Evaluating and identifying a 24x7 Internet of Things-based 2PI surveillance system with Raspberry Pi

[1]Kondala Rao Punati, [2]Sowmya Chowdar Y Malinid I, [3]Kiranmai Potnoori, [4]B Sinduja
[1,2,3]Assistant Professor, [4]UG Student, [1,2,3,4]Department of Electronics and Communication Engineering, Rishi MS Institute of Engineering and Technlogy for Women, Kukatpally, Hyderabad.

ABSTRACT
The fact that precious items are routinely stolen is certainly one of the world's numerous concerns. Consumers may already purchase a number of tools that will aid them in finding products that are currently on the market. One of them would be setting off an alarm using the television's remote control. However, these solutions lack a feature that would enable automatic tracking and recovery of stolen devices. A call was made to the property owner in an attempt to contact them. A project that seeks to find a solution to this issue will make use of theft identification based on camera video. This objective will be achieved through the use of image processing. The system compares the two image frames to determine whether or not there has been movement since the previous comparison. When the system identifies motion, the system owner is immediately notified with an alert message and provided with a picture of the event.
Keywords: IoT; surveillance; security; Raspberry Pi

INTRODUCTION

One of the most common and fundamental forms of criminal behavior is theft, and it is becoming more and more commonplace every day [1]. The number of crimes has increased throughout the entire country, not just in one area. With an increase in thefts, people feel more powerless and as like they have lost something. To prevent the issue from getting worse, there has to be a solution that can end thievery everywhere [2]. It requires little effort to arm or disarm the system, is easy to use, and does not generate a lot of false alerts. The development of security measures to prevent theft will be the primary focus of this project. Pay extremely close attention to the precautions that have been taken inside the room [3]. This item is an apparatus mounting atop the structure is an option, and installation within the area is not required. It will be adequate for its purpose to identify motion in the environment. Through the use of detection movement, it is possible to differentiate between a bogus theft claim and a genuine one. You can also differentiate between minor and significant alterations to the legal system. The term "output device" refers to the software or programmed that is run to activate the output device [4]. You can either move forward by pressing a key on the keyboard or by clicking a button. You only need topress a single button on your computer's keyboard or the touch-screen of your mobile device to turn off the output device [5]. For the purpose of this project, the computer will be used to monitor the camera and search for any indication that there is motion in the store or any other protected area [6-7]. The Raspberry Pi is a low-cost, small computer that is about the size of a credit card and can be purchased for a relatively low price [8]. It can be connected to a computer monitor or atelevision, and its keyboard and mouse are compatible with those of the vast majority of other computers [9]. It is a device that enables people of all ages to learn about computers and how to code in languages such as Scratch and Python. The device is quite small but packs a powerful punch [10]. The component in question is known as a Raspberry Pi. It is capable of performing all of the tasks that one would normally expect a conventional desktop computer to be able to perform [11]. Additionally, able to communicate with the outside world, the Raspberry Pi has found its way into a variety of digital maker projects due to its versatility. These projects range from music makers and parent finders to weather stations and

birdhouses equipped with infra-red cameras that produce tweeting sounds [12-15]. Every one of our DVR recorders is equipped with a function that initiates recording whenever motion is detected [16-21]. The digital video recorder watches what is being captured by the cameras and makes a determination regarding the presence of motion based on what it sees. The DVR must examine each image frame individually to accomplish this task. It demonstrates how they differ from the one that came before them. If it finds differences, then it presumptively concludes that motion took place because the differences indicate that something has changed [22-26].

Proposed System

The following is the block diagram, which can be found in Figure 1: The framework that underpins the operation of the system. There is also Raspberry Pie 3, in addition to the original
Raspberry Pi. One of the most essential elements of a computer is referred to by its component name, the Pi Camera module.

