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Intelligent Motion Activated Camera

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Abstract: This project describes the design and implementation of a low-cost, intelligent motion-activated camera system using the ESP32-CAM module, which consists of an integrated OV2640 camera with WiFi, an LDR, and a Passive Infrared motion sensor. This project only works in night/dark condition. First , through the LDR, it detects low light conditions of the surrounding area. Once the dark condition of the surroundings is detected, the PIR sensor detects motion for any human or object movement. On detecting motion and low light condition, ESP32-CAM is activated and sends an image to the website via an HTTP POST request. A Website is made which receives an image and further sends this image and an alert to the user. Since most of the components are low-priced, the philosophy behind this work is to make it as simple and inexpensive as possible while being reliable, for home security, wildlife monitoring, and small-scale surveillance.

Index Terms- ESP32, LDR, PIR

1.INTRODUCTION:

An intelligent motion-activated camera is a system designed to automatically capture images when movement is detected within its range. Unlike traditional cameras that require manual operation, this system uses sensor like a PIR sensor to detect motion in the environment. Traditional security cameras often require continuous power and monitoring, leading to high costs and inefficiency. This project will use the ESP32-CAM, one of the cost-effective microcontrollers with an integrated camera and Wi-Fi, to develop a motion-triggered intelligent camera system operating only in the dark. The main objective of this project is to detect motion only in dark/night conditions, capture a photo with OV2640 when motion is detected, send an alert and the captured photo to the user, and minimize triggers with cool down. This intelligent operation makes it an ideal system for low-cost home and outdoor surveillance, observation of wildlife, restricted areas, and IoT-based smart security systems. Since it will be able to operate itself without the need for continuous human supervision, it can be deployed in any remote or energy-constrained environments. This is an affordable and easily scalable system.

2.LITERATURE REVIEW:

[1] In the paper "Development of Machine Learning Wildlife Camera Using ESP32 CAM for Small Mammals". The ESP32 CAM is efficient in capturing an image. But it has some drawbacks like its narrow field of view, low-resolution image capturing, and low light vision. The training of the detection model would more probably provide better results by using pictures captured from the same site as opposed to web-mined pictures.

[2] In the paper "Smart surveillance system using ESP32 and camera-based motion detection with IM technology". The smart surveillance system using ESP32 and Camera-based motion detection with IM Technology is very highly effective in prompt sending of notification, functioning PIR motion and ESP32 camera, effective in giving an alert, and the product is highly recommended for implementation in facilities of the area. The network connectivity is good for the smart surveillance system. The system is highly reliable, and traditional CCTV is moderately reliable.

[3] In the paper "Development of a Motion Activated Security Cam for Monitoring Applications". It tells about the development of a wireless motion activated surveillance system based on IoT technology.The system applied sensor technology, signal processing techniques of capture recording images when the PIR sensor detects motion. Some development achievements have been made, including: systems using an ESP32-CAM as a microcontroller connected to Wi-Fi can display all images from video recording in real-time effectively, the monitoring system integrates with the Telegram messenger application for notification alerts and the wireless surveillance system was useful for mobile users to access and receive real time information.

[4] In the paper entitled “Arduino based security system using esp32 camera microcontroller with telegram notifications” the Esp32 Cam microcontroller is used in designing the security system connected to the PIR sensor Data transmission is done via the internet by using the wi-fi module on the Esp32 Cam microcontroller. If the smartphone is connected to the internet network, the system can send data to the Telegram application. This proposed technique is designed to operate a security Camera Using PIR motion sensor to Detect person. The motion sensor sends a signal to ESP32CAM and it takes image and send it to Telegram application for user.

[5] In this paper entitled “ESP32-CAM PIR Motion Detector with photo capture”. Motion capture (Mocap) is an effective 3D animation tool for realistically capturing human motion. It uses PIR sensor that is easy to interface with any other components. By using this system, one can reduce the power consumed and memory space of the system.

[6] In this paper entitled "The combined alarm system based on ESP32CAM" it proves the possibility of making a combined remote control system against unauthorized entry into a room and fire alarm based on the inexpensive ESP32-CAM module. In addition to sending a signal of danger, an image is sent too.

