Anti theft alarm - IoT Monsoon 2021 project

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What is this project about ?

The Anti-theft system along with fire alarm is an IOT project to protect our important belongings from being stolen. It adds additional security to homes, banks, lockers. Our main focus here is to build a home security alarm.

Objective

It is to provide home safety and detect burglary. They provide protection against fire and such threats. We will be mainly focusing on designing a fire alarm and burglary detection by giving an alarm and turning on the lights whenever it encounters a rise in temperature and motion in its vicinity. There will be a motion sensor and DHT11 for detecting motion and temperature. We take the password of the locker through the serial monitor at the entry. If the password is correct then we do not activate any buzzer or alarm. If the password is incorrect or there has been no input and we detect a motion, then we activate buzzers and lights to indicate an attempt of theft. If the temperature of the locker exceeds a certain amount, then we give a buzzer with a different tone to indicate fire. If it is possible we would also like to add a camera to snap a picture when illegal access is registered.

Hardware components used

- ESP32
- Jumper wires
- Resistors
- LEDs
- DHT11
- PIR sensor
- HC-SR04 sensor
- Buzzer

Input

- Power supply
- Password
- Room temperature considered by DHT11

This password is given as input to the serial monitor when prompted.

Without the correct password or no password the sensors protecting the locker gets activated and as a result LEDs and buzzer turn on and keep alarming till the owner shuts them off.

DHT11 sensor continuously senses the room temperature and if the room temperature exceeds a particular value (say 70C) then the buzzer sounds on.

Output

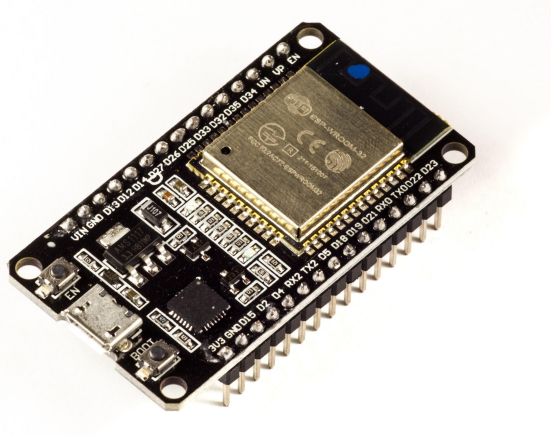
- Sound
- Light

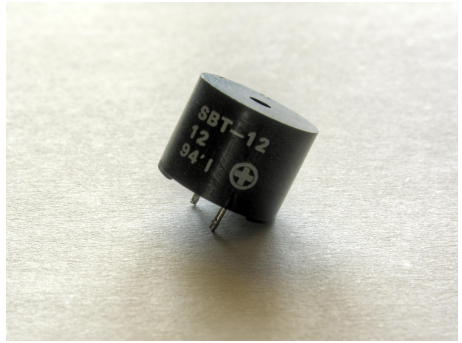
Sound is due to the buzzer and light is due to the LEDs.

If we detect a threat due to motion in the room the we turn on the red LED and if we detect a threat due to temperature rise (fire) then we turn on the blue LED.

电源灯
R1201620
VCC
DATA
GND
YL-47
1K
DHT11
3.5V-5.5VDC
20%-96%RH
0-50℃
±5%RH ±2℃

SR04
T
R
VCC
Trig
Echo
Gnd


EN
BOOT


SBT-12

ESP32 devkit

ESP32 devkit has 36 pins and 18 on each side of the board.

It has 34 GPIO pins and each pin has multiple functionalities which can be configured using specific registers. There are many types of GPIOs available like digital input, digital output, analog input, and analog output, capacitive touch, UART communication and many other features.

Digital input GPIO pins:

It has six GPIO pins which can be used as digital input pins only. They cannot be configured as digital output pins. They do not have internally connected push pull resistors.

