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Design and Implementation of IOT Based Smart Surveillance and Intelligent Monitoring System Using Raspberry Pi

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Abstract:

Surveillance systems have become more important for everyone and everywhere for the purpose of security. Surveillance is close observation especially of a suspected. Proposed Intelligent surveillance system needs the use of both control system and information technologies to reduce the need of manpower in authorized area, which help users to view their authorized network area from anywhere by using internet and mobile devices. The Proposed Intelligent surveillance system can be controlled and operated from anywhere with the help of Internet of Things. The system can be used in school, College and Transport Buses especially to predict Eve Teasing against Women. The system uses the camera to capture images of the people those who are coming under the surveillance area and these images will be saved in the cloud for further investigation. Video streaming is also possible by using this system. The main important things in this simple low cost intelligent surveillance system are Raspberry pi and Pi camera.

Keywords — **Intelligent Surveillance System, IOT, Raspberry Pi, Pi Camera.**

I. INTRODUCTION

The terms "Smart Bus Surveillance System", has been used to introduce the concept of surveillance and monitoring activities inside the Bus. Smart Bus Surveillance represents a great opportunity in creating new fields in Bus security. Due to the advancement of wireless technology, there are several types of connections are introduced such as GSM, WIFI, ZIGBEE, and Bluetooth. Each of the connection has their own unique specifications and applications. Among the four popular wireless connections that, Wi-Fi is being chosen with its suitable capability. This application will be used to control the AC loads according to the command that you are giving from the android app. This project is designed with combination of two latest and most demanding technologies that are Android and Embedded Systems. To do this we are using this Android App, which is open source and easy to install and gives instruction to the module and then stores the data provided by the sender. Proposed Intelligent surveillance system needs the use of both control system and information technologies to reduce the need of manpower in authorized area, which help users to view their authorized network from anywhere on internet and mobile devices. Android is a Linux based operating system designed primarily for mobile devices and it is an There are so many applications are already developed on Android and many applications are being developed at free of cost for its users. This project is our experiment to give a start to the era of real-time noticing. This system will take care of all the activities inside the Bus. It will avoid all the issues that can happen inside the Bus.

II. OUTLINE OF THE SYSTEM

In this system, surveillance will be done using Raspberry interfacing with pi camera and the raspberry interfacing with modem or WiFi for internet purpose. Pi camera 2 will be of 5 mp. It is capable of taking 1080p high resolutions videos as well. It small in size and can be connected directly

to raspberry pi board. The Raspberry Pi is a series of small single-board computers. The Raspberry model features a Broadcom with integrated ARM compatible central processing unit (CPU) and on-chip graphics processing unit (GPU). Processor speed ranges from 700 MHz to 1.2 GHz for the Pi 3; on-board memory ranges from 256 MB to 1 GB RAM. Secure Digital (SD) cards are used to store the operating system and program memory in either

SDHC or MicroSDHC sizes. The boards have one to four USB ports. For video output, HDMI and composite video are supported, with a standard 3.5 mm phone jack for audio output. Lower-level output is provided by a number of GPIO pins which support common protocols like I²C.

A. PROPOSED SYSTEM

This surveillance system will be an in-vehicle surveillance where the user will be given the key to give instruction. Pi cameras will be installed inside the vehicle which will take picture when required. The system will be connected via Wifi / modem for internet purpose which will send the picture to the cloud where all such pictures will be stored. Authorized individual can only access the cloud with the unique identification provided.

B. SCOPE OF STUDY

The scope of study which is needed for the completion of this project involves the following criteria:

1. Architecture of ARM11 knowledge
2. Programming in Python language.
3. The study of the serial communication.
4. Interfacing Pi camera with processor.
5. Wifi connectivity or Interfacing modem with Raspberry Pi.
6. App building knowledge.

III. HARDWARE IMPLEMENTATION

This section briefly explain bout the hardware implementation of the system. It discusses the design and working of the system with the help of block diagram in detail. It explains the various modules used in the system.

A. SYSTEM DESIGN

The system design can be divided into two parts

1. Hardware design
2. Software design

The hardware design and principle are explained in this section using the block diagram. The block diagram discusses about the required components of the design and working.

B. BLOCK DIAGRAM OF THE PROJECT AND ITS DESCRIPTION

The block diagram of the design is as shown in the below figure. It consists of raspberry pi, pi camera.

