

Hardware Design of IIOT

Group 4

E/18/010 ABEYWICKRAMA A.K.D.A.S.

E/18/149 JAYAKODY J.M.I.H.

E/18/156 JAYATHILAKE W.A.T.N.

Smart Security System

Introduction

Smart Security System aims to create a robust and reliable security system for residences, businesses, and other sites by utilizing the most recent developments in IIoT technology.

This will allow users to automate the process of maintaining the security of the premises by sending out alarms and warnings, as well as allowing the system handler overall control of the system via a mobile application.

By integrating a number of sensors and modules to offer complete security features while giving highly beneficial and practical solutions for enhancing security measures and ensuring the safety of premises and individuals.

Overview

Here use a combination of sensors, cameras, and alarms to monitor and secure our homes. The sensors may include motion detectors, door and window sensors, and smoke detectors. These sensors will be connected to a central hub ESP32, which will collect data from them. The automation can be triggered by certain events or by user commands that are received through a mobile application or a voice assistant.

To store the sensor and camera data, we can use MQTT protocol which is a lightweight messaging protocol that is commonly used in IOT devices. The microcontroller will publish the data to a MQTT broker, which will then store the data in a database. This will allow us to analyze the data and detect patterns that can help us improve the security system.

To enhance the security of the system in future, we can use facial recognition technology to detect and identify individuals. This can be achieved using cameras and ML facilities. Including a variety of features and components to monitor and control security systems in real-time.

Features

Hope to build system with,

☐ Access Control:

Include sensors connected to ESP8266 or ESP32 modules to control access to the premises with control door/ window and other entry points that can be controlled remotely through the system.

Also motions will be detected by this system using specific sensors.

☐ Real-time Alerts:

When unauthorized access is attempted or when any suspicious activity is discovered, the system has the ability to send notifications in real-time to the owner or relevant security staff.

☐ Automated Responses:

The system may be set up to react to specific security hazards automatically, such as by sounding an alarm / buzzer, turning on lights, and displaying warnings.

Component list

- **ESP Door Sensor**

Device that can wirelessly transmit information to a smart security system when it detects the opening and closing of a door / window.



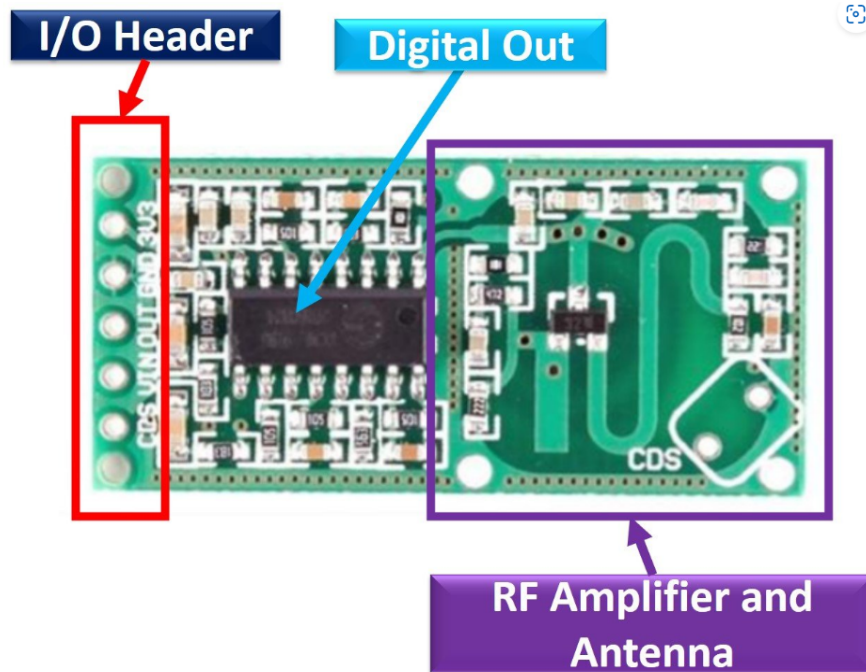
Typically, a magnetic reed switch and a magnet make up the door sensor. The magnet is positioned on the door itself, while the switch is attached to the door frame. The magnet pulls the switch closed when the door is closed completing an electrical circuit. The circuit is broken when the door is opened because the magnet moves away from the switch.

