

## Surveillance using Digital Signage

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**Abstract** - Internet of things (IoT) is a network of physical objects embedded with electronics, software, sensors, and connectivity to enable it to accomplish more value and service by creating new applications and arrive at shared objectives. This project intends to camouflage the CCTV surveillance system which may seem like a display board for publicity. Digital signage boards are an economical and advanced solution for the present static advertisement boards. The proposed framework utilizes a shrouded camera mounted on digital signage for dubious human activity monitoring and detection. This system of digital signage boards are conveniently accessible and easy to control remotely using the internet. It will replace the micro-controller based system with raspberry pi. The video output would be processed and Machine learning would be used for the detection of any illegitimate activities. Our Project will benefit the security officials to detect any unauthorized activity in the surroundings. Using Machine learning and Open CV, various anomaly detection will be done in real-time. Access Control for the same will be provided only to concerned officers.

**Key Words:** Internet of Things, CCTV, Raspberry Pi, Amazon Lambda, Django, Motion Eye Operating system, Digital Signage, YOLO algorithm.

### 1. INTRODUCTION

Internet of Things (IoT) includes interfacing all gadgets and devices to the internet. Digital signage is a new and rapidly growing communications medium.[1]The most recent advancements incorporate multi-core processors and wireless networks. Here we build up a digital signage board that is centred around the region of IoT. On an alternate note, the CCTV surveillance system has brought a revolution in protecting homes and other public or commercial places.

[2] In recent times, the occurrence of violations or illegal activities is becoming a recurring event. Most of the surveillance systems today generally are obvious to people. The ones carrying out the offense are often mindful of the establishment of most security systems, particularly ones that track their movement. Surveillance systems albeit present to gain security in numerous spots are as yet not been able to grant complete security if the system itself is not secure. Numerous cases in which the system literally has been for the most part hacked remotely or physical damage mostly has been done to the system so as to basically commit any dubious movement. They most often easily hack into the system physically or remotely. Physical tampering with the

system is observed most of the time. Any activity to be carried out, especially ones that particularly are illegitimate are planned cautiously due to knowledge of the existing surveillance. These systems are thus inclined to hacking in some way or another.

To essentially avoid such situations, we utilize the plan to camouflage the surveillance behind a digital signage board in this case. This idea could be implemented in areas where the number of illegal activities occurring is statistically high. The innovative media of digital signage with interconnected systems can now be enhanced with various perks in our system where we consolidate surveillance and digital signage by camouflaging the camera inside the board. The benefit gained from this system will be mainly to the authorities who will be the approved users who can view the entire system. [3] The additional feature would be the detection of anomalies using machine learning, thus making surveillance easier. The [5] real-time detection of anomalies as required will only further assist the authorities in monitoring and using this system.

The proposed system intends to develop various IoT devices to camouflage the CCTV system. The highlights will incorporate a display system for advertisement or a name board, Wi- Fi / Internet connectivity, multiple system connectives through Bluetooth along with the detection of various anomalies, generated using various object detection techniques, convolutional neural networks and [6] YOLO algorithm for real-time detection. The recording obtained through the surveillance will be stored on [7] Amazon S3 cloud storage with the date/time stamp. Access control will be provided uniquely only to authorized users

Our contribution focuses on compromised surveillance systems and a solution on how to overcome the same. In section 3, we define our system design and the entire flow of our project. It includes the three modules of our project and the task assigned to each of them. Section 4 mainly describes the methodology used for the implementation. It defines each step, right from data collection, processing of the data and the output for the same.

### 2. RELATED WORK

The Raspberry Pi was intended to be very cheap but powerful. Moreover, it is small and less power consuming. In some executed prototypes of digital signage use a Raspberry Pi. Some functions to use signage display systems are executed on Raspbian. The storage system uses an SD Card,

which is divided into two disk partitions, one is for the operating system, and the other is for the signage content information. Through this execution, the cost can be reduced. In any case, operation costs will remain. The backend development of the system comprised a node.js web server, a control panel web page from which the signage board can be controlled. The system comprised of raspberry pi 3 which go about as the core of the system and a node.js web server to host the front end as well as the backend web interface. [10]The Digital display is connected with the raspberry pi using HDMI, no additional hardware equipment is required. Raspberry pi 3 is connected to a router and that router provided internet to raspberry pi 3 so that remote accessibility could take place.

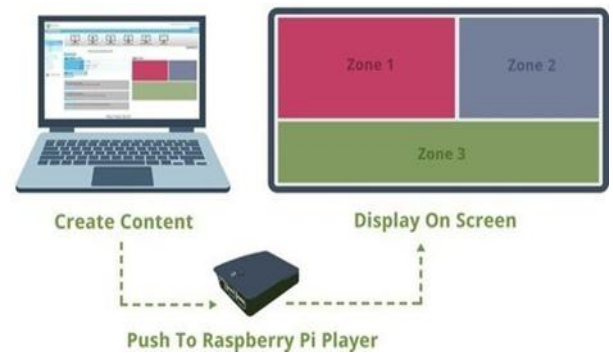
Data scraping methods used to display the web extracted data on the digital board. The front-end display of the digital signage board was done on the chromium browser which was installed on the Raspbian pixel operating system. In raspberry pi 3, to acquire a dedicated display on the signage board, kiosk mode of the browser is used.