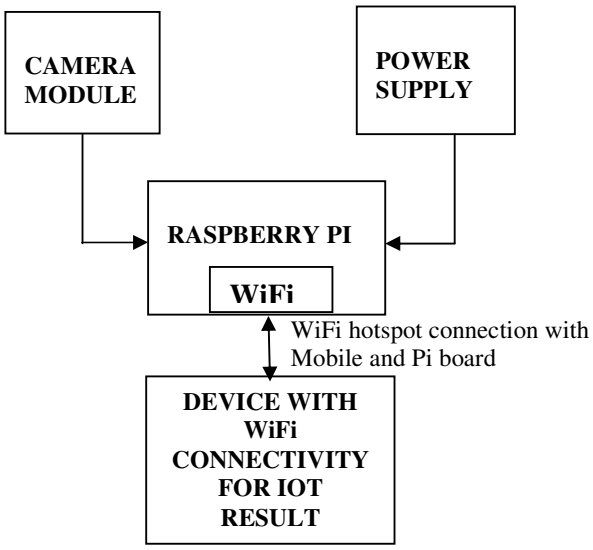

Figure 1: Block Diagram

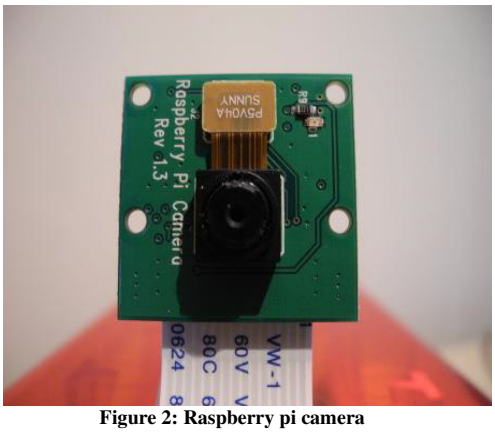

Figure 2: Raspberry pi camera

- 5 mp camera exclusively made for raspberry pi
- Can take 1080p high resolutions videos
- Small in size and can be connected directly to raspberry pi board.
- 1080p, 720p and also still pictures.

The camera consists of a small (25mm by 20mm by 9mm) circuit board, which connects to the Raspberry Pi's Camera Serial Interface (CSI) bus connector via a flexible ribbon cable. The camera's image sensor has a native resolution of five megapixels and has a fixed focus lens. The software for the camera supports full resolution still images up to 2592x1944 and video resolutions of 1080p30, 720p60 and 640x480p60/90.The Raspberry Pi camera module is small and inexpensive. It is supported by its own command line applications for still pictures and video, with standard Linux V4L drivers in preview form. You can expect to see more applications developed to make use of the camera, as well as hardware add-ons like cases. Already users have developed a number of interesting applications. For example, removing the built-in lens allows it to operate as a macro camera for close-up images and some people have exploited this feature.

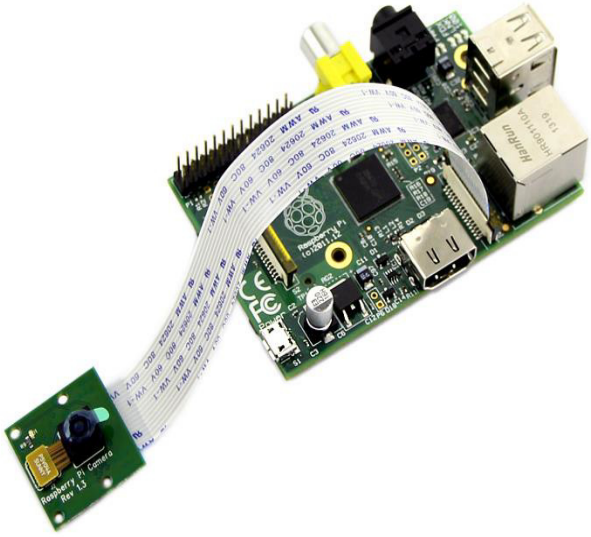

Figure3: Pi Camera Connection on Raspberry Pi

IV. FIRMWARE IMPLEMENTATION

The implementation starts with Algorithm and Flowchart to estimate the correct functionality of the system. The following part explains the working procedure of the system with help of Algorithm and Flowchart.

