Internet of Things Based Indoor Smart Surveillance and Monitoring System using Arduino and Raspberry Pi

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Abstract. Security now constitutes a big concern for a day & is rising fast every day. Save your house, records, money & other valuable things like jewellery is vital to all. The methodologies used by offenders have now strengthened with the advancement of very recent technology. Therefore, the appropriate monitoring strategies for global transformation are very critical to develop. Video detection and tracking system are the latest and powerful technologies used against burglary and stealing. However, some individuals can not bear the cost of building and running such devices. A new and efficient system has been suggested for motion detection rather than applying different complex algorithms. When the PIR sensor senses the action, it records the image with the camera & sends it to the user. The cost of construction can be that, and the energy-efficient program can be used with this approach.

Keywords: Arduino, PIR sensor, Surveillance Robot, Camera, IoT, Wireless sensor network etc.

1. Introduction
Together with contemporary society, self-governing mobile robots have taken on an essential role. A relevant type of autonomous mobile robots is geared to the functions of monitoring indoor security. Besides being able to maneuver and avoid obstacles, this specific type of robot must carry out monitoring tasks, such as detecting intruders. Several factors have to be taken into account in creating automated mobile robots, such as the type of operation & the specific robot architecture and sensors that make up the architecture of the robot. Also, an essential component of a robot is its command & navigation system, which is the robotic system software.

Below is the following part of this article. Section II specifies the related works done. The proposed technique and its work are defined in Section III. The analyses and discussions are discussed in Section IV. Part V ends respectively with the conclusion.

2. Literature Survey
It is difficult to obtain an involves enhancing that passes through the static cam in a smart surveillance network. Using a multi-pinned cameras channel & a Pan-Tilt webcam has been recommended[1-2], respectively. Also, a pinch camera & Pan-Tilt-Zoom webcam solution was also recommended, which
gets the image by tracking a camera's activity & then observing the Griddle camera's motion.[3-4]. Nonetheless, in the deep angle even without cam, Remote Bot with the camera was proposed[5] as well for productive image. So where a database and computer are required to transmit the image, interconnecting with many other cameras is difficult because the cam itself uses the interface that wirelessly dispatches the image. A security guard program is listed in buildings with an autonomous robokit[6].

The security robokit is an unmanned robotic device that travels along a programmed road, warning something suspicious, including objects moving[7]. The vehicle is equipped with cams & sends photos back to the control point while patrolling it. Once the patrol has been done, the robot must reload itself instantly and land at a power loading station[8]. Multiple sensory control systems are available: fire detection, intruding detection, driver diagnostic, intrusion detection & environmental detection. The client user can monitor such sensory signals through the Internet [9-10]. As an interface in virtual monitoring and control systems, Laptops & PDA’s can be used. This robot safety systems make our homes and workplaces more stable.

Research has evolved rapidly over the last ten years in the area of multi-camera automatic surveillance. [11] Started playing with object detection strategies in the camera view and passed information from one camera to another on tracked objects [12-13]. While a simulation of a scene was carried out only with results tracked by many nonoverlapping cameras, a variety of ideas came from this work such as the principle of object 'trajectories' [14-15].

3. Proposed System

The ultimate aim of the system is to implement the security system. The system can be achieved through the microcontroller. The proposed device diagram consisting of Controller, Raspberry Pi, Webcam, ultrasonic sensor, PIR, Wi-Fi, motor circuit, and four DC motors, is shown in Figure 1. This is the surveillance system with real-time monitoring. An ultrasonic sensor is used to avoid the robot from crashing on the obstacle which comes before it. The PIR sensor is used while the house owner is off his home to sense human activity. The motor driver circuit is used to interface the motor with the controller and avoid back current from the motor destroying the controller. The data connection is provided through the ESP 8266 Wi-Fi module or the USB Cable. If any motion is detected via a PIR sensor, then the microcontroller creates an alert to a user mobile and drives the motor circuit. The microcontroller records the actions via camera and sends it to the user through the cloud. In this, wireless communication is achieved through the Wi-Fi module or USB cable. Here the Arduino triggers the raspberry camera.

**Arduino:** Arduino is a microcontroller which is operated on ease-to-ease projects. It is an open-source platform. Arduino can achieve a surveillance monitoring system.

**PIR Sensor:** A PIR sensor is a sensor used to detect the motion around its view. It is nothing but, it measures the emitted IR rays of every object. It only detects the general movement.

**Ultrasonic sensor:** An ultrasonic sensor is a sensor that measures the distance of a target object by emitting ultrasonic sound waves, and converts the reflected sound into an electrical signal. It is used to avoid the obstacles in the path of the system.

**Raspberry Pi:** Raspberry Pi is a low-cost, credit-card-sized computer. It is used to implement the camera module to Arduino. Whenever the motion detected, the Arduino trigger the raspberry pi, to use the camera module, and transmit the data to the user via the Internet and cloud system.
4. Results & Discussions
A new and efficient system has been suggested for motion detection rather than applying different complex algorithms. When the PIR sensor senses the action, it records the image with the camera & sends it to the user. The cost of construction can be that, and the energy-efficient program can be used with this approach. Figure 2 shows the hardware implementation of the proposed system. The prototype is switched on by the user once they are set to leave the house. And the prototype starts surveillance, due to the use of ultrasonic sensor the robot avoids the obstacles inside the house. And PIR sensor senses the infra-red rays around the house. So whenever a human come across the robot-kit, then Arduino triggers the raspberry pin which triggers the camera that captures the image inside the house. Also, it is coded in such a way that the captured image is sent to the user.
5. Conclusion
This paper offers a more efficient web cameras monitoring system and surveillance system to deploy a portable bot using a solo smart surveillance device developed and implemented. The robot moves intruder tracking and video communications devices, camera surveillance system, uses motion vectors to find the direction, and Autonomous surveillance system Monitors the object or a human being who may come across, as the robot travels & senses the movement of humans & transmits the image to the users from the road, by using data from an entity.

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