- GPIO 34
- GPIO 35
- GPIO 36
- GPIO 37
- GPIO 38
- GPIO 39

Touch sensor pins

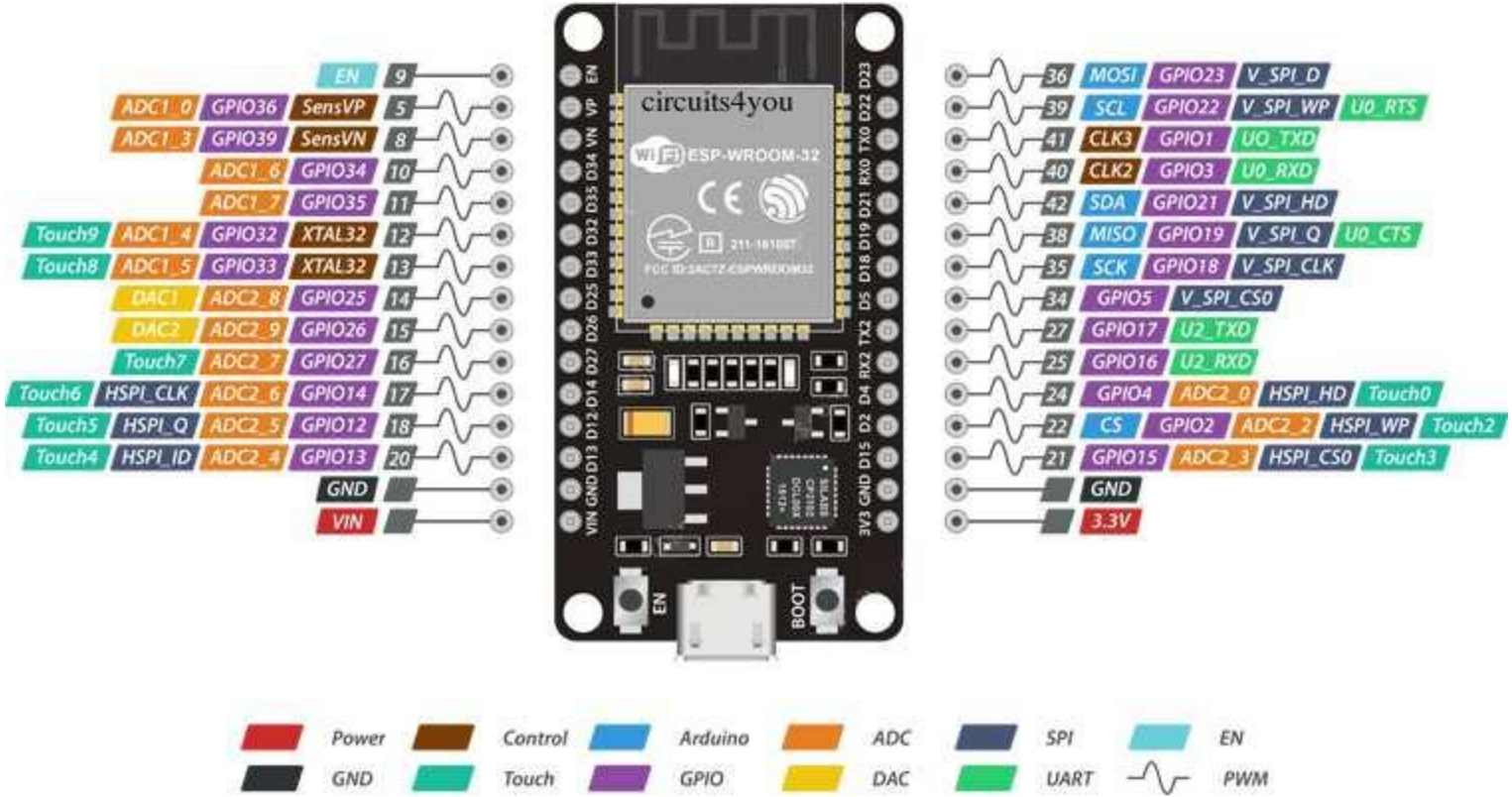
ESP32 provide on board **10 capacitive touch sensors**. These capacitive touch sensors can be used to detect any electrical and magnetic waves around like magnetic field detection.

- TOUCH0 – GPIO 4
- TOUCH1 – GPIO 0
- TOUCH2 – GPIO 2
- TOUCH3 – GPIO 15
- TOUCH4 – GPIO 13
- TOUCH5 – GPIO1 2
- TOUCH6 – GPIO 14
- TOUCH7 – GPIO 27
- TOUCH8 – GPIO 33
- TOUCH9 – GPIO 32

I2C communication pins

It has dedicated pins available for two-wire I2C communication. One pin is used for data transfer and another pin is used for clock synchronization.

- **GPIO 21** is SDA pin.
- **GPIO 22** is SCL pin.