A. ALGORITHM

Step 1: Start the system by switching the power supply.
Step 2: If the user instruction is not given then the system goes to stop.
Step 3: If the user instruction is given then the program will be continued.
Step 4: If the user wants to watch the live video then the required IP address should be given then the page will be live streaming page will be opened.
Step 5: If the user want to capture the image then the required IP address should be given then the static page will be opened and the photo can be captured.
Step 6: The system will be stopped after the program is completed.

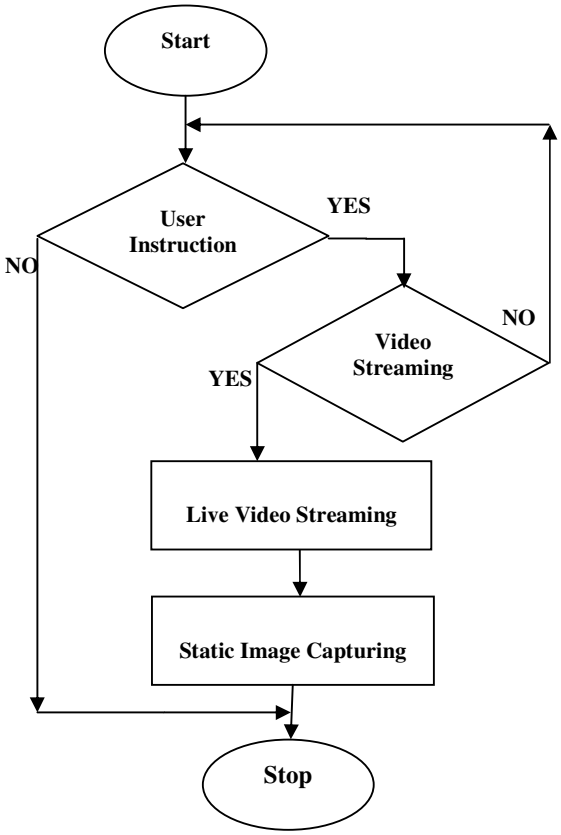

Figure 4: Flowchart

B. INSTALLING OS

```
import os
os.system('LD_LIBRARY_PATH=/opt/mjpg-streamer/ /opt/mjpgstreamer/
mjpg_streamer -i "input_raspicam.so -fps 15 -q 50 -x 500 -y 280"
-o "output_http.so -p 9000 -w /opt/mjpg-streamer/www" &')
```

C. WORKING PROCEDURE

This surveillance system will be an in-vehicle (Bus). Pi cameras will be installed inside the vehicle which will take picture when required. After the picture is clicked. The system will be connected via modem / WiFi for internet purpose which will send the picture to the cloud where all such pictures will be stored. Authorized individual can only access the cloud with the unique identification provided.

V. RESULT

In this section the Output of the system can be explained with real time images obtained by the system. This section also shows IP Addresses for capturing images and live video streaming with respect to the pi camera installation in the Raspberry Pi hardware board .

Figure 5: Final Working Module Display

Procedure For the working module:

1. The figure shows the working module of Smart Bus Surveillance System.
2. Start the system by switching the power supply.
3. If the user instruction is not given then the system goes to stop.
4. If the user instruction is given then the program will be continued.
5. The camera should capture the image according to the instruction given to system.
6. The image will be sent to the cloud from where user can access.
7. System will be stopped after the program is complete.