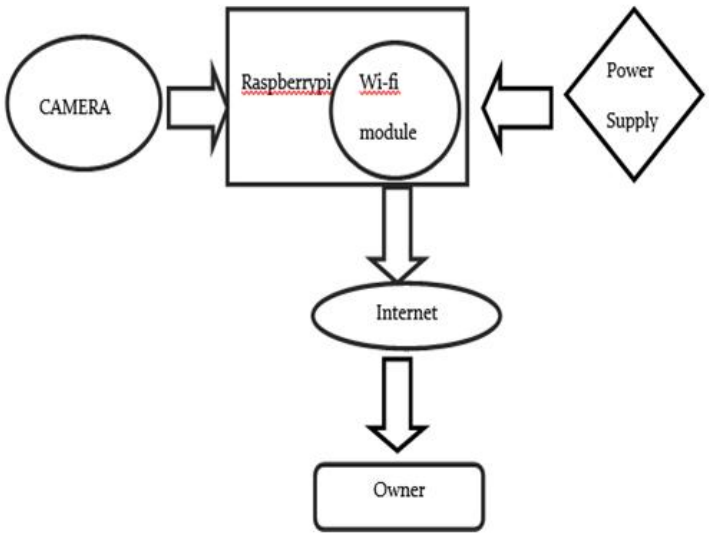

Fig.1. Block diagram of proposed system

Because it is responsible for controlling everything else, this step is an essential component of the process. This location contains a Wi-Fi module for your convenience. Because it is constructed on hardware, the Raspberry Pi 3b does not require an additional Wi-Fi module to function. The proposal that has been made for the plan If a company is well run, its human resources department won't have to keep a close watch on it all the time because it won't be necessary to do so. Therefore, people's offers of additional work are never refused. A Raspberry Pi 3 serves as the central processing unit for this project B (sample), which is being demonstrated here. Putting the pieces of the puzzle together: Make use of sensors to maintain a constant awareness of the location of the space. They will send a warning message to the proprietor of the store along with the photographs that they have taken regardless of whether or not anyone enters the store. In this particular defence system, image processing is used to determine whether or not something is in motion.

Figure 2, which can be found down below, depicts the sequence of events that took place. The actions that are carried out by a computer after it has taken a picture The proprietor is informed that there is an issue with the system.

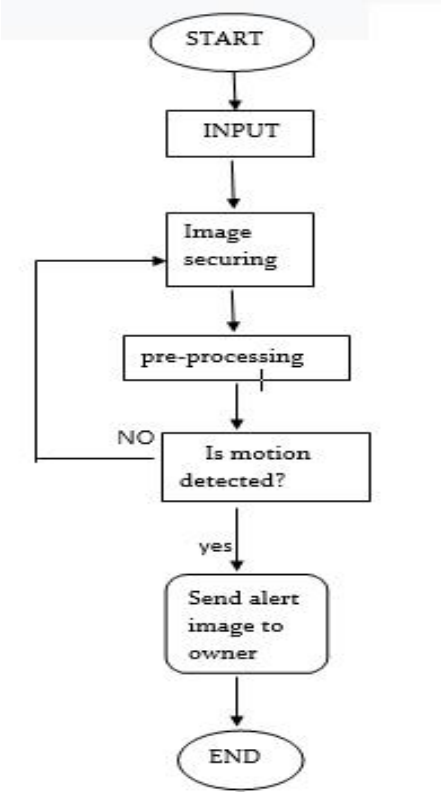

Fig.2. Flow Chart

START and INPUT

The anti-theft device in the room or shop will require between 5 and 12 volts of electricity once the camera module for the Raspberry Pi has been installed. The operation of the entire system will begin as quickly as is humanly possible. providing uninterrupted power to the apparatus

Securing Image

As an input device, the Raspberry Pi Camera Module will be utilised in the system that has been proposed. Video can be captured at a resolution of 280 by 180 pixels per hour using this device. This paves the way for the acquisition of the system. The camera has been set up in its new location. It is recommended that the frame rate for both the wall and the video be set to 18 frames per second. Finding things that are moving around can be very challenging at times. The presence of noise, reflections, and shadows, as well as varying degrees of brightness, is a significant factor. will be implemented in order to facilitate the discovery of the suggestedalgorithm. The various nuances that distinguish one legal system from another

Preprocessing

During the pre-processing stage, a number of operations, including background evaluation, background minus, external rejection, legal difference, and section, are carried out simultaneously.

Background evaluation

The background rating of this picture is grade A, and "background rating" is a shortened form of "background rating." In order to unravel the mystery of what took place, a significant number of the laws that were suspended will be reinstated. In order to conduct a background check, this stepmust first be taken. Analyzing the events that took place in the past Taking into consideration only the context in which the attitude was formed; this is a straightforward example of taking thecontext into consideration. The background is comprised of the entirety of the image, including the picture's border or frame. In this particular instance, the Background evaluation requires

only a single frame to be completed.