Security systems are a need completely to be applied. For which it required security system devices that can be maintained full time and in real-time. [12]So it required security technology that has a mobile characteristic technology. The thought depends on executing a CCTV monitoring system using raspberry pi. CCTV monitoring system is a framework for monitoring completed by a device like an IR camera that works for photographs or captures every move and records it in jpg or video streaming format. [18]This monitoring system is likewise furnished with a software, motion eye OS that is installed on the raspberry pi just as outfitted with a network system in the form of OpenVPN. Since the OpenVPN network itself is a special network that is on the public network. At that point, the customer can observe the results of the video in real-time.

The implementation required the installation of the Raspbian OS on Micro SD and equipped with SSH network protocol. When the Raspbian OS is introduced then raspberry pi is fit to be utilized as a server.[19] OpenVPN is an open- source application that uses private keys, certificates, or file ovpn extension profiles to obtain confirmation in building up a connection. OpenVPN is to ensure security and data validity. Data security and validity can be ensured in light of the fact that it has encryption and authentication. Parameters that were estimated include delay, packet loss, jitter, and throughput for each sort of various goals on each plan used to get optimal outcomes.

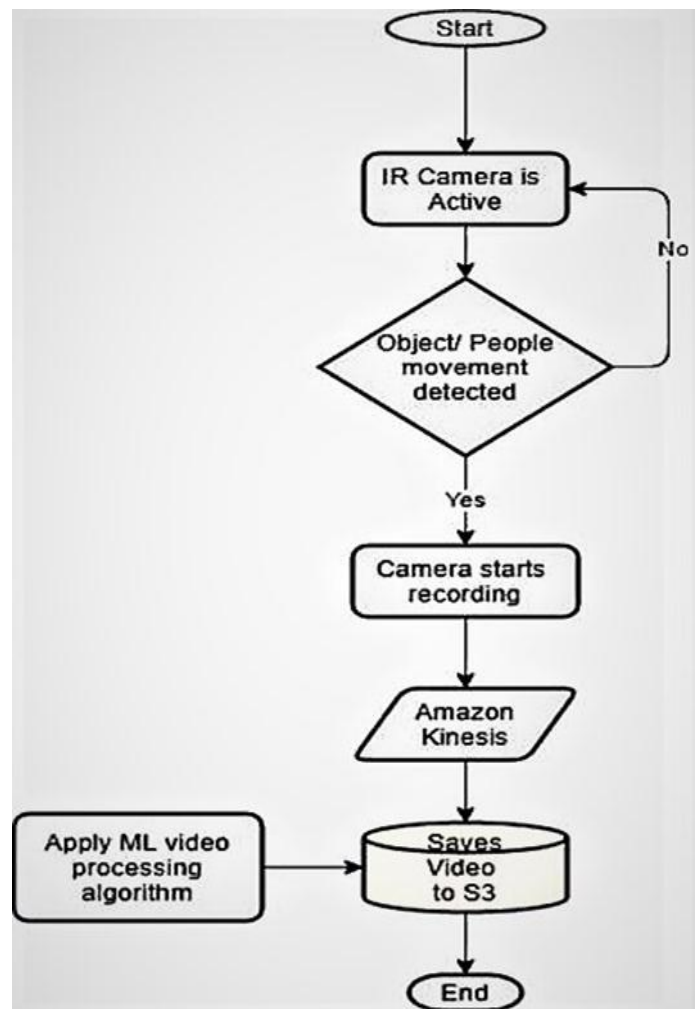
**3. SYSTEM DESIGN**

The following figures show the basic outline of the system design and the architectural overview of the system. The flowchart for the system depicts the entire process of the digital signage and surveillance system.



**Fig -1:** . Overview of the system design using Raspberry Pi

Fig.1 shows the basic system design of the project using a Raspberry Pi. The Raspberry Pi acts as an interface between the content management system and the display board. The content management portal being operated by the client and the display board being part of the surveillance system.



**Fig -2:** . Overall System Flowchart





The client will have access to the content management portal. The system process starts with the client uploading their advertisement through the content management portal. They can set the time frame for how long each image or advertisement should be displayed as per requirement. This advertisement is then uploaded on the display board that is connected with an RPi. To change the advertisement, the admin can use the custom Django based Digital Signage system. The Django server running on Rpi provides a user interface for configuring video playback. The uploaded advertisement will be then rendered on the screen. The surveillance system is equipped with motion eye technology which captures footage only when motion is detected, which helps avoid redundant use of power and storage. The camouflaged camera behind the screen will record its surroundings, and this footage will be temporarily stored in the SD card of the pi. Amazon Lambda is triggered to collect the footage and store it on the Amazon S3 cloud storage. The web portal has access to all the videos stored on the S3 storage. Whenever the admin wants to access the footage, he can use the API gateway to get the required footage from S3. The admin can also get the live feed from the cameras on the display on his dashboard if he is an authorized user on the portal. There are controls provided to the pan-tilt mechanism and zoom in/out for focusing the camera.

The surveillance footage can be then analyzed using Amazon Rekognition which will help to detect/compare faces for user verification, people counting, social distancing, and public safety use cases. Authorities can monitor suspects in real from these camouflaged cameras.

## 5. CONCLUSION

As the innovation is propelling each spending day the display board systems are moving from static boards display to digital signage display. In the proposed system, a blend of both digital signage and surveillance system architecture is designed using raspberry pi 3 and web application. The technology is created keeping in mind the present hardware and software engineering technologies. Our system will assist the authorities to monitor and detect suspects and dubious behavior through this surveillance by eliminating most security threats.

## 6. FUTURE SCOPE

As recommended, our project Surveillance using digital signage will basically help overcome the issues faced by government authorities so as to particularly help establish a protected and secure environment. The government officials can use this innovation so as to recognize any dubious action occurring in the region of the surveillance in a subtle way.

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