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TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

Motion Detection Security Camera Using ESP-32 CAMsss

**A Project Report Based on:
SENSORS AND
ACTUATORS**

Presented by:

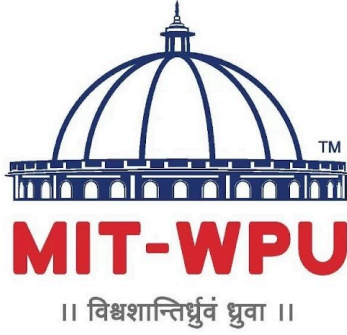
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INTRODUCTION:

Security threats like unauthorized access and vandalism are increasing, and traditional surveillance systems often lack real-time adaptability. This project introduces a motion detection security camera powered by the ESP32-CAM, integrated with the Blynk app to provide an affordable and efficient modern security solution.

Using a PIR sensor, the system detects motion and triggers the ESP32-CAM to capture images or videos. The ESP32 microcontroller processes the sensor data, activating the camera only when needed to conserve power and storage. Through Wi-Fi connectivity, the system can send captured media to cloud storage and alert users through the Blynk app for remote monitoring and management.

With the Blynk app, users can receive real-time notifications, view captured media, and control the security camera from their smartphones, enabling continuous, hands-free surveillance. This smart, cost-effective setup offers an innovative approach to home and business security, delivering both adaptability and convenience.



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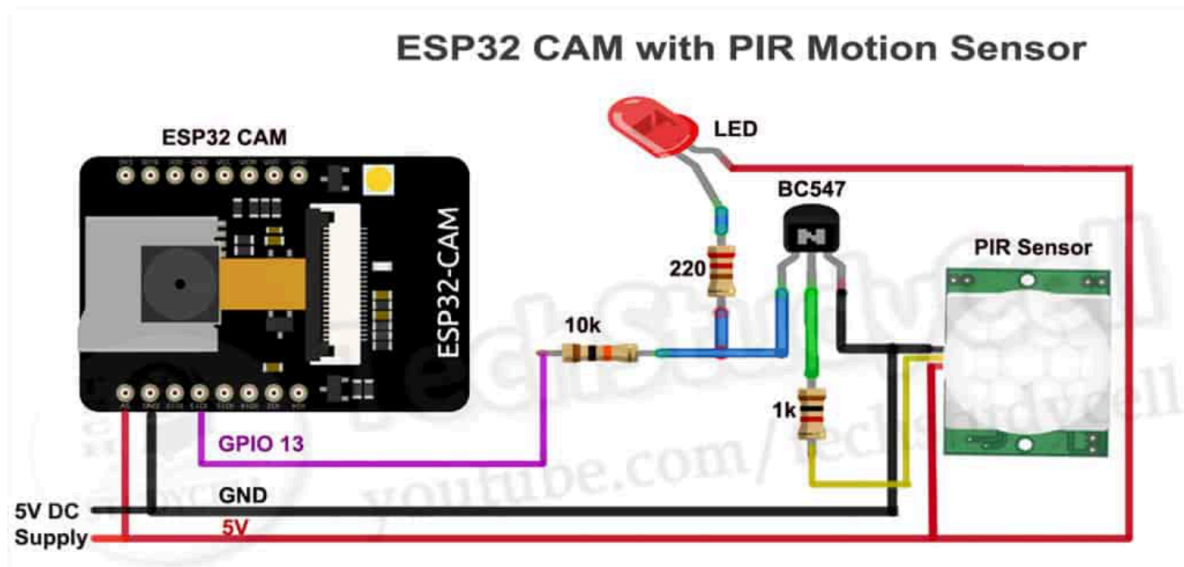
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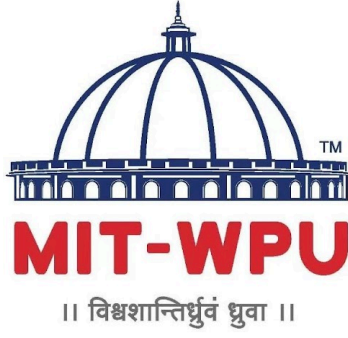
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PROJECT OVERVIEW:

The Motion Detection Security Camera using ESP-32 CAM aims to enhance security by automating surveillance based on real-time motion detection. Using the **ESP-32 CAM** microcontroller along with a **PIR sensor** and **camera module**, the system detects movement and captures images or video only when necessary. Data can be stored remotely or sent to a cloud service for easy access, while users can monitor and control the system via a mobile app. This project offers an efficient, low-cost solution for modern security, leveraging IoT technology to improve safety and provide real-time alerts.

BLOCK DIAGRAM:





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INTERFACING DIAGRAM:



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HARDWARE DETAILS:

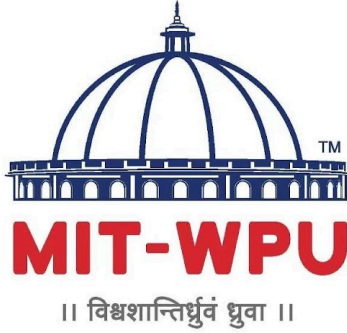
ESP32 cam

Purpose: Acts as the main controller, handling data acquisition and Wi-Fi communication.

PIR Motion Sensor

Purpose: Detects movement by sensing infrared radiation changes, commonly used for security or occupancy detection.

