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Home Security System using Arduino Uno

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***Abstract:** This Project is based on implemented of an IOT based home security system, to be able to secure homes from anywhere in the world. The Major aim of this Project is it should be cost efficient and at the same time it should be secure, and this was achieved with the use of internet of things and some other electronics component. With the help of a mobile app and a keypad a working automatic door system was achieved.. IoT refers to the infrastructure of connected physical devices which is growing at a rapid rate as a huge number of devices and object are getting associated with the internet. Home Security has become a very important and useful application of IoT and we are using it to build an economical security system for homes as well as industrial use*

***Keywords:** Arduino, ESP32 CAM*

I. INTRODUCTION

The MQ-2 sensor which is also known as the gas sensor which is used to detect if there is a gas leak will be placed inside the home mostly in the kitchen area so if there is a gas leak or a fire it will sense it send a signal to the arduino and the buzzer will go off alerting people about it.

The LDR will be cleverly placed behind the door. A laser light will be used to put light on the LDR. As long as the light from the laser is focused on the LDR it will be neutral and will make no changes or sound no alarm but, as soon as the light from the laser towards the LDR is cut by a person or blocked even by an object the LDR will send signal to the Arduino and the buzzer will go off. And the people around will be alerted that there is an intrusion or an unauthorized access to the premises.

The Esp32 cam will be placed in front of the door.

And this will work with the help of the LDR. When there is an intrusion detected the LDR will send signal to the buzzer as well as the camera. The camera after the signal is received will turn on and capture a video of 30 seconds of the front door. This will help in capturing the intruder's face, which can be used later on if a case needs to be filed in case of robbery.

II. ARDUINO

Arduino Uno is a microcontroller board based on the ATmega328P. There are 14 digital input/output pins from which 6 of those can be used as PWM outputs, a 16 MHz quartz crystal, 6 analog inputs, an ICSP header and a reset button, a USB connection and a power jack, It has everything that is needed to support the microcontroller; you can simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or even use a battery to get started.. You can interfere with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for very less price and start all over again.

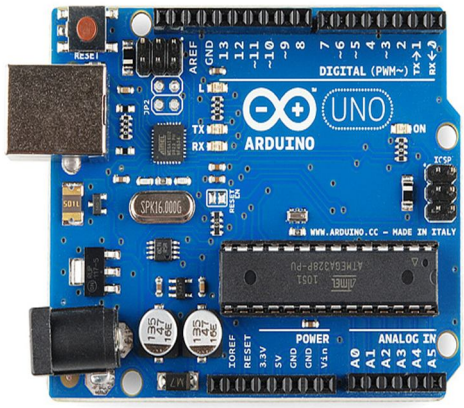


Figure 1: Arduino UNO

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Arduino Uno can sense the things that are going around in the surrounding by receiving inputs from different types of sensors that can change its surroundings by controlling lights, other actuators, and motors. The microcontroller is encoded using the Arduino programming language and the Arduino development environment. It is also capable of sending data and receiving data on the internet with the help of a lot of Arduino shields, which are also deliberated in this paper. An Arduino development board(hardware) and Arduino Integrated Development Environment(software) is used by the Arduino. C and C++ programming languages can be used to program the microcontrollers. The Arduino boards in India were restricted to only small scale projects. The Arduino boards have entered the Indian market only a few years ago. The Arduino IDE provides a very easy incorporated platform which can run on regular PCs and permit the users to write the programs in C or C++.

It is also capable of receiving and sending information over the internet with the help of various Arduino shields, which are discussed in this paper. Arduino uses a hardware known as the Arduino Development board and software for developing the code known as the Arduino IDE (Integrated Development Environment). Built up with the 8-bit Atmel AVR microcontroller's that are Manufactured by Atmel or a 32-bit Atmel ARM, these microcontrollers can be programmed easily using the C or C++ language in the Arduino IDE. It is also capable of receiving and sending information over the internet with the help of various Arduino shields, which are discussed in this paper. Arduino uses a hardware known as the Arduino development board and software for developing the code known as the Arduino IDE (Integrated Development Environment). Built up with the 8-bit Atmel AVR microcontroller's that are manufactured by Atmel or a 32-bit Atmel ARM, these microcontrollers can be programmed easily using the C or C++ language in the Arduino IDE. It is also capable of receiving and sending information over the internet with the help of various Arduino shields, which are discussed in this paper. Arduino uses a hardware known as the Arduino development board and software for developing the code known as the Arduino IDE (Integrated Development Environment). Built up with the 8-bit Atmel AVR microcontroller's that are manufactured by Atmel or a 32-bit Atmel ARM, these microcontrollers can be programmed easily using the C or C++ language in the Arduino IDE.

