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A Study on using a PIR Sensor of Surveillance Robot Capturing Intruder

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Abstract

This research focuses on a surveillance mission carried out in an environment by an autonomous mobile robot. The Robert is intended to discover as many invaders as possible during its operation, thanks to its versatility and monitoring capabilities. However, because the robot does not know where and how many environmental intruders are present, it is hard for the robot to estimate an intrusion pattern or discover unknown intruders without the data. This paper addresses the problem of estimating the robot's incursion trend by presenting a novel surveillance strategy. Bayes' rule is primarily utilised for this purpose. This probabilistic technique enables the robot to express invaders based on their probability and frequency of occurrence. In addition to smaller locations, the robot is primarily capable of monitoring places with an infiltration tendency. The efficiency of the proposed strategy for unknown intrusions is demonstrated through simulation studies. Furthermore, the robot's adaptability to various types of infiltration trends is examined using a probabilistic technique.

Keyword: *Robot, Surveillance, Bayes' rule, Intruders, PIR sensor*

INTRODUCTION

The most important reason to choose a security system is to protect our property from burglaries. Thefts and burglaries are recorded on a daily basis, and the number of incidents is increasing. As a result, it is solely the responsibility of each individual to secure their own safety. Installing a

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security system in our provinces could be a viable deterrent to these burglary difficulties. Burglaries and crime rates can be influenced by security systems and alarm monitoring systems. These security systems present a significant obstacle to thieves, making it easier for police officers to apprehend them.

According to several statistics, a place secured by any type of security system is less vulnerable to robberies. As a result, in addition to security precautions such as window locks and door deadbolts, a security system is a top contender for security alternatives. For those considering installing a security system, the price, which often includes a monthly fee as well as any initial installation items and charges, is often the most important factor. However, the expenditure is justified in light of the potential risks, a decision that we alone can make.

Security systems employ a variety of equipment (such as cameras and alarms) as well as human intervention to safeguard people and property against threats such as crime and theft. Instead of simply defending our provinces, these security systems can notify a firm that is monitoring our target, inform us the status of intrusions, and alert the surrounding area in the event of a break-in, among other things. For the development of a user-friendly and effective security system, various technologies are being used.

METHODOLOGY

Methodology in Use

Surveillance is the process of keeping track of the state and condition of an environment. Monitoring cameras can be found in office buildings for security and safety purposes. These cameras are also used to deter crime. The installation of cameras has been regarded as an art gallery and sensor planning issues. However, it is impossible to keep track of the entire community's living environment. As a result, we continue to be victims of invasion crimes. Crimes do, in fact, occur in the blind zones. The mobility of monitoring equipment has received a lot of attention in recent years. The focus of this research is on an autonomous mobile robot with a camera as a vision sensor. The robot's surveillance job is to use its mobility and monitoring capabilities to detect as many intruders as possible. The robot now has a map of its surroundings.

It is essential of the robot to visit as many rooms and unknown intruders as possible. In the initial stage of patrolling, however, the robot does not have accurate

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information on intruders. As a result, the robot acquires the knowledge first during patrolling trials. In terms of data, the robot concentrates on the likelihood of an incursion into the room. The target rooms are then chosen based on the likelihood of an infiltration. The intelligent patrolling faces a hurdle in the so-called explore/exploit trade-off in reinforcement learning to address the problem of patrolling as part of the learning concerns. As a result, the problem of multi-armed bandits is introduced. For this goal, we propose stochastic surveillance systems based on Bayesian learning.

Drawbacks

- Because crime rates are rising in cities around the country, we need to protect our sector.
- We are currently unable to follow the theft in real time (instantly). When looking into having an alarm monitoring system, the cost is generally the biggest deterrent.
- It is incapable of detecting moving intruders.
- There is no notification to the owner of the breakdown.
- It fails to catch the image of the invader.

Proposed Methodology

When you consider all of the possible savings that you could lose in a single burglary, the proposed security system may end up being less expensive. It is classified as a commercial security system. More advanced technologies and equipment are used in commercial security systems. Small-business security systems can't afford the most advanced technologies. As a result, we created this project for small enterprises at a low cost.