[7] The title of the paper is “Development of an affordable real-time IoT-based surveillance system using ESP32 and TWILIO API. Video surveillance systems have become advanced since the introduction of digital and wireless technology”. This allows users to view their homes remotely through surveillance cameras, while sensor networks provide additional security options depending on the sensors applied. Moreover, adding Wi-

Fi to security systems enables faster data transfer and also makes it able for users to view and control the System from any place in the world.

[8] The title of the paper is "Door security system for home monitoring based on ESP32". In this paper, they are telling us about security monitoring based on IOT technology. This system consists of ESP32, PCB Board, Step Down 12V to 5V, Adaptor 12V, Button to reset, PIR Sensor, green LED, red LED, Magnetic Sensor, Internal Touch Sensor, two MOSFET, Alarm Buzzer, and Electric Strike door lock. This is a system that can monitor and control the door remotely, receive a warning if a motion is detected near the door, granting door access to trusted people to control the door, view the door access history log and user access, get a notification that the door is still open after the limit time has passed, and turn on the alarm should the door be opened by force.

[9] In the paper entitled "An IoT Based Home Security System with ESP32, Video Monitoring, and Blynk Integration" ESP32-CAM module, ESP32 microcontroller, PIR sensor, infrared sensor, Blynk app, 12v alarm, and LED bulb have been used to develop a modern and cost-efficient home security system. The ESP32-CAM module works as a surveillance camera. The ESP32 microcontroller is the primary control unit, with which the electronic components are combined, and allows various components to exchange information. PIR sensors and infrared sensor, integral to home security systems, detect changes in infrared radiation emitted by warm objects within their field of view.

[10] Yusuf Aji Cahyono Nugroho Suharto, Lis Diana Mustafa, 2022-Design and Build a Home Security System based on an ESP32 Cam Microcontroller with Telegram Notification. The design of the security system uses the ESP32 Cam microcontroller which is connected to the AM312 PIR sensor and the MC-38 magnet sensor. Data transmission is transmitted via the internet by utilizing the WIFI module on the ESP32 Cam microcontroller.

3. METHODOLOGY:

By using ESP32-CAM, this project establishes a method for achieving automated and intelligent surveillance, which is structured so that image capture and alerts can only occur under certain situations. By doing this, the system can provide the best performance and optimally operate when using the least amount of power. As laid out in the following sections of this guide, the methodology of the work completed for this project consists of the following steps:

1. System Initialization – The first phase of this project consists of initializing all the components (ESP32-CAM, PIR Sensor, LDR Sensor, and Wi-Fi Module) to ensure all components are working together to provide a seamless user experience. During this phase, initial configurations of the camera are established; input pin configurations are created and assigned; and the Wi-Fi Module establishes communication with the Wi-Fi Network allowing data transfer. Once the components are successfully initialized, they will remain powered on for continuous use.

2. Night Condition Checking – The LDR Sensor helps in detecting the lowlight/dark conditions. Only if the condition is dark it sends a signal to the ESP32 microcontroller.

3. Motion Detection – The PIR Sensor will continue to monitor the infrared energy emitted by a human or object until there is a difference in energy levels, thus indicating that either a person or an object has traversed

the area where the PIR is oriented. Once the PIR Sensor detects motion, it will send a signal to the ESP32 microcontroller.

4. Activation of Image Capture and Alert – Once both motion detection and the fact that it is still night have been confirmed, the ESP32-CAM will be activated and an image is captured. The image captured is sent to the website created using HTTP POST request.

5. Alert and Notification: Upon receiving the image, the image and an alert is sent to the user's email. This includes the captured image and a notification stating " hello, your night security system has detected motion and captured an image. Please review it immediately to ensure everything is safe." enabling the user to respond quickly to potential security events.

6. Cool down and Reset: A cooldown period (typically 10 seconds) is introduced after each capture to prevent repeated triggers and alert spamming.