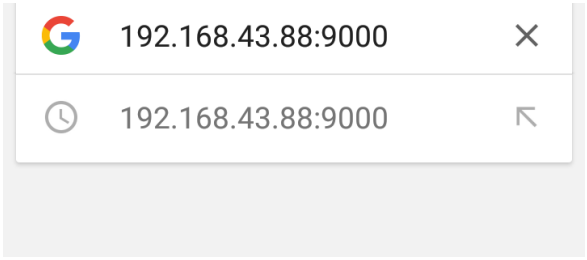

Figure 6: IP Address For capturing images

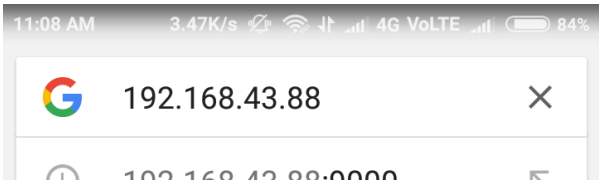

Figure 7: IP Address For live streaming

Figure 8: Live streaming page

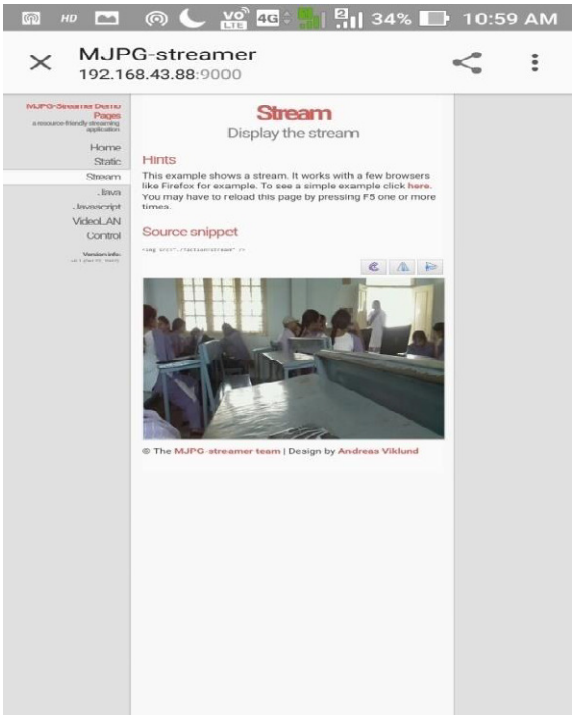

Figure 10: Capturing video page

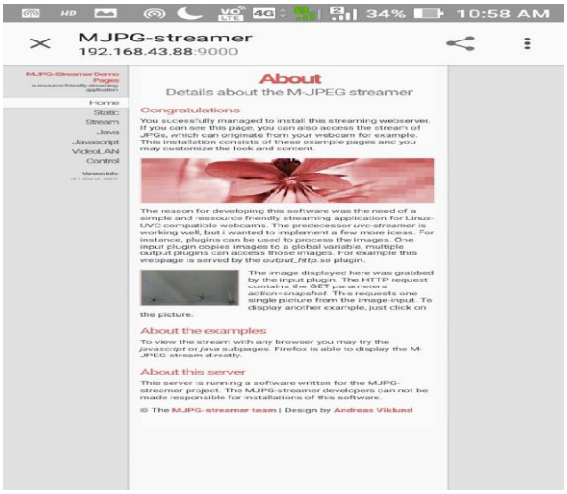

Figure 9: Picture capturing

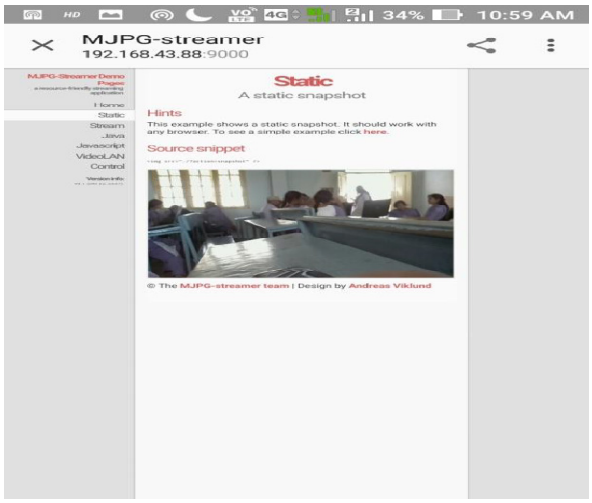

Figure 11:Capturing image page

VI. CONCLUSION

The implementation and insight of **" Design and Implementation of IOT Based Smart Surveillance and Intelligent Monitoring System Using Raspberry Pi "** is done successfully. The

communication is properly done with interferences between different modules in the design. System design is done to meet all the specifications and requirements. It can be concluded that the design implemented in the present work provide portability, flexibility, low cost and the data transmission is also done with low power consumption.

VII. FUTURE SCOPE

The system can extend with live video streaming recording with audio functionality. The live image capturing is already done successfully. So these two results can be send to authorized persons through their e-mail also for safety and protection of the live data information collected by the system at surveillance area for further investigation. This feature can add in this system for better results. This system can also extend further by adding GPS and GSM Modules to the system to send location and messages to the host or authorized person at the surveillance area.

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