ESP32 Dev. Board Pinout

Sensor description

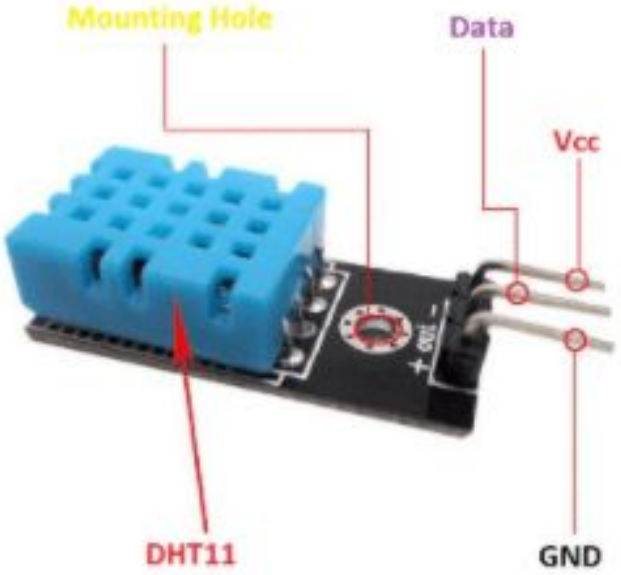
DHT11 temperature sensor

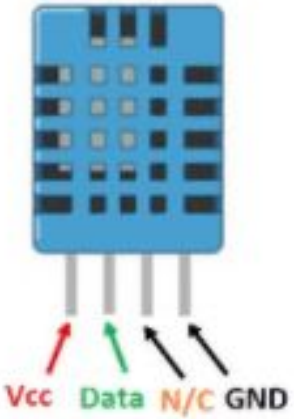
DHT11 sensor consists of a capacitive humidity sensing element and a thermistor for sensing temperature. The humidity sensing capacitor has two electrodes with a moisture holding substrate as a dielectric between them. Change in the capacitance value occurs with the change in humidity levels. The IC measure, process this changed resistance values and change them into digital form.

For measuring temperature this sensor uses a Negative Temperature coefficient thermistor, which causes a decrease in its resistance value with increase in temperature. To get larger resistance value even for the smallest change in temperature, this sensor is usually made up of semiconductor ceramics or polymers.

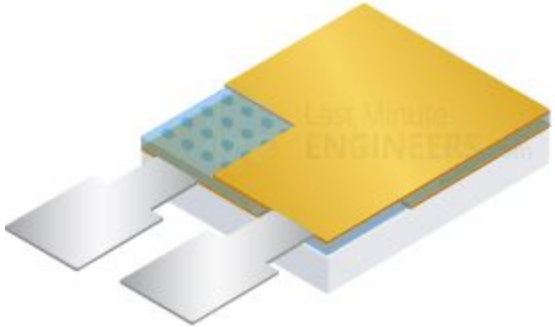
Specifications:

Operating voltage: 3.5V - 5.5V
Operating current:
0.3mA(measuring)60uA(standby)
Output: Serial data
Temperature range: 0C to 50C
Humidity range: 20% to 90%
Resolution:
Temperature and humidity both are 16-bit
Accuracy: ±1C and ±1%

