android voice application is used to convert voice command to text command and HC-05 Bluetooth module is used for wireless communication between smartphone and Arduino mega board. HC-SR04 ultrasonic sensor which is connected to Arduino board is used to detect the motion and will send to the user mobile via GSM SIM 900A. This method has the ability to remotely control home appliances and monitor the sensor. The symbolic representation of the existing voice controlled home automation method through the created application is shown in Fig.1 .
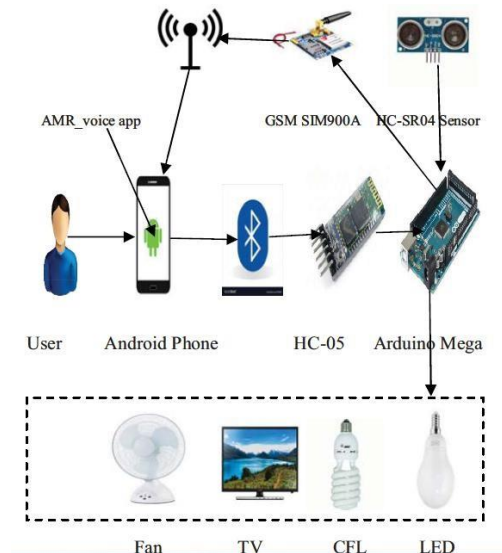

Fig.1 symbolic representation of voice controlled home automation system

This project has two main parts which are
(i)   Software part and
(ii)   Hardware part.

The software part consists of AMR voice and Arduino integrated development environment (IDE). AMR voice application is installed in the android phone and Arduino IDE installed in the laptop. The hardware part consists of Arduinomega, Bluetooth module, GSM SIM 900A, four channel relay module, ultrasonic sensor and Android phone. The overall system design of this proposed smart home automation system is shown in Fig. 1

The drawbacks in the existing voice controlled home automation method through the created application are Need for external Wi-Fi module as Arduino mega is used which is highly cost, Lack of security as video surveillance is not possible, Automation is done through only voice commands, Less User Friendly and Accessible only for limited distance as it is based on Bluetooth technology.

IV. PROPOSED SYSTEM

The proposed system computes voice recognized home automation using Google Assistant and continuous video surveillance by live video streaming using pi camera. A Voice recognized automation through Google Assistant can be used to industrialize tasks performed by human which can be done through Internet of Things (IoT). Also bringing the house under video surveillances for the security purpose through live video streaming by connecting raspberry pi Camera which is cost efficient and requires less storage space than Closed Circuit Television (CCTV).The live streaming can be viewed anywhere in the world from any web browser or even in mobile app. Hence, Smart Home Security System that computes voice recognized Home Automation using Google Assistant and live

video streaming for the security purpose can be designed and constructed in which overall cost and power usage is less when compared to existing model. Apart from this, DHT-11 humidity sensor is used to monitor the temperature and humidity content of the smart home and MQ-4 gas sensor is used to detect the leakage of gas. Also human detection can be done through IR sensor which makes the smart home more safer. The bock diagram of proposed system is shown in Fig. 2.
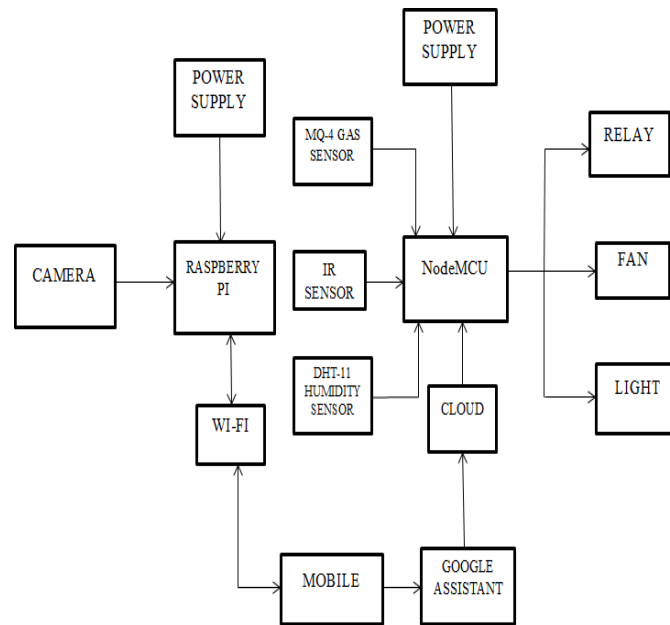

Fig.2 Block diagram of Proposed system

\   A. HARDWARE DESCRIPTION

RASPBERRY PI ZERO W

With the addition of wireless LAN and Bluetooth, the Raspberry Pi Zero W (Fig. 3) is ideal for making embedded Internet of Things (IoT) projects. The Pi Zero W has been designed to be as flexible and compact as possible with mini connectors and an unpopulated 40-pin GPIO, allowing you to use only what your project requires. At the heart of the Raspberry Pi Zero W is a 1GHz BCM2835 single-core processor, with 512MB RAM.
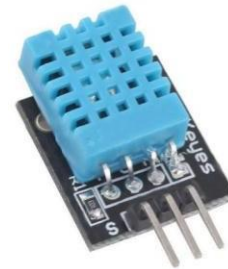