Background minus

The background is first removed from the image using each algorithm for processing images, and then the background is assigned a score. Getting rid of the background is almost always the most effective method for locating objects in a picture. It requires making educated guesses about the background of an image in order to locate the objects that are contained within the image. It appears that the background has been removed. The process is carried out in the pixels domain one pixel at a time at a time. The method that was suggested operates on a pixel-by-pixelbasis, omitting the background and leaving room for errors.

External rejection

When it comes to the search for nearby neighbours, the appropriate actions will be taken. The pattern that is visible in the two images that came before and after the one we are looking at rightnow. However, there are a few issues with using this approach. For instance, it manufactures a great deal of exteriors. It is possible for these Outsiders to make registration errors, some of which are very important. RANSAC The algorithm is what is used to get rid of the componentsthat are on the outside.

The operation is as follows:

An illustration of how the external rejection method operates in conjunction with RANSAC isprovided by the algorithm.

Iteration:=k

While iteration< k

N randomly selected corresponding pointsCalculate h^t-1,

Consensus_set count:=0

For every corresponding point p^t-1,p^t,If ||[p^t-1,1]-H^t-1,[P^t,1] <& then

Increase consensus_set countIncrease iterations

Return best H^t-1,

Because of the random selection process, it can be challenging to find pairs of matches that are compatible with one another. It has been determined what the value of the Htt-1 change will be. The RANSAC algorithm's ability to be matched is evaluated using the objective function. Inhale through the process of calculating the Euclidean distance between dots in three dimensions that have not changed and dots that have changed in three dimensions.

Section

The results of the frame subtraction method are problematic in many different ways. Some examples of this include blockages and ghost spots. The information contained in the record is accurate. In conclusion, the following points will be made: removing by cutting it up into smaller pieces using the sectioning method. Division, which was initiated on the outskirts of the RANSAC, possesses the following points: When you move an object, the voxels to which it is attached will be combined with those of the surrounding voxels.

Decision Making

The process that is used to make decisions The proposed system makes use of an algorithm that is straightforward in its explanation and is predicated on the degree to which various features complement one another. They started off by being taken captive. This image is going to besaved in the database so that it can be referred to at some point in the future. Object discoveredas a direct result of a brand new photograph that was recently taken To match the values in the database, you should apply a technique known as "feature fit." In the event that the currents cooperate effectively, there will be sufficient space in the frame to accommodate both the picture frame and the note. If you have a database, the proposed system will send you a warning message about the potential risks. In addition to the lengthy initial video, the user or owner can view the image that was captured on their device. They are not going to compete against one another in any way. After these two snapshots, the process that was initiated in the previous image will carry on. Acquisition Steps Input from either the user or the owner is required by the algorithm that makes decisions. Shop, immediately following the sending

of the alert to you and the taking of the picture. The user will examine the picture, and based on what they see, they willdetermine whether or not the item has been stolen. Whether what they say is accurate or not, as well as whether or not they believe something should be done, the question remains.

Use case diagram

Use-case diagrams, such as figure 3, illustrate the motion sensor camera's complete function in the system.

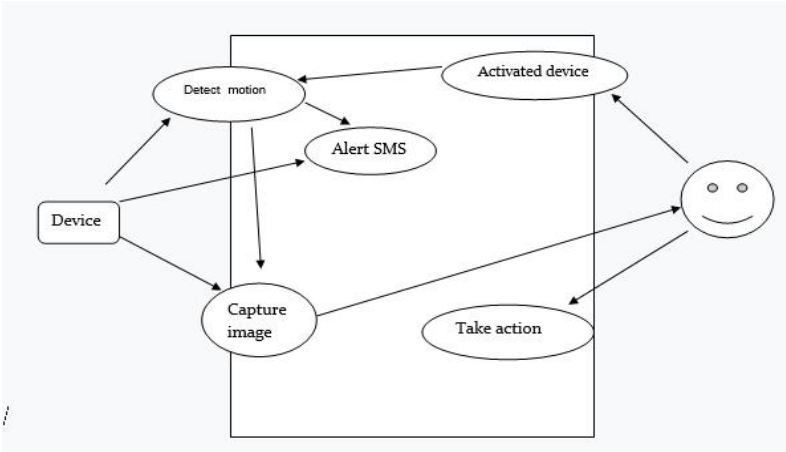

Fig.3. Use Case Diagram

System

An anti-theft device for the system that begins functioning the moment it is installed in the appropriate location. The owner of the camera will initially begin the motion detection task, and then the task will be started after it has been prepared with the assistance of written code for image processing techniques. It will take place if there is any movement toward it. Send a warning message to the owner of the dog, along with a picture of the people who currently have the dog. On the page that the app displays for the proprietor, it offers the user a selection of options for how to deal with the alert message that was received.