The switch's state is read by the ESP32 microcontroller and sent to a central hub, which might be a smartphone app or a dedicated security system. The system can be set up to send notifications whenever the door is opened, closed, or left open for a predetermined period of time.

- **Microwave Proximity sensor**

A scientific phenomena known as the "Doppler Effect" is used this time for proximity detection. As innovative as this seems, it can be done quickly and affordably with the help of a special small sensor called the RCWL-0516.

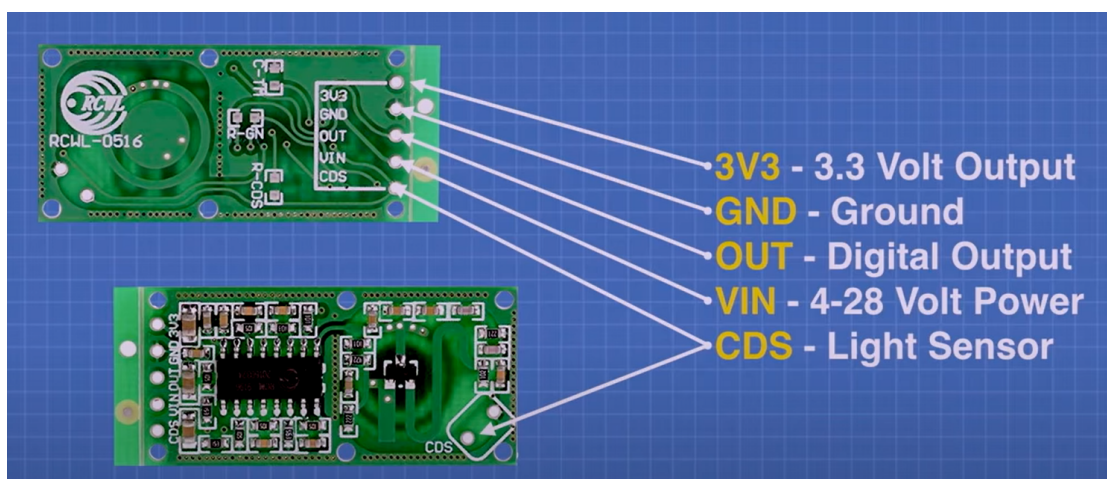
RCWL-0516



This device is the perfect part for a battery-powered design because it uses little electricity and functions in the 4 to 28 volt range.

It is entirely self-contained since the microwave antennas are integrated onto the tiny printed circuit board.

Additionally, the RCWL-0516 supports an optional light-dependent resistor (LDR), which enables the device to only function in complete darkness even. In situations involving light control, this can be quite helpful.



- **Buzzer**

A buzzer is often used in security systems as an audible alert mechanism to indicate an intrusion or a breach of security. When a sensor detects something suspicious, such as the opening of a door or window, it triggers an alarm circuit that sends a signal to the buzzer. The buzzer then produces a loud and distinct sound to alert anyone in the vicinity of the potential security breach.



