



Smart Video Surveillance System Using IoT

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Abstract:- Security in our daily lives has now become a basic requirement for all of us. The rapid advancement of technology has resulted in a more sophisticated life, and on the other hand, it can be used to save lives and protect the assets we have acquired. However, we must understand how to use the technology. When we are not at home, one of the most serious problems is home burglary and crime. Because of the lack of monitoring systems in our home, burglars may be able to steal all of our mobile assets while we are away on vacation. There's a chance we'll lose everything we've worked hard for in order to have a brighter future. As a result, we require an effective home monitoring system capable of enabling the aforementioned situation. For the same scenario, there are numerous monitoring systems available; however, in this work, we offer a new efficient monitoring system with a dynamic cloud resource allocation method and better data analytics that provides the most accurate findings.

Term Index- Real-time video surveillance, IoT-based home security, and IoT-based surveillance are all examples of IoT-based surveillance.

Introduction:-

The proposed system is based on Internet of Things (IoT) technology. The standard model detailed below is at the heart of IOT's basic architecture. It entails the data being processed by connected devices. The system begins with a data-gathering module known as sensors. IoT Devices, IoT

Connectivity, and Embedded Intelligence are discussed. The surveillance video camera is used as an IOT sensor device in our proposed system. It could be either wired or wireless. The main focus of this module is data sensing, which includes data capture, precise data sensing, and data storage. Analog sensors and digital sensors can be classified based on their output. It can be classified as a scalar sensor or a vector sensor based on the data type. The following module includes Internet gateways, a data acquisition system for data aggregation, analogue to digital conversion, measurement, and control. It also provides data transit and security. Focusing on access networks, cloud, and edge data transfer is what access means. Then we require Edge IT, which is the analytics and preprocessing component of the proposing system, where we offered an Improved data analytics approaches for image comparison algorithm for improved analysis. Because a decision must be made in the system based on the outcomes of this study. As a result, we've prioritised the data analytics section. Big Data analytics, Artificial Intelligence, and cognitive analysis at the edge are all part of this data analytics. Then there's Data Value and Action Taken, which includes everything from analysis to action, APIs and processes, and Actionable Intelligence. This is the setup's final module. It's also a crucial component of the IoT Architecture. Action will be performed or automation can be created based on the decision made and the analysis. Regardless, now that we've created an IoT-based application, we need to focus on the following difficulties in order to improve performance. That

is a problem with Hardware Compatibility. In this application, we use a greater number of devices. All of our devices must be compatible with one another. Data connectivity is the second concern. We must ensure data connectivity during the data transfer from the first to the last module. It means that data should not be lost at any time. Because even a single minute of delay has an impact on the system's performance. There is a large potential for data loss in this location. Almost all gateway devices available are compatible with GPRS and Wi-Fi. Next challenge is Data Analytics, one of the most important part too. Next challenge is the analytics challenge .The real worth of this IOT system is realized through the effective and most appropriate actions taken from the collected data and analysis done at the final state. So the analytics we used must be capable of handling enormous datasets. Then incorrect data capture difficulties must be addressed in this section. Due to this issue the whole system will become incorrect. So we must analyze the data's coming from the sensors and ensure that we are processing with the right dataset. Finally a data security issues can be consider for the given setup. Securing the system from many ransomware and other attacks. And, all IOT applications we need to ensure that the data is being processed safe. The flow of data in our system will be from sensor to gateway then gateway to Internet through proxy server. From the internet to cloud server via web socket .There an improved analytics algorithm is enabled .From the results made actuation will be stimulated. Video sensing is the technology of Digital image Analysis. The proposed systems can range from wireless house security cameras to sophisticated alarm systems that reports law enforcement at the first sign of trouble. The presence of video sensing cameras can serve as a deterrent to thieves, whereas hidden cameras can protect discretely. The communication between the cameras and the gateway may be wired or wireless, anyhow maintaining the system with standard Wi-Fi technology can be advisable. All IOT Devices in the setup is in the network. So each will have its own unique identification address called as Internet Protocol address.

Advantages of video surveillance:

Availability- There was a time when the surveillance techniques were utilized only in shopping centers and malls. Now-a-days, you can notice closed-circuit televisions almost at any place you visit, from a small store to homes and holy places. As a result, they guarantee greater public security at a fraction of the cost.