III. LDR

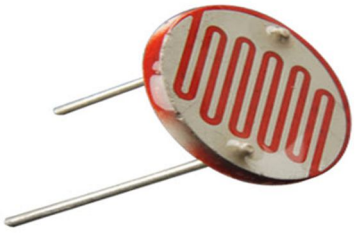


Figure 2: LDR

A LDR is very small piece that is used to sense the amount of light that falls on it and then signals the microcontroller about it. It has an adjustable resistance that changes with the light concentration on it. The LDRs are made of semi-conductor material. LDR is a special type of resistor that works on the photoconductivity standard means that resistance changes according to the intensity of light. the resistance of the LDR decreases when there is an increase in the intensity of light.

The principle on which the LDR works is photoconductivity, which is nothing but an optical occurrence. The light is absorbed by the material then the conductivity of the material increases. When the light falls on the LDR, then the electrons in the valence band of the material are ready for the conduction band.

The light failure alarm circuit uses an LDR and is also used in light meter. The LDR is also used in the smoke detectors. It is used for automatic brightness and contrast regulator in television receivers.

LDR is one type of resistor that can understand changes in resistance when there is a change in light reception. LDR is also known by many names: photo-conductor, photo-resistor, photo-conductive cell, and which is often used in literature is photo-cell or photo-resistor. The amount of resistance value on the LDR depends on the extent of the light received by the LDR itself. LDR is often called a sensor or device in the form of resistors that are sensitive to light.

LDRs or photo resistor are often used in electronic circuit designs and few projects where it's necessary to detect the presence of sunlight.

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IV. BREADBOARD

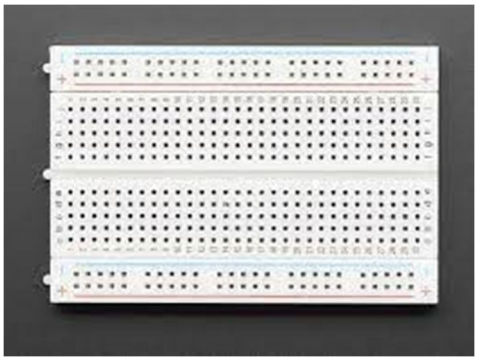


Figure 3: a breadboard

The Breadboard is made up of strips of metal which are under the board that is used to connect the holes on top of the board. This is mainly used for building and testing the circuits before finalizing any design that is there for particular project that needs to be made.

The breadboard contains a lot of holes in which circuit components like resistors and ICs can be inserted. Breadboards have a standard power supply that either connects to a wall outlet or even a battery can be used. There are specific holes in the breadboard which are connected to positive and negative voltages so that when a circuit is appropriately wired the current flows through the circuit.

Breadboards uses very low amount of voltage and current so that when the components are being used it is safe to touch even when the breadboard is plugged in, but it is always better to keep the breadboard unplugged when the components are needed to be touched and if it has a power switch, turn it off until a circuit is complete. This will help to avoid shocks or damaged components.

Breadboards come in many dimensions from tiny boards which have fewer rows of holes to large breadboards where a lot of electronic components like micro-controllers, resistors, etc.

A breadboard is a device which you can use to build and test electronic circuits, without having the need to do any soldering. In order for the electricity to flow in a circuit from component to component certain parts of the breadboard are wired together. Laypersons and professionals alike use them to test with circuit ideas, and in some cases, they can be used to build helpful and useful devices straight on the breadboard.

V. MQ2 SENSOR MODULE



Figure 4: a MQ-2 sensor module

In the MQ sensor series the most commonly used one is the MQ-2 sensor which is made up of Metal oxide Semiconductors. It is also known as the chemiresistors because the detection is based on the change of resistance of the sensing material when there is presence of gas and it comes in contact with the material.