4. BLOCK DIAGRAM:

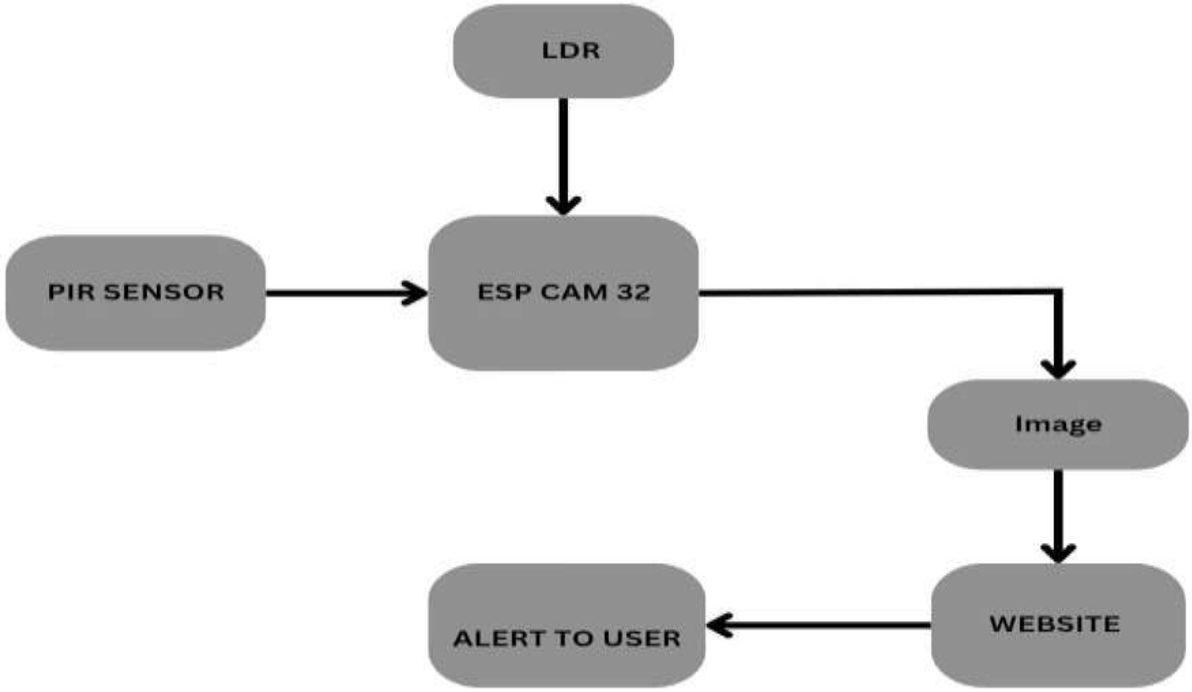


Fig: Intelligent Motion Activated Camera

5. FLOW CHART:

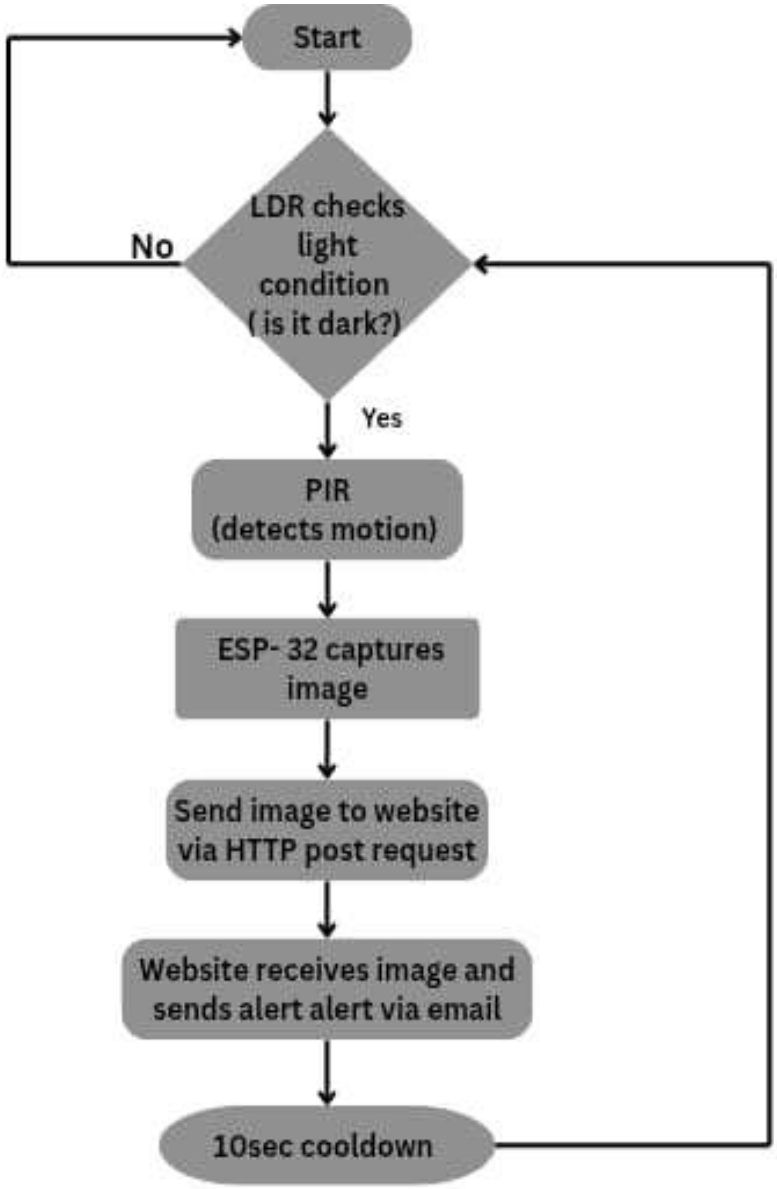


Fig: Flow chart of Intelligent Motion Activated Camera

6. RESULT AND DISCUSSION:

The Intelligent Motion Activated Camera system was successfully designed and implemented using the ESP32-CAM module, PIR motion sensor and LDR sensor. After implementation, the system performed the following operations effectively:

1. Motion Detection:

The PIR sensor accurately detected movement within its sensing range.

When motion occurred, the LED indicator lit up, confirming that motion was successfully detected.

2. Light Detection - LDR (Dark Condition):

The LDR sensor reliably determined the light intensity of the environment.

The system only activated the camera when the LDR indicated a low light condition (darkness), ensuring images were captured only at night or in dark areas.

3. Image Capturing and Processing:

Upon satisfying both conditions (motion detected and dark environment), the ESP32-CAM captured an image. The captured image quality was clear enough for object and person identification.