Real-time monitoring- Traditionally big organizations have always had the benefits of video surveillance manned by security professionals. In the past times, the events captured on video were used to expose important information and work as proof after the event happened. But, modern technologies let users to check and reply to alarms immediately

2.Smart home surveillance system using iot with an efficient data analytics:-

IOT devices will interchange the data with other connected device or it only give/get the data from another device and communicate the data to cloud or server. Global cloud Communication will be taken place with the help of IOT Protocol. It consists of Data link layer, Network layer, Transport layer and Application layer. Data link layer supports 2G/3G/4G.And all other communication medium like LR-WPAN, Wi-Fi, WiMAX and Ethernet connection. Network layer or Internet layer supports IPv4 and IPv6 capabilities. Then transport layer will give the support over the TCP and UDP which deals about wired and wireless medium. Finally the Application layer deals with HTTP, CoAP, Web Socket and DDS. Here TCP provides connection oriented reliable transmission. Also provides error detection facility to ensure that no duplication of packets. But, UDP is connectionless doesn't have reliable transmission. And it is not providing the proper ordering of message. It is stateless and transaction oriented. Then the logical design of this IOT application involves devices, communication, services, management, security and application. And it needs the help of the technologies such as wireless sensor networks, cloud computing, big data analysis and embedded systems. In the proposed system we have four types of communication models such as device to device communication, device to gateway communication,

device to cloud communication and backend data sharing model.

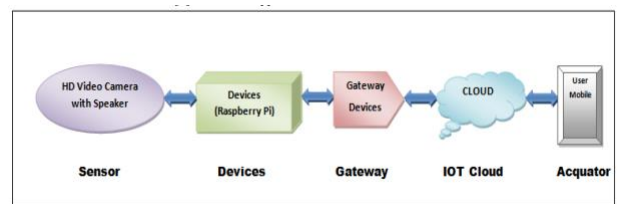
Existing System:-

The Existing system in surveillance mechanism available that video capturing device is working based of the motion detection algorithm. It detects the motion inside the home and sends the data to the cloud for analysis through gateway. Based on the decision made an SMS will send and the captured video will send to the mail id 1. In the next approach, when a sensor detects the unauthorized movement in the home, it sends the sensed date to the to the cloud and that image will be send to user mail id and alert SMS will be send to the user mobile number 2. In both approach Raspberry Pi is used for the human detection. In our proposed work also we use High definition video surveillance camera is used as a sensor device. Then with the help of Raspberry Pi human moment is being identified, then the SMS alert will be send to the registered mobile number and also one more module is added with the existing system. That is live streaming will be initiated to the user mobile with the help of an application installed in the actuator side..

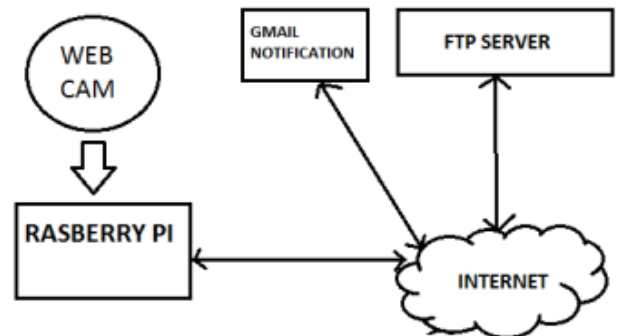
3. Working Priciple:-

We propose an Improved smart home surveillance system with enhanced facilities which provides the most accurate results .The system architecture of the proposed system is given and discussed .From the sensor side data is being collected and that will be transmitted to the internet cloud through the gateway. Analytics will be done as a part of the proposed system. Whether any moment is there in the locked room or not using Human motion analysis. In which the moment of the human being is detected with the help of background segmentation and background subtraction algorithms. Once the analysis got over and the motion is detected, the immediate action will be taken. The part will be done in the actuator side. This will be an SMS alert to the registered mobile number and the live video streaming will be initiated to the application as specially designed for this surveillance system which is installed in the user's mobile.

If user starts the App, he can see the live video streaming of his home. And In addition to that, we have given one more provision. Since we have used the Surveillance video camera contains small speaker, while seeing the live streaming itself, he can warn the intruder of his home through the mobile phone. We use the video surveillance camera for the sensing part. Raspberry Pi is a set of small programmable one-board computer which can be operated on Linux operating system. Windows 10 IoT core, NetBSD and openBSD are some of the system used in this. And, we use Background subtraction algorithm to detect the intrusion in the locked home.