FTDI : it is used for connecting esp32 cam with the computer using the port on the FTDI



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SOFTWARE DETAILS:

```
#define BLYNK_TEMPLATE_ID "TMPL6zvqM98WE"  
#define BLYNK_TEMPLATE_NAME "Security Camera "
```

```
#include <WiFi.h>  
#include <BlynkSimpleEsp32.h>  
#include "esp_camera.h"
```

```
char auth[] = "KfHzlFIkfd05qoxyECTAZ7dwF7-t0UTd";  
char ssid[] = "VK306 3731";  
char pass[] = "1234567890";
```

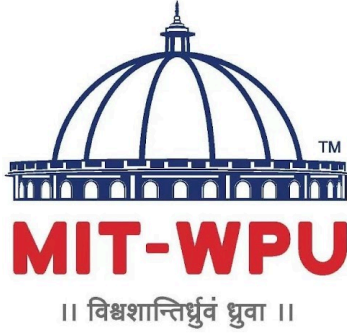
```
#define PWDN_GPIO_NUM    32  
#define RESET_GPIO_NUM  -1  
#define XCLK_GPIO_NUM    0  
#define SIOD_GPIO_NUM    26  
#define SIOC_GPIO_NUM    27
```

```
#define Y9_GPIO_NUM       35  
#define Y8_GPIO_NUM       34  
#define Y7_GPIO_NUM       39  
#define Y6_GPIO_NUM       36  
#define Y5_GPIO_NUM       21  
#define Y4_GPIO_NUM       19  
#define Y3_GPIO_NUM       18  
#define Y2_GPIO_NUM       5  
#define VSYNC_GPIO_NUM    25  
#define HREF_GPIO_NUM     23  
#define PCLK_GPIO_NUM     22
```

```
#define PIR_PIN 13
```

```
void setup() {  
  Serial.begin(115200);
```

```
  WiFi.begin(ssid, pass);  
  Blynk.begin(auth, ssid, pass);
```



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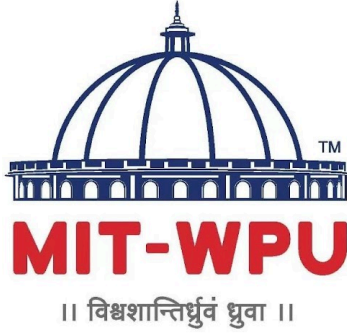
```
camera_config_t config;
config.ledc_channel = LEDC_CHANNEL_0;
config.ledc_timer = LEDC_TIMER_0;
config.pin_d0 = Y2_GPIO_NUM;
config.pin_d1 = Y3_GPIO_NUM;
config.pin_d2 = Y4_GPIO_NUM;
config.pin_d3 = Y5_GPIO_NUM;
config.pin_d4 = Y6_GPIO_NUM;
config.pin_d5 = Y7_GPIO_NUM;
config.pin_d6 = Y8_GPIO_NUM;
config.pin_d7 = Y9_GPIO_NUM;
config.pin_xclk = XCLK_GPIO_NUM;
config.pin_pclk = PCLK_GPIO_NUM;
config.pin_vsync = VSYNC_GPIO_NUM;
config.pin_href = HREF_GPIO_NUM;
config.pin_sscb_sda = SIOD_GPIO_NUM;
config.pin_sscb_scl = SIOC_GPIO_NUM;
config.pin_pwdn = PWDN_GPIO_NUM;
config.pin_reset = RESET_GPIO_NUM;
config.xclk_freq_hz = 20000000;
config.pixel_format = PIXFORMAT_JPEG;

if (psramFound()) {
    config.frame_size = FRAMESIZE_UXGA;
    config.jpeg_quality = 10;
    config.fb_count = 2;
} else {
    config.frame_size = FRAMESIZE_SVGA;
    config.jpeg_quality = 12;
    config.fb_count = 1;
}

esp_err_t err = esp_camera_init(&config);
if (err != ESP_OK) {
    Serial.printf("Camera init failed with error 0x%x", err);
    return;
}

pinMode(PIR_PIN, INPUT);

void loop() {
    Blynk.run();
}
```



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```
if (digitalRead(PIR_PIN) == HIGH) {  
  Serial.println("Motion detected!");
```

```
  
  camera_fb_t * fb = esp_camera_fb_get();  
  if (!fb) {  
    Serial.println("Camera capture failed");  
    return;  
  }  
  
}  
}
```



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RESULT:

The Motion Detection Security Camera System using ESP32-CAM automates real-time surveillance by capturing and recording images when motion is detected, enhancing security with minimal human intervention. The system activates the camera only when movement is sensed within a specified range, conserving power and storage while ensuring efficient monitoring. Images and notifications are sent to a mobile app, allowing remote access and alerting users to any suspicious activity. Testing showed improved response time in detecting intruders and a reduction in false alarms. Overall, this system offers a reliable and cost-effective solution for enhanced security in various settings.



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1. R. R. PBV, V. Sonaleo Mandapati, S. L. Pilli, P. Lahari Manojna, T. H. Chandana and V. Hemalatha, "Home Security with IOT and ESP32 Cam - AI Thinker Module," 2024 International Conference on Cognitive Robotics and Intelligent Systems (ICC - ROBINS), Coimbatore, India, 2024, pp. 710-714, doi: 10.1109/ICC-ROBINS60238.2024.10533960.
2. Dinakarasu, S., et al. "Real Time Face Detecting Unauthorized Human Movement Using ESP 32 CAM Module." (2022).