4. Data Transmission and Server Communication:

The ESP32-CAM successfully connected to the local Wi-Fi network and communicated with the Node.js server using HTTP POST requests.

Each image was uploaded to the server URL defined in the program without packet loss or delays.

5. Image Storage and Cloud Upload:

The server processed and stored each image in Cloudinary, generating a unique cloud URL for remote access.

Each upload record was stored in the MongoDB database, including timestamp and image link.

6. Email Notification System:

Immediately after an image upload, the Node mailer service sent an automated email alert to the registered user.

The email contained the captured image or its cloud link, enabling the user to verify the detected motion instantly.

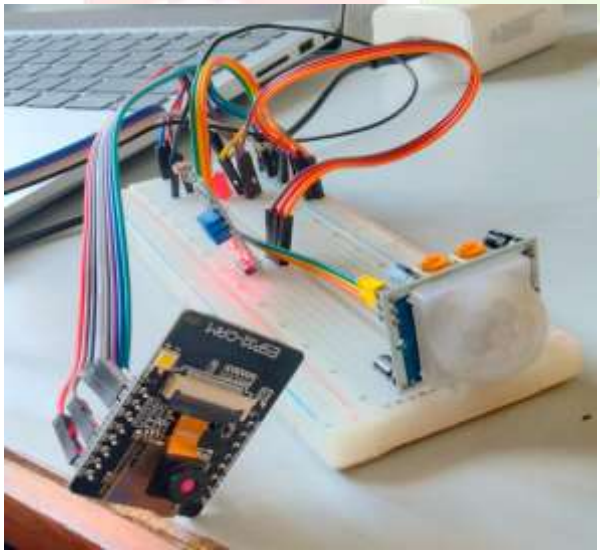
7. Web Interface Performance:

The React.js-based web dashboard displayed all uploaded images in real time.

Users could view through a responsive and user-friendly interface.