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The MQ2 sensor comprises of an electrochemical sensor, which changes its resistance for different concentrations on different gasses. The sensor is connected in series with a flexible resistor to form a voltage divider circuit and the flexible resistor is used to change the sensitivity. SnO2 is the sensitive material of MQ-2 sensor, which lowers its conductivity in clean air. The sensor's conductivity is high when higher amount of combustible gas is present in the air. It is good to use a simple electro circuit for converting the change of conductivity to correspond with the output of gas concentration.

The MQ-2 sensor can sense or measure gasses like LPG, Hydrogen, Propane, methane and even CO. The module version of the sensor has a Digital Pin which helps in making the makes work even without a microcontroller which makes it very easy when you are only trying to detect only one particular gas. An analog pin is used when there is a need to measure the gas in ppm. This pin is TTL driven and works on 5V which makes it possible for it to work with the most common microcontrollers. The sensor provides an analog output voltage which changes in proportion to the concentration of gas present. If there is less gas concentration then it will show less voltage and if there is high gas concentration it will show high output voltage.

VI. ESP32 CAM

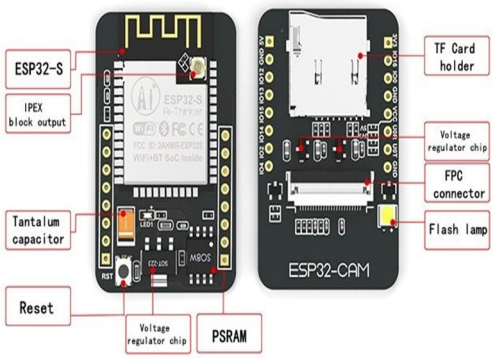


Figure 5: an ESP32 camera module

The ESP32-CAM is a very small camera which also has the ESP32-S chip in it. The ESP32 camera also has micro ds card slot in it which can be used to store the images or the videos taken by the camera. This module also supports image Wi-Fi upload and multiple sleep modes, which can be used for various projects and outdoor applications.

A variety of IOT applications and projects are out there which use the ESP32 cam. It is used in smart home devices, wireless monitoring for homes and even industries, wireless identification and other IoT applications.

The ESP32 CAM also consists of a Wi-Fi Module and can also work with Bluetooth. The module has only 2MP camera which is very small sized and operates independently as a minimum system with an outline of only 40mm x 27mm. it uses less amount of current which makes it suitable for smart home device projects and also for industrial wireless control where not a lot of electricity is to be used.

This module has a DIP package and must be directly inserted into the backplane to know quick production of products, which provides customers high-reliability connection mode, which is suitable for applications in various IOT hardware terminals.

VII. ARDUINO IDE SOFTWARE

The Arduino IDE is an open-source software platform, which is used to create and upload code to the Arduino boards. The IDE application is appropriate for different operating systems such as Linux, Mac OS X, and Microsoft Windows. It supports the programming languages C and C++. IDE in the Arduino IDE stands for Integrated Development Environment.

Arduino IDE is software for Arduino. It is a text editor with different features like a notepad. It is used for writing codes, compiling the codes and to check whether there are any errors and uploading the code to the Arduino. The programs that are written in the Arduino software are called sketches. The file extension ino is given to the sketches that are written in the Arduino software. This software also provides features such copy, paste, searching the text as well as replacing it, etc. the message area gives feedback and also displays errors while saving and exporting the code. It displays the configured board and the serial port on the bottom right corner of the window.

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VIII. BENEFITS

The major benefit of this home security system is that it is going to save a lot of electricity as the camera won't be on the whole time. It's going to save the cost for buying heavy storage devices as there isn't going to be a need for it. Because the camera will capture the video only when an intrusion is detected and will not record the whole day's footage.

IX. CONVENIENT

This security system is going to be very easy to use. Once it is installed the user doesn't have to do anything to make it work, it will work on it's on by just being plugged to the power socket. Its maintenance will be very cheap as all the parts are readily available in market for very little price.