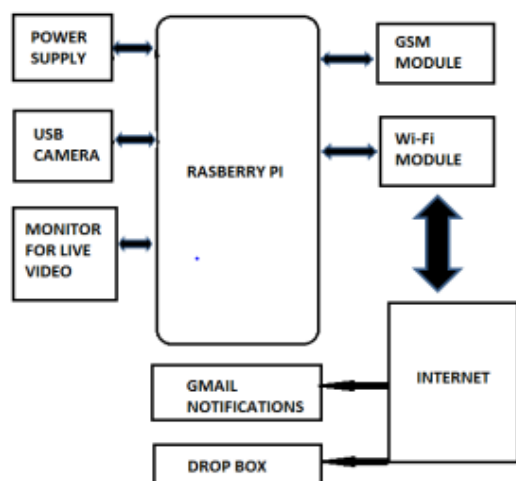
4. Background Subtraction Algorithm:-



Background subtraction is technique to extracting out the foreground objects from the background in the sequence of the frames of a specific video. It is one of the extensively used approach for identifying moving objects from static cameras. In this approach, All frames of every two seconds are captured and the last two frames are taken for consideration for processing. Estimation of background for time 't' is done. Then subtraction of estimated background from the input frame is processed. By Applying the threshold value 'td', we could get the absolute difference between the two frames of the video playing. The threshold value 'td'

can be less than the difference between two taken frames. Here the sensitive part of the background subtraction is finding the threshold. Though, there are so many techniques to find this, we have taken the most accurate approach called automatic thresholding. Pixel values are modeled as a mixture of adaptive Gaussians. Because, in a pixel multiple surfaces appear and there may be a change of lighting. In every iteration, using a simple heuristic method, Gaussians are evaluated to determine which is most likely to correspond to the background. Other pixels are compared with background Gaussians. Different pixels will be categorized as foreground. And, all foreground pixels are grouped together. Since we are dealing with various thresholds for each pixel, it adapts by time. And all objects are permitted to be a part of the background along with the existing background model. Deletion of the existing background model is not allowed.

ONE OF THE MAJOR ADVANTAGES OF THIS TECHNIQUE IS FAST RECOVERY. AND ONE OF THE DISADVANTAGES OF THIS METHOD IS SUDDEN LIGHT CHANGES. THE SYSTEM WILL BE ABLE TO WORK EFFICIENTLY WITHOUT ANY SUDDEN LIGHT CHANGES AND DRASTIC LIGHT CHANGES. BECAUSE THIS ALGORITHM SUPPORTS POORLY IN THIS SCENARIO.



Major four tasks of this algorithm are preprocessing, background modeling, foreground detection and data validation. After the frame gets preprocessed, background modeling is applied. This process is the major process.

Though there are various background modeling techniques, we use the recursive one. Finally, we could identify the intruder in our home using this technique. Describes that the intruder at home. Then tells that how this background subtraction algorithm works. Our proposed data analysis system, comparing the subsequent frames of the camera at a particular time interval, if it detects any intruder or motion of any object, the background subtraction algorithm employs. It extracts the foreground image from the background image and analysis will be done. After the image is analyzed with the help of foreground and background images, once it is identified that there is something going wrong, immediately a message will be sent to the registered mobile number and the notification will be sent to the same mobile phone to initiate the live streaming.

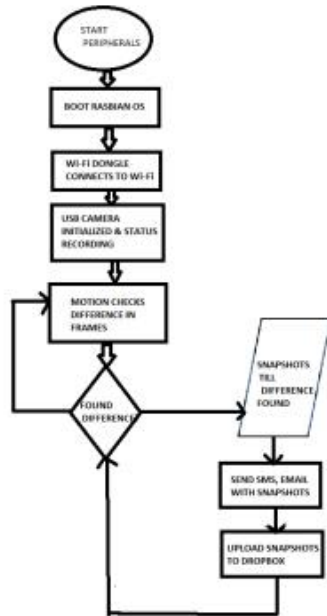
The project aims to simplify motion detection and the interface to be user friendly, which would send prompt notifications when motion is detected using Raspberry Pi which depicts a security alert framework utilizing low-power chips utilizing Internet of Things which screens and get alerts when movement is recognized and sends photographs and recordings to a cloud server. The photographs and recordings are sent to a cloud-managed service like Dropbox, Gmail Notifications with snapshots and SMS alerts to the user. When the cloud is not accessible, then the information is stored locally on the Raspberry Pi and sent when the association resumes. The primary functions of the project are:

Detect Movement: Python script would analyze the video of the USB WEB Camera, if there is a difference from the last frame to the current frame, it would be flagged and video recording and snapshots generation will begin.

On Movement Detected: When movement is detected, then the Python script will execute on the Raspberry Pi to send an email to the registered email with attached snapshots and SMS notifications to the registered mobile number.