8. System Reliability:

The entire system worked reliably under multiple test conditions - day/night cycles, varying motion intensity, and different Wi-Fi strengths.



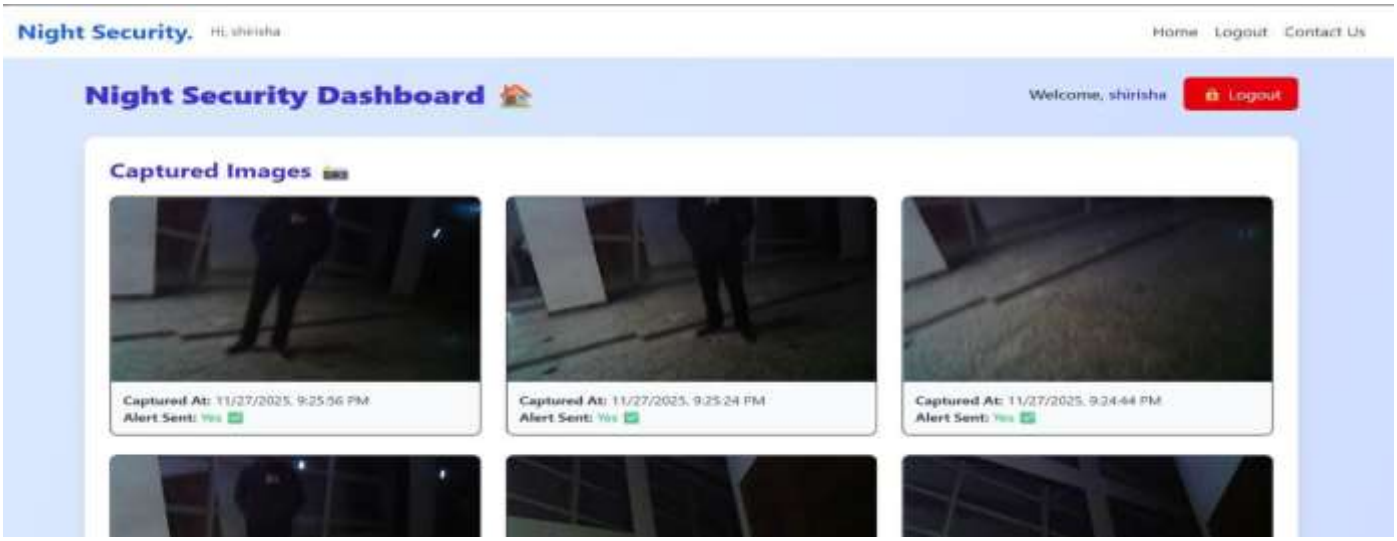


Fig- Working, alert and website image

7. CONCLUSION :

The conclusion of the project has demonstrated that it is possible to create an intelligent camera system using low-cost and readily available parts. As a result, the ESP32-CAM has now become an affordable and effective option for smart surveillance. It allows users to monitor activities in their home or business, capture images when motion is detected, and send alerts via wireless communications without the need for a separate computer.

8. FUTURE SCOPE:

Potential future improvements to this project may include:

1) Integrating software applications like Google's Cloud Storage and Firebase into the existing system to facilitate automatic backup of video and image files to the cloud.

2) Incorporating capabilities such as real-time video streaming through a smartphone application and notifications whenever an event occurs in the monitored area.

3) Implementing artificial intelligence, machine learning, and computer vision technologies to analyze threats more effectively and to enhance the overall performance of the system.

4) Creating the ability to use the system outdoors by providing solar energy sources (solar panels).

5) Provide additional functionalities by connecting with other Internet of Things devices (IoT), such as a burglar alarm or smart door lock.

6) A battery backup in case of power failure.