Fig. 3 Raspberry zero w RASPBERRY PI CAMERA

The Raspberry Pi Camera Module v2 is a high quality 8 megapixel Sony IMX219 image sensor custom designed add-on board for Raspberry Pi, featuring a fixed focus lens. It's capable of

3280 x 2464 pixel static images, and also supports 1080p30, 720p60 and 640x480p60/90 video. It attaches to Pi by way of one of the small sockets on the board upper surface and uses the dedicated CSi interface, designed especially for interfacing to cameras.

sensor capability. It is integrated with a high-performance 8-bit microcontroller. Its technology ensures the high reliability and excellent long-term stability. This sensor includes a resistive element and a sensor for wet NTC temperature measuring devices. It has excellent quality, fast response, anti-interference ability and high performance.

NodeMCU

Fig. 4 Raspberry Pi Camera

IR SENSOR

Fig. 7 DHT11 Humidity Sensor

NodeMCU will   runs   on   the ESP8266 Wi- Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. It is an open source firmware. NodeMCU Development board is featured with wifi capability, analog pin, digital pins and serial communication protocols. To get start with using NodeMCU for IoT applications , we need to write/download NodeMCU firmware in NodeMCU Development Boards with the help of Arduino IDE.

Fig. 5 NodeMCU MQ-4 GAS SENSOR

This is a simple-to-use compressed natural gas (CNG) sensor, suitable for sensing natural gas (composed of mostly Methane [CH4]) concentrations in the air. The MQ-4 can detect natural gas concentrations anywhere from 200 to 10000ppm. This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC.

Fig. 6 MQ-4 Gas Sensor DHT11 HUMIDITY SENSOR

This DHT11 Temperature and Humidity Sensor features a calibrated digital signal output with the temperature and humidity

IR sensor is a simple electronic device which emits and detects IR radiation in order to find out certain objects/obstacles in its range. Some of its features are heat and motion sensing. IR sensors use infrared radiation of wavelength between 0.75 to 1000µm which falls between visible and microwave regions of electromagnetic spectrum. IR region is not visible to human eyes.
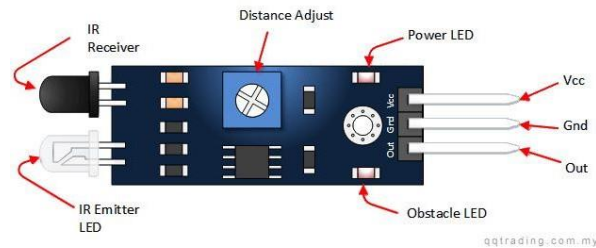

Fig. 8 IR sensor

B. SOFTWARE DESCRIPTION

ANDROID STUDIO

Android Studio is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. Android is an open source and Linux- based Operating System for mobile devices such as smartphones and tablet computers. Android was developed by the Open Handset Alliance, led by Google, and other companies. Android offers a unified approach to application development for mobile devices which means developers need only develop for Android, and their applications should be able to run on different devices powered by Android.

PYTHON

Python is a general-purpose interpreted, interactive, object- oriented, and high-level programming language. It was created by Guido van Rossum during 1985- 1990. Like Perl, Python source code is also available under the GNU General Public License (GPL). Python is a high-level, interpreted, interactive and object- oriented scripting language. Python is designed to be highly readable. It uses English keywords frequently where as other languages use punctuation, and it has fewer syntactical constructions than other languages.

ARDUINO IDE

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board. Arduino provides a standard form factor that breaks the functions of the micro-controller into a more accessible package. The Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks the functions of the micro-controller into a more accessible package.
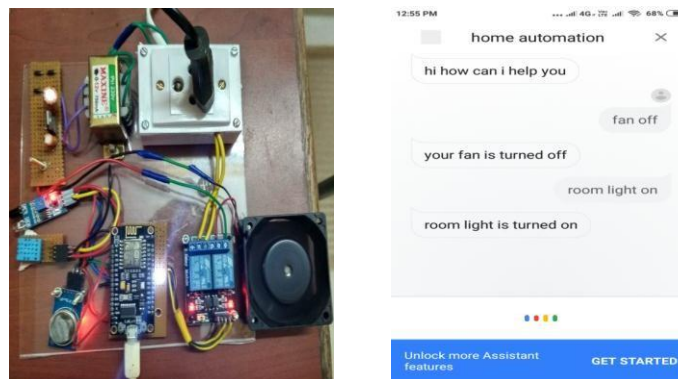
C. GOOGLE ASSISTANT

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

V. RESULT

This system allows us to reduce the human hands on interaction by automating the home appliances using voice recognition through google assistant and also increases the security level through continuous video surveillance. Also home appliances can be industrialized through the application created using android studio. The IR sensor, MQ-4 gas sensor, DHT-11 humidity sensor are being present to ensure the safety measure of the home.