An uninterruptible power supply with a voltage range of 5–12 volts must be provided by the person who owns the device before it can be used. This step needs to be taken before the tool canbe put to use. The owner will investigate the situation if the device detects motion and sends an image along with the alert message. The contents of the message could indicate whether or not the alleged theft actually occurred. If the theft actually took place, the owner will be responsible for dealing with the aftermath. To request assistance, select "Call Police" from the list ofavailable options in the application. The proprietor has the option of ignoring the message altogether by selecting "Ignore" from the available menu options in the event that the notificationis in error. This is done in order to improve the police officers' ability to do their jobs.

Advantages

It helps keep people safe by detecting movements that could be suspicious and acting on thatinformation.

It makes the overall level of safety higher.

Make the investigation into the post move along at a more rapid pace.

Conclusion

The computer will only take pictures whenever it detects that there is motion in the scene. Exceeds a particular limit that had been predetermined by the system administrators. Because of this, there is less data to consider, which makes the process simpler and more straightforward to carry out. Additionally, because it does not require the use of images that are static, it helps save space. The majority of the time, the intriguing aspect is not contained within the phrase. It is going to be beneficial for both the home and the workplace. It is possible to use it as a sensor for the intelligent home security system as soon as the project is completed and is functioning

effectively. Extremely useful for locating instances of automatic theft, which is essential for maintaining security. It will come in handy at the bank, the museum, and even out on the street after midnight. In the course of our future research, we intend to make use of artificial intelligence in order to differentiate between the actual act of stealing and the straightforward relocation of an item.

References

1. Piquero, Nicole Leeper, Alex R. Piquero, Stephen Gies, Brandn Green, Amanda Bobnis, and Eva Velasquez. "Preventing identity theft: perspectives on technological solutions from industry insiders." Victims & offenders 16, no. 3 (2021): 444-463.
2. Quinn, Liam, Joseph Clare, Jade Lindley, and Frank Morgan. "The relationship between variation in price and theft rates of consumer and commodity goods over time: A systematic review." Journal of Experimental Criminology (2022): 1-31.
3. Kumar, K. Suresh, AS Radha Mani, S. Sundaresan, T. Ananth Kumar, and Y. Harold Robinson. "Blockchain-based energy-efficient smart green city in IoT environments." In Blockchain for Smart Cities, pp. 81-103. Elsevier, 2021.
4. Khant, Shailesh, and Atul Patel. "COVID19 Remote Engineering Education: Learning of an Embedded System with Practical Perspective." In 2021 International Conference on Innovative Practices in Technology and Management (ICIPTM), pp. 15-19. IEEE, 2021.
5. Kumar, K. Suresh, T. Ananth Kumar, A. S. Radhamani, and S. Sundaresan. "Blockchain Technology: An Insight into Architecture, Use Cases, and Its Application with Industrial IoT and Big Data." In Blockchain Technology, pp. 23-42. CRC Press, 2020.
6. Raj, S. Gokul, N. Srinath, and T. Ananth Kumar. "Real-Time Trespasser Detection Using GPS based UAV." In 2019 IEEE International Conference on Innovations in Communication, Computing and Instrumentation (ICCI), pp. 50-54. IEEE, 2019.
7. Kalyanam, Krishnamoorthy, David Casbeer, and Meir Pachter. "Pursuit of a moving target with bounded speed on a directed acyclic graph under partial information." IMA Journal of Mathematical Control and Information 38, no. 1 (2021): 74-89.
8. Rajakumar, G., and T. Ananth Kumar. "Design of Advanced Security System Using Vein Pattern Recognition and Image Segmentation Techniques." In Advance Concepts of Image Processing and Pattern Recognition, pp. 213-225. Springer, Singapore, 2022.
9. Babu, J. Chinna, and K. Naveen Kumar Raju. "Safety Locker System with Image Identification by Using IOT." Modern Approaches in Machine Learning & Cognitive Science: AWalkthrough 1027 (2022): 415.
10. Padmapriya, N., T. Ananth Kumar, R. Rajmohan, M. Pavithra, and P. Kanimozhi. "Secure Vehicular Communication Using Blockchain Technology." In Blockchain, Artificial Intelligence, and the Internet of Things, pp. 141-162. Springer, Cham, 2022.
11. Joseph, Abin John, Nidhin Sani, K. Suresh Kumar, T. Ananth Kumar, and R. Nishanth. "Towards a Novel and Efficient Public Key Management for Peer-Peer Security in Wireless Ad- Hoc/sensor Networks." In 2022 International Conference on Smart Technologies and Systems for Next Generation Computing (ICSTSN), pp. 1-4. IEEE, 2022.
12. Kumar, K. Suresh, A. S. Radhamani, and S. Sundaresan. "Proficient approaches for scalability and security in IoT through edge/fog/cloud computing: a survey." International Journal of Data Science 6, no. 1 (2021): 33-44.
13. Gholamzadeh, Amin, Yang Qiu, Min Zhang, Shuping Dang, and Nadim Hossain. "Sensor system to detect accidental bucket contact with structures and people." In 2015 IEEE International Conference on Signal Processing, Informatics, Communication and Energy Systems (SPICES), pp. 1-4. IEEE, 2015.