X. PROFITABLE

It is profitable to the user as it is very cheap. It requires less voltage to use an Arduino board which uses only 12V DC supply. It can be switched on and off with the help of a mobile. It saves a lot of electricity and storage space.

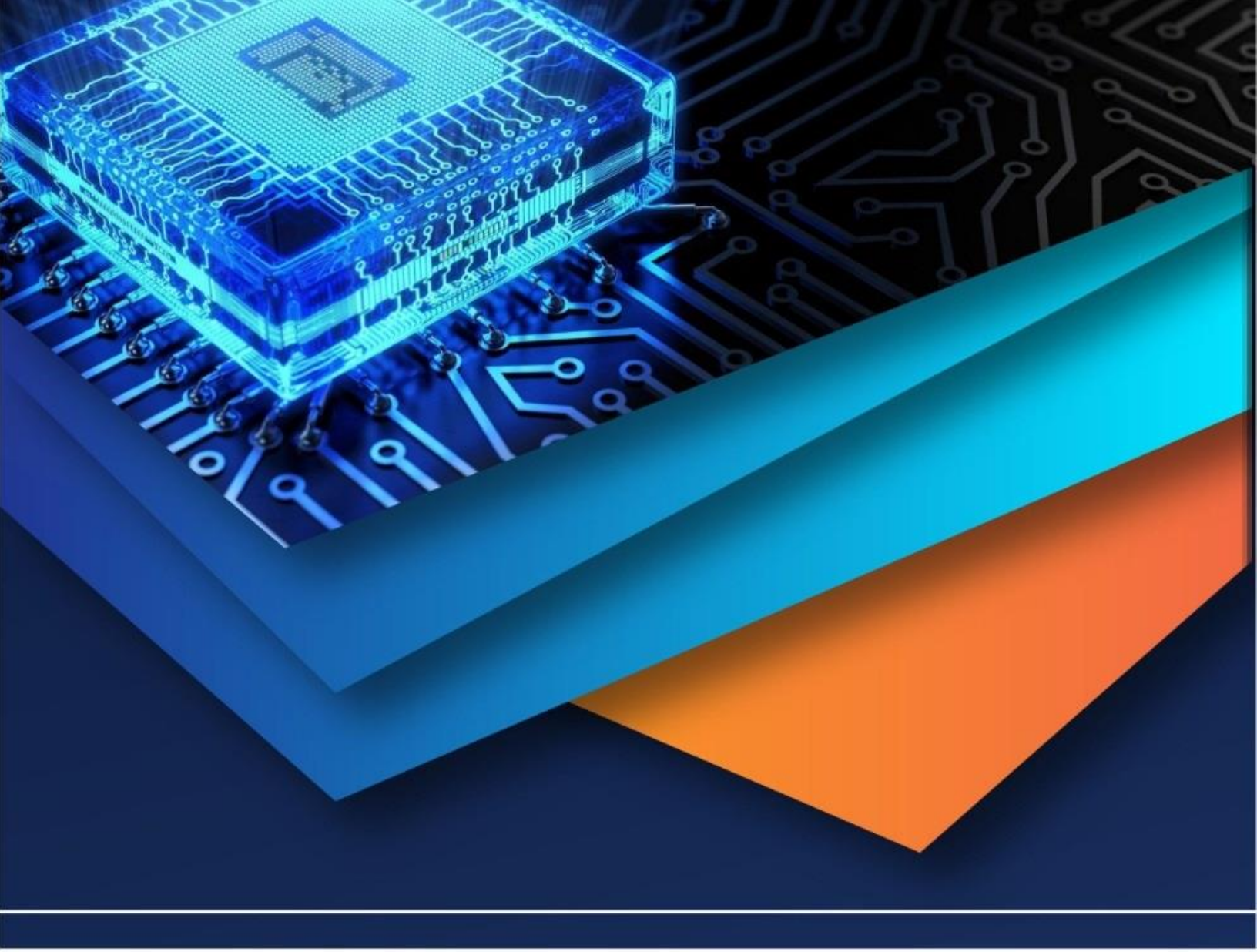
XI. CONCLUSION

This paper summarizes and gives brief information about the Home security system using Arduino UNO and how it is different from the existing security systems present out there.

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