On Snapshot Save: When a snapshot is saved, by default it is saved locally on the SD card of the Raspberry Pi. Shell script will upload the snapshots to a cloud-managed service like Dropbox, which supports command-line Linux-based

commands. The snapshots are saved instantly if there is a breach in the surroundings/house and the person tries to remove the setup still the snapshots already been stored to external cloud service Dropbox as configured.



applications from simple text processing to WWW browsers to games.

Python was developed by Guido van Rossum in the late eighties and early nineties at the National Research Institute for Mathematics and Computer Science in the Netherlands. Python is derived from many other languages, including Html, CSS, C, C++, Algol-68 and other scripting languages. Python is copyrighted. Like Perl, Python source code is now available under the GNU General Public License (GPL).

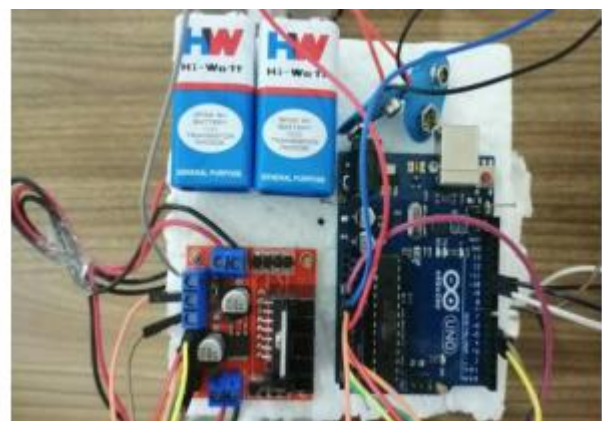


PYTHON- Python is a high-level, interpreted, interactive and object-oriented scripting language. Python was designed to be highly readable which uses English keywords frequently where as other languages use punctuation and it has fewer syntactical constructions than other languages.

- Python is interpreted: This means that it is processed at runtime by the interpreter and you do not need to compile your program before
- Python is Interactive: This means that you can actually sit at a Python prompt and interact with the interpreter directly to write your programs.
- Python is Object-Oriented: This means that Python supports Object-Oriented style or technique of programming that encapsulates code within objects.
- Python is Beginner's Language: Python is a great language for the beginner programmers and supports the development of a wide range of

5. Experimental setup and result:-

Above said Smart IoT based video surveillance system has implemented with the help of necessary equipments such as Video surveillance camera, Arduino board with IoT components shown in. Arduino board is connected with batteries for power supply. And analysis will be made based on the conditions we have given with the raspberry Pi. Sensors are connected with the gateway for data transmission.



IoT System Set up hardware

From that the sensed, data will be analyzed with the help of proposed background subtraction algorithm. In that, two subsequent image frames will be analyzed by foreground and background segments of the image. Once the intruder is confirmed, immediately the action taken part will be activated, which means, a notification message will be send to the registered mobile number and the live streaming session will be initiated with a small notification alert. Then, from the registered mobile phone the live streaming could be monitored.



Then finally the out is shown as following figure that is live streaming of the sensor and the with one alert message . And the limitations of this proposed approach is lighting and some unwanted disturbances like pet animals entering to the frame.



6. Conclusion:-

In this, proposed IoT based smart video surveillance system with efficient data analytics has given the new solution to the surveillance with live streaming

approach .Sensors will sense the data and efficient data analytics has been applied to identify the intruder accurately .For that background subtraction algorithm is used. Finally the actuator part is for action taken, which is in terms of sending the message and initiating the live streaming with the user's registered mobile number. For future enhancements, we have considered to ensure the consistence accuracy with various lighting situation IoT based smart security surveillance system using Raspberry pi have been successfully designed and implemented which is capable of recording the videos and capturing the images and the same has been uploading to cloud service Dropbox if it is not available then stores locally on Raspberry Pi storage. At the same time SMS notifications and Gmail notifications with captured snapshots will send to user. Live video streaming also provided to monitor continuously. It is advantageous as it offers reliability and privacy on both sides. It is authenticated and encrypted on the receiver side; hence it offers only the person concerned to view the details. Necessary action can be taken in short span of time in the case of emergency conditions such as industries, offices, military areas, smart homes, elderly person falling sick etc.,

Future scope:- Further extensions and feature enhancements are always inevitable in the present generation trending technologies. As the future scope this system can be extended further by adding additional infrared emitting system to detect the people face if they wore the mask on his/her face. By adding this additional system we can easily identify the person even though the person covered his/her face. Apart from this we can interface sensors like Gas sensors, Smoke sensors, and Fire sensors to give alerts respectively

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