In a given setting, the suggested system detects human intrusions. In the event of a malfunction, such as an unauthorised person accessing the room, a fire, or a leak of flammable gas, the owner is notified immediately. The intruder image is caught by the webcam attached on the robot, and an SMS is sent through the IoT. The image of the intruder is sent to authorised mail, and a buzzer is activated at the location of the breakdown.

This system appears to be made up of two modules, as shown in Figure 1. The transmitter part, for example, detects any movement at our target location. When it detects motion, it sends a notification to

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the beneficiary. This part is extremely accurate in recognising movement, and the surveillance range may be adjusted to meet the needs.

A PIR sensor, a module that warns the user about intrusion, and a module that triggers the alarm through a buzzer are among the hardware modules used in this module. The Email application is the other module. The intruder's email is sent to the recipient.

RESULT AND CONVERSATION

The authorised person is first notified of the motion detection, and then the intruder image is transmitted to the permitted email address. The image of the invader is caught by a web camera mounted on the robot.

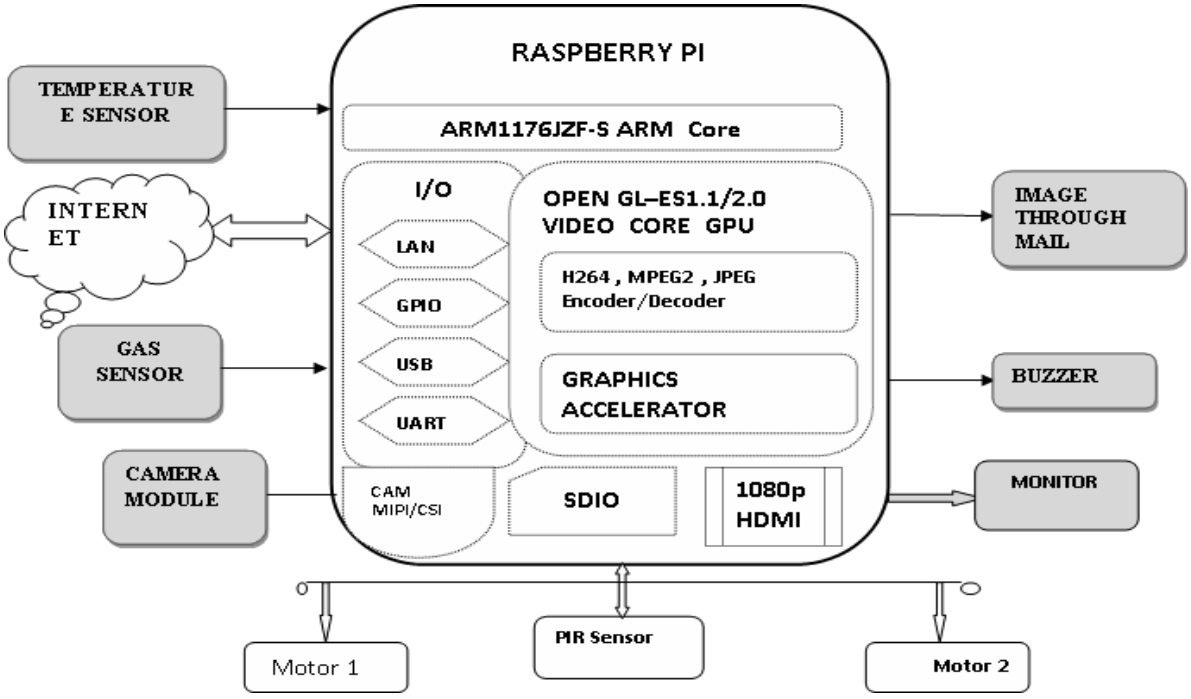


Figure 1: Block diagram of security system

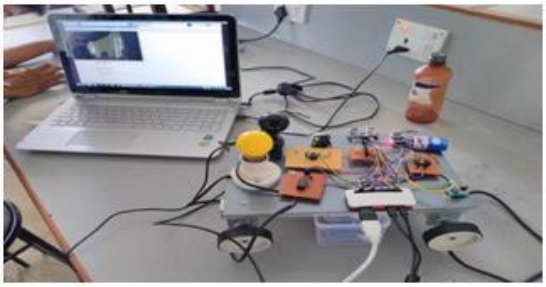


Figure 2: Complete security system setup

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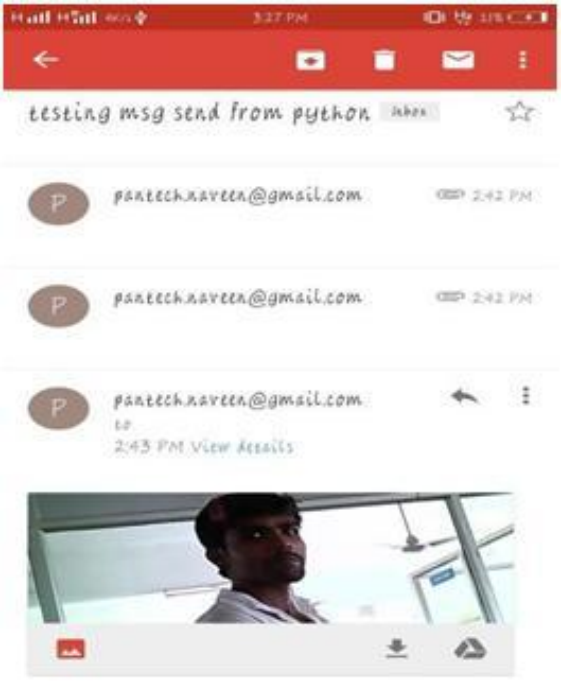


Figure 3: Intruder image send to mail

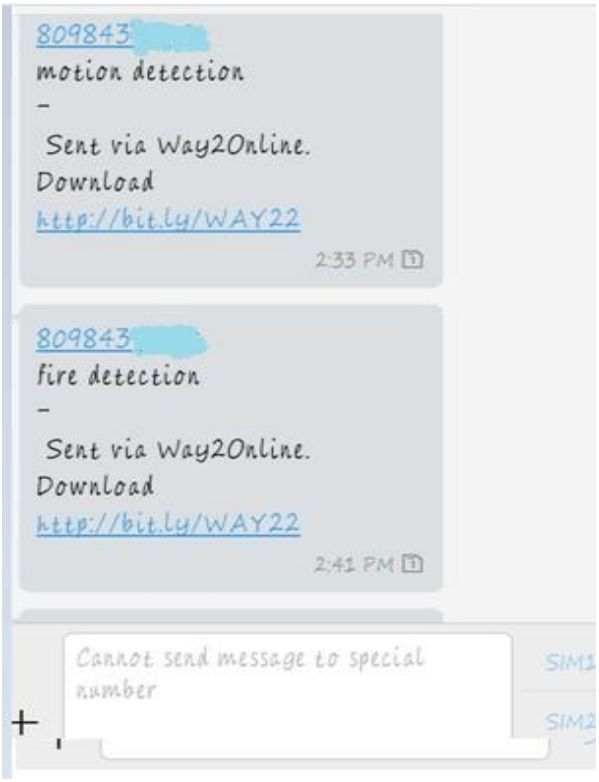


Figure 4: Intimation about the breakdown (SMS)