- **LED**

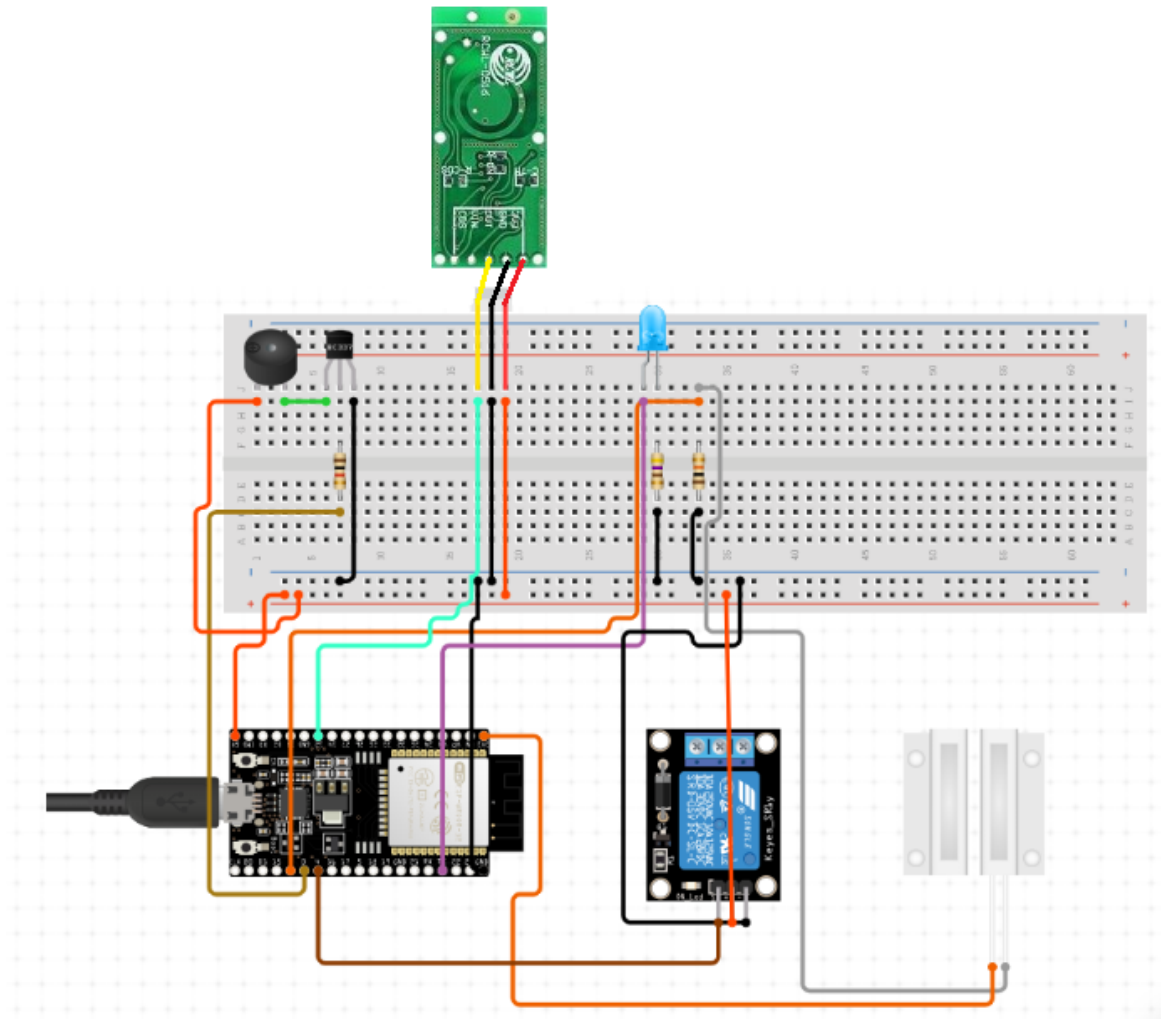
In security systems, an LED (Light Emitting Diode) indicator is a frequently used part. It offers a visual signal to show the state of the security system or a particular system component. Here are some applications for LED indicators in a security system:

Calculations

Required voltage for the circuit will be provided by the USB port. Main sensors such as, door Sensor & microwave Proximity sensor need 3.3v to be operational. Since esp32 output voltage is 3.3v both of them function as required.

Here, the relay module allows low voltage to control a high voltage circuit & provide safety and reduce the risk of damage to other devices..

Hardware design



Approximate cost

Item	Quantity	Cost (Rs)
ESP32 Dev Kit	1	2,000
RCWL-0516 Sensor	1	1,000
Door window Sensor	1	500
Buzzer	1	150
LED	1	10
Relay Module (depends on #channels)	1	600
Resistor	3	10
Jumper Wires	15	300
Breadboard	1	360
Total cost		4,930

References

- [ESP32 - Door Sensor | ESP32 Tutorial \(esp32io.com\)](#)
- [Experiments with the RCWL-0516 | DroneBot Workshop](#)
- [RCWL-0516 Microwave Radar Sensor Module with ESP32 \(microcontrollerslab.com\)](#)
- [rcwl-0516-data-sheet.pdf \(automotionsensor.com\)](#)
- [ESP32 - Door Sensor | ESP32 Tutorial \(esp32io.com\)](#)