9. REFERENCES:

[1] www.varta-bezpeka, Ohoronna sygnalizacija, [Online], available at: https://cutt.ly/PMEJhhm

[2] Protypozhezhna sygnalizacija i systemy opovishhennja, [Online], available at: https://cutt.ly/9MEKsaM

[3] Ahumada, J. A., Fegraus, E., Birch, T., Flores, N., Kays, R., O'Brien, T. G., Palmer, J., Schuttler, S., Zhao, J. Y., Jetz, W., Kinnaird, M., Kulkarni, S., Lyet, A., Thau, D., Duong, M., Oliver, R., & Dancer, A. (2020). Wildlife insights: A platform to maximize the potential of camera trap and other passive sensor wildlife data for the planet. Environmental Conservation, 47(1), 1–6. https://doi.org/10.1017/S0376892919000298

[4] ESP32-Cam Pir sensor and photo capture by MS.Jayashree cs, Pradum Singh, Shivanandan NM,Sreelekshmi C,IJARIIE-ISSN(O)-2395 4396,Vol-8 Issue-4 2022.

[5] Real time face detecting unauthorized human movement using ESP32 module by S. Dinakarasu,M.Baskar,C.Balaji,M.Gawtham,e-ISSN: 2395-0056 p-ISSN: 2395-0072Volume: 09 Issue: 06 | June 2022

[6] Bary, P. & Crowley, P. (2012). Network Connectivity. Modern Embedded Computing. https://doi.org/10.1016/B978-0-12-391490-3.00012-6

[7] Caliwan, C. L. (2023, January 19). CIDG: 11.5K criminals nabbed, 9 terror financing raps filed in 2023. Philippine News Agency. Retrieved September 23, 2023, from https://www.pna.gov.ph/articles/1217243

[8] R. H. Yoga Perdana, N. Hidayati, A. W. Yulianto, V. Al Hadid Firdaus, N. N. Sari and D. Suprianto, "Jig Detection Using Scanning Method Base On Internet Of Things For Smart Learning Factory," 2020 IEEE International IOT, Electronics and Mechatronics Conference (IEMTRONICS), 2020, pp. 1-5.

[9] N.H. Rahman, N.A. Abdullah, I.R. Hamid, A CCTV system with SMS alert (CMDSA): An implementation of pixel processing algorithm for motion detection. AIP Conf Proc 1891(1):020013-1–020013-6 (2017)

[10] H. Kruegle, CCTV Surveillance: Video Practices and Technology. Elsevier (2011)

[11] S.K. Panda, S.K. Sahu, Design of IoT-based real-time video surveillance system using Raspberry Pi and sensor network. Intell. Syst. 115–124 (2021)

[12] Chong, P. L., Than, Y. Y., Ganesan, S., & Ravi, P. (2023). An Overview of IoT Based Smart Home Surveillance and Control System: Challenges and Prospects. Malaysian Journal of Science and Advanced Technology, 2(S1), 54–66. https://doi.org/10.56532/mjsat.v2iS1.121

[13] M.F. Wicaksono, M.D. Rahmatya, Implementasi Arduino dan ESP32 CAM untuk smart home. J. Tek. Informasi. 10(1), 40–51 (2020)

[14] J. Obermaier, M. Hutle, Analyzing the security and privacy of cloud-based video surveillance systems, in Proceedings of the 2nd ACM International Workshop on IoT Privacy, Trust, and Security (2016), pp. 22–28

[15] E. P. Dewa dan R. Kartadie, "Integrasi Sensor Gerak Dan Ponsel Pada Arduino Sebagai Sistem Kontrol Keamanan Rumah," JIPI (Jurnal Ilm. Penelit. dan Pembelajaran Inform., vol. 1, no. 02, hal. 30–37, 2016.

[16] M. S. Annas dan D. Maulana, "Perancangan Audio Streaming Menggunakan Wifi Berbasis Mikrokontroler ATMega 328," vol. 1, no. 1, hal. 27–32, 2019.

[17] M. Ardiansyah, A. Febryan, Andriani, dan Rahmania, "Rancang Bangun Sistem Keamanan Rumah Berbasis Telegram Menggunakan Esp 32 Cam," VERTEX ELEKTRO-Jurnal Tek. Elektro UNIMUH, vol. 15, 1, hal. 64–71, 2023, [Daring]. https://journal.unismuh.ac.id/index.php/vertex/article/view/10246/5624

[18] Tersedia pada: F. Masykur dan F. Prasetiyowati, "Aplikasi Rumah Pintar (Smart Home) Pengendali Peralatan," J. Teknol. Inf. dan Ilmu Komput., vol. 3, no. 1, hal. 51–58, 2018.