A. OUTPUT FOR HOME AUTOMATION

Google Assistant is trained in such a way that it process our voice commands and act accordingly to

automate the home appliances. When a voice command is given through the google assistant it process the voice signal and convert it into the text commands. Then these commands through the cloud server reaches the nodeMCU and nodeMCU makes the home appliances to act accordingly to the voice commands as shown in Fig. 9 .

Fig. 9 Automation of Home Appliances using Voice commands

Also an application is created using android studio through which home appliances can be automated. The application for home automation is shown in Fig. 10.
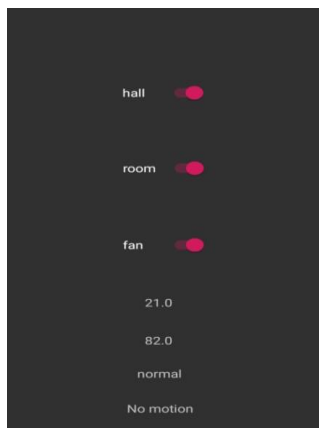
Fig. 10 Application for Automation of Home Appliances

B. OUTPUT FOR VIDEO SURVEILLANCE

Live video streaming can be viewed in the created application as shown in Fig. 11.Live video streaming for security purpose is done through Raspberry Pi Camera connected to camera module of the Raspberry Pi and it is viewed with the help of local host i.e., wi-fi connection in our mobile phone. The Raspberry Pi performs the operation based on the python code imported on the Raspberry Pi.

Fig. 11 Live Video Streaming

C. SENSOR OUTPUTS

To follow some safety measures IR sensor, MQ-4 Gas Sensor, DHT-11 Humidity sensor are used. IR sensor detects the human movements and MQ-4 sensor indicates the leakage of gas. DHT-11 humidity sensor continuously update the temperature and humidity content of the house environment to the created application which is shown in Fig. 10.

D. OVERALL SYSTEM PERFORMANCE

The overall performance is analyzed by realizing all outputs at once. An application is created through which live video streaming and automation of home appliances can be done. Also home appliances can be automated through voice commands. When we command through our voice, it is being processed by google assistant through cloud and it is converted into text commands and these text commands reaches the NodeMCU through the cloud. Then the NodeMCU process the text command and it industrializes the home appliances based on the voice command. Live video streaming through continuous video surveillance can be viewed through the application created and it is viewed with the help of local host i.e., wi-fi connection in our mobile phone. The Raspberry Pi performs the operation based on the python code imported on the Raspberry Pi.Sensors used in our design plays a major role by monitoring certain conditions which is being used as the safety measures and makes the home more smarter. IR sensor

is used to detect the human in our home based on their movements which increases the security level of the home. DHT11 Humidity Sensor updates the temperature and humidity level of the home through the created android application. MQ-4 Gas Sensor is used to detect the leakage of gas which increases the safety measure of the home. The overall system performance is shown in fig. 12.
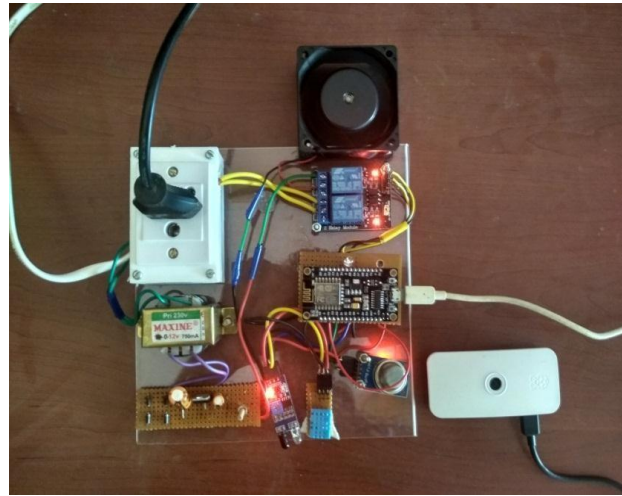

Fig. 12 Overall System Performance

VI. CONCLUSION

The proposed system which computes voice recognized home automation using google assistant and live video streaming for the purpose of continuous video surveillance was developed and implemented successfully. This system is highly cost efficient and consumes less power. In this system, home appliances can be industrialized using voice commands through google assistant and it can also be industrialized through the application created using android studio.

Live video streaming for the purpose of video surveillance reduces the chance of threats and thefts which increases the security level of the home. The presence of gas sensor is one of the safety measure that detects the leakage of gases and the IR sensor detects the human with the help of their movement which makes the home to act smarter. Presence of humidity sensor updates the humidity content and temperature level through the application created using android studio. As a whole, this system is highly reliable and efficient for the aged people and differently abled person on a wheel chair who cannot reach the switch for the switching ON/OFF the device and are dependent on others.

VII. FUTURE SCOPE

The future scope for this system (Proposed System) can be huge. There are many factors to improve on to make the system more powerful, intelligent, scalable, and to become better overall for home automation. For example, controlling the speed of the fan, more number of devices can be integrated, like a coffee machine, air conditioner etc. To make the system respond more faster own private Blynk server can be made. Live video streaming with motion detection algorithm makes the system more efficient and reliable. Well, no system is ever perfect. It always has a scope for improvement. One just needs to put on a thinking cap and try and make the system more better.

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