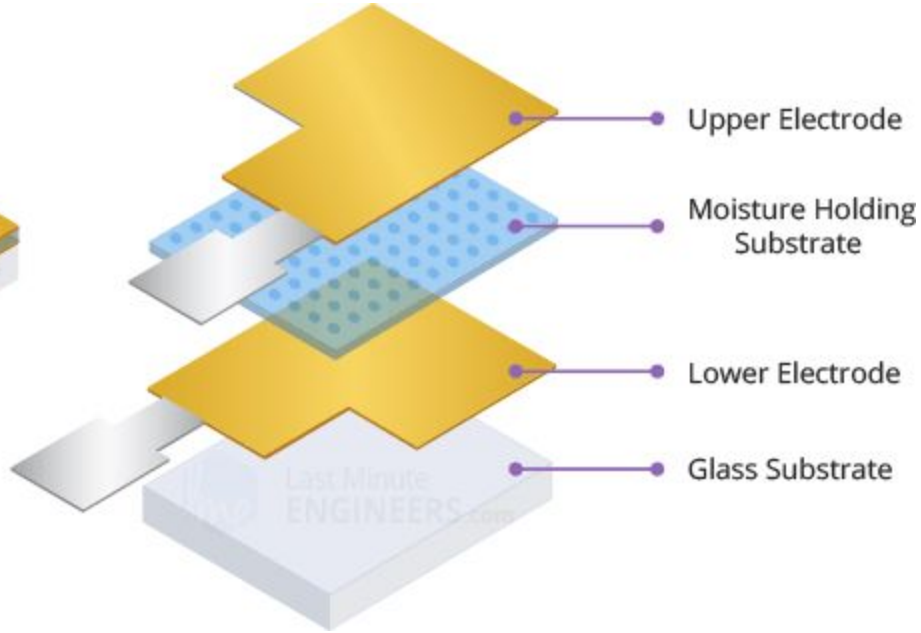




DHT11 Internal Circuit



Humidity Sensor

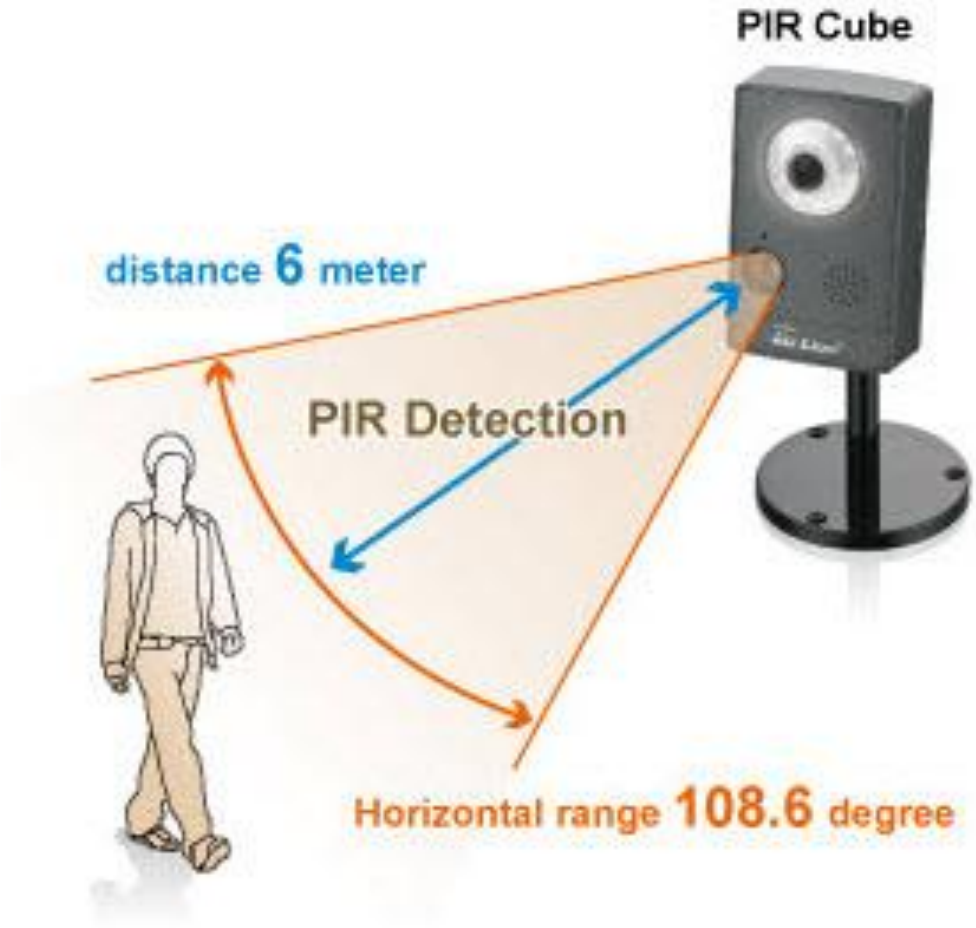


PIR motion detecting sensor

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "**Passive Infrared**", "**Pyroelectric**", or "**IR motion**" sensors.

A rectangular crystal in the center is used to detect the levels of infrared radiation.

Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion (change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low.


PIR Cube
distance 6 meter
PIR Detection
Horizontal range 108.6 degree

HC-SR04 ultrasonic sensor

This is the HC-SR04 ultrasonic distance sensor. This economical sensor provides 2cm to 400cm of non-contact measurement functionality with a ranging accuracy that can reach up to 3mm. Each HC-SR04 module includes an ultrasonic transmitter, a receiver and a control circuit.

HC-SR04 Specifications

- Working Voltage: DC 5V
- Working Current: 15mA
- Working Frequency: 40Hz
- Max Range: 4m
- Min Range: 2cm
- Measuring Angle: 15 degree
- Trigger Input Signal: 10μS TTL pulse
- Echo Output Signal Input TTL level signal and the range in proportion
- Dimension 45 * 20 * 15mm

Model in reality