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Figure 5: The glowing of bulb and the buzzer alarming sound in case of intruder detection

CONCLUSION

When a person enters our industry in an unwelcome manner, the movement of that person is initially recognised by a PIR sensor based on temperature fluctuations. The PIR sensor is attached to the Raspberry Pi, and the processor outputs "Movement detected" on the serial monitor. The CPU is then connected to the Internet of Things. After movement is detected, IoT sends a message alert to the user's smartphone. When the user sees the notification, he or she can take the appropriate action. The photographs were collected and successfully uploaded to the email. In our industry, the robot will activate the buzzer in the event of an intruder. In the event of an unwelcome intrusion (such as a pet animal moving), the alarm button will not be triggered; instead, we will observe it via our application's web camera. If theft is detected in the future, the photographs acquired by our webcam will be communicated to an authorised person in a timely manner.

ENHANCEMENT IN THE FUTURE

Because of its features such as low power transmission, robustness for multipath fading, and low power dissipation, the system will be more precise in the future if a UWB sensor (Ultra Wide Band Technology) is used. When more than one PIR sensor is used, the target area under monitoring can be expanded. This system will be upgraded to allow access to a larger number of cameras and sensors. If a theft is detected, the photographs acquired by our web camera will be communicated to an authorised person in a timely manner.

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