14. Kumar, K. Suresh, T. Ananth Kumar, S. Sundaresan, and V. Kishore Kumar. "Green IoT for Sustainable Growth and Energy Management in Smart Cities." In Handbook of Green Engineering Technologies for Sustainable Smart Cities, pp. 155-172. CRC Press, 2021.
15. Kumar, T. Ananth, A. John, and C. Ramesh Kumar. "2. IoT technology and applications." Internet of Things 43 (2020).
16. Alangari, & Ahmed Khan, N. (2021). Artificially Intelligent Warehouse Management System. Asian Journal of Basic Science & Research, 3(3), 16–24. https://doi.org/10.38177/AJBSR.2021.3302.
17. Khan, Siddiqi, A. M. U., & Ahmad, M. (2021). Development of Intelligent Alumni Management System for Universities. Asian Journal of Basic Science & Research, 3(2), 51–60. https://doi.org/10.38177/AJBSR.2021.3206.
18. Pawar, Ambhika, C., & Murukesh, C. (2021). IoT Hacking: Cyber Security Point of View. Asian Journal of Basic Science & Research, 3(2), 1–9. https://doi.org/10.38177/AJBSR.2021.3201.
19. Stefano Farné, Francesco Benzi & Ezio Bassi. (2020). IIOT based efficiency optimization in logistics applications. Asian Journal of Basic Science & Research, 2(4), 59-73. https://doi.org/10.38177/AJBSR.2020.2406.
20. Lumasag, Jerry M. and Talirongan, Hidear and Talirongan, Florence Jean B. and Labanza, Charies L., Data-driven Decision Support on Student's Behavior using Fuzzy-Based Approach (2020). Middle East Journal of Applied Science & Technology, Vol.3, Iss.4, Pages 59- 68, October-December, Available at SSRN: https://ssrn.com/abstract=3815265.
21. Li, Junyan. "Cyber-attacks on cameras in the IoT networks." In 2021 2nd International Conference on Computer Communication and Network Security (CCNS), pp. 94-97. IEEE, 2021.
22. Kumar, Tamilarasan Ananth, Rajendrane Rajmohan, Muthu Pavithra, Sunday Adeola Ajagbe, Rania Hodhod, and Tarek Gaber. "Automatic face mask detection system in public transportation in smart cities using IoT and deep learning." Electronics 11, no. 6 (2022): 904.
23. Devi, A., M. Julie Therese, P. Dharani Devi, and T. Ananth Kumar. "IoT-Based Smart Pipeline Leakage Detecting System for Petroleum Industries." In Industry 4.0 Interoperability, Analytics, Security, and Case Studies, pp. 149-168. CRC Press, 2021
24. Kumar, T. Deva, TS Arun Samuel, and T. Ananth Kumar. "Transforming 2 Green Cities with IoT." Handbook of Green Engineering Technologies for Sustainable Smart Cities (2021): 17.
25. Matilda, S., and T. Ananth Kumar. "The Winning Combo: Cryptocurrency and Blockchain." In Blockchain Technology, pp. 199-217. CRC Press, 2020.
26. Arago, Nilo, Rodney Rafael Robles, Chris Alvarez, Angelita Mabale, Charl Legista, Nicole Repiso, Timothy Amado, August Thio-ac, Lean Karlo Tolentino, and Jessica Velasco. "Smart Dairy Cattle Farming and In-Heat Detection through the Internet of Things (IoT)." International Journal of Integrated Engineering 14, no. 1 (2022): 157-172.