Traffic Monitoring System

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Abstract: *TheInternet of Things (IoT) is a connection of various types of things like personal computer, tablets or smart phones etc to the internet which brings up new type of communication between things and people and also between things. With IoT, research and development in automation is becoming popular in recent days. A robust and reliable traffic surveillance system is adire need to enhance traffic control and management. This IoT project focuses on building an efficient traffic management system by live streaming the entire camera data of all the streets in the city onto a webpage. Only a person such as a police commissioner or a traffic police officer with login id and password are authorized to see the data. This will help a traffic police men or commissioner to oversee the live location of ambulance or chief minister convoy and make necessary traffic adjustments to ease the flow of traffic, thus avoiding the need to go personally to the control room and handle the traffic.*

Keywords: *IoT, surveillance, monitor, traffic, webpage, automation, surveillance.*

I. INTRODUCTION

Internet of Things (IOT) is the inter-networking of physical gadgets, vehicles, structures and other apparatus embedded with electronics. It is aconstantly developing system of physical object that provide an IP address for Internet connectivity. In today's world, traffic is the major issue everywhere as we go out, hence increase in traffic congestion and other factors results in development of traffic surveillance. Utilization of IoT for traffic monitoring and surveillance system and by using IP address any person can access the login page from anyplace in the world.

In recent years, webcam or video monitoring and surveillance have been widely used in traffic monitoring purposes. So, this paper deals with much portability of surveillance in mobile devices than at large display LCD monitoring screens at control station. In general method, used in nowadays, the video stream recorded is sent directly to the control station via communication link [2]. But this system can stream the video live anywhere through internet in any type of portable or non-portable device. The video surveillance system for traffic monitoring has inspiring result in security applications. The proposed system improves much more and made the existing systems portable to any officials of traffic management [3].

The growth in urban population and its effects like accidents, travelling with high speeds are detectable to the traffic cameras now days and sends information to the traffic control management, but its efficiency can be enhanced with the use of proposed model using Raspberry Pi and IoT [4].

Some of the concerns of these traffic congestions and accidents are waste of time, property damage and pollution. IoT provides a new trend or ways for traffic surveillance or monitoring [5]. Thus the traffic monitoring is developing into higher level transport system based on IOT. [10]

IoT can be used to create a world where all smart objects of daily life are connected to the internet and interact with each other's. The cellular phone services (mobile devices) have provided access to internet from any location for monitoring traffic providing increased portability and efficiency [6].

A. HARDWARE SPECIFICATIONS

*1) Raspberry PI-3 Model-B:*The Raspberry Pi is a single-board mini-computer which was manufactured with the intention of promoting the teaching of basic computer science in schools. The Raspberry Pi 3 Model B is the third generation Raspberry Pi built on the latest Broadcom 2837 ARMv8 64bit processor hence the new generation Raspberry Pi 3 Model B is faster and more powerful than its predecessors. While maintaining the popular board format the Raspberry Pi 3 Model B brings you a more powerful processor 10X faster than the first generation Raspberry Pi [1]. It has enhanced power administration to bolster more powerful external USB devices and further to customer feedback based development, the new Raspberry Pi 3 now comes with built-in wireless LAN and Bluetooth connectivity making it the ideal solution for powerful connected designs.We install Raspbian OS in it and store code in the SD card slot in it.

Board specification:
• Broadcom BCM2837 64bitARMv7 Quad-Core Processor running at 1.2GHz.
• One GBRAM.
• BCM43143 Wi-Fi on-board.
• Bluetooth Low Energy (BLE).
• 40-pin extended GPIO.
• 4x USB 2-ports.

• Four pole Stereo output and Composite video port.
• Full-size HDMI port.
• CSI camera port for interfacingthe Raspberry Pi-camera.
• DSI display port for interfacing the Raspberry Pi touch screen display.
• Micro-SD port for loading the operating system and storing data.
• Upgraded switched Micro-USB power
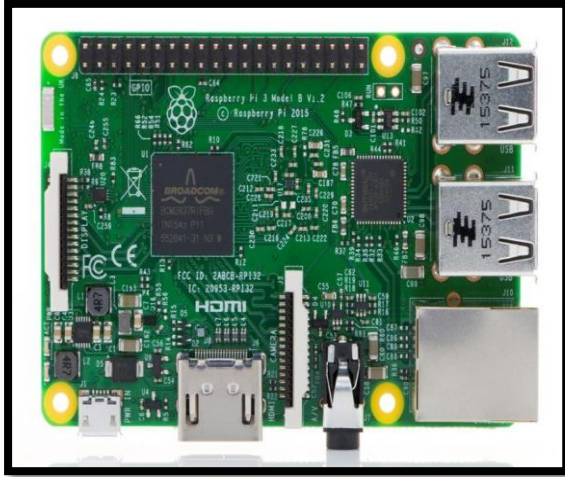• Two LEDs for indication.

Fig. 1. Raspberry Pi board

2)Keyboard & Mouse: Most standard USB keyboards and mice will work with the Raspberry Pi. Wireless keyboard/mouse should also function, and only require a single USB port for an RF dongle.

3) Display: Any display unit can be used during programming purpose and for displaying the surveillance video on the display screen having HDMI or VGA as input.

4) Power Supply: A standard modern phone adapter with a micro USB connector will do, providing it can supply at least 700mA at +5Vdc.

5) Web Camera: Any USB camera with high resolution can be used for live-streaming the video. A Quantum 495 Lm-3937 having up to 10 level zoom on live video is used.

*6) Router:*A wireless router is an instrument that performs the functions of a router and also includes the functions of a wireless access point. It is used to provide access to the Internet or a private computer network. It can function in a wired LAN, in a wireless-only LAN (WLAN), or in a mixed wired/wireless network, depending on the manufacturer and model. A NETGEAR N150 router is used for wireless transmission of data.

B. SOFTWARE SPECIFICATIONS

*1) Linux:*A Linux-based system is a modular Unix-like operating system, deriving much of its basic design from principles established in UNIX [7]. A Raspbian OS is loaded on the Raspberry Pi which is based on Linux OS .Hence the Raspberry Pi can be used for data storing, processing and transferring.

*2) Python Programming:*Python is a powerful high-level, object-oriented programming language. It has simple easy-to-use syntax; making it the perfect language .Python has a very simple and elegant syntax. It's much easier to read and write Python programs compared to other languages like: C++, Java, C#. Python makes programming fun and allows you to focus on the solution rather than syntax. If you are a newbie, it's a great choice to start your journey with Python.

3) Apache Server: Apache HTTP Server generally called Apache is free and open source, cross platform, web server software. Apache is developed and maintained by an open community of developers. It is Most commonly used on a Unix-like system (usually Linux).It was Originally based on the NCSA Http server, development of Apache began in early 1995 after work on the NCSA code stalled. Apache played an important role in the initial growth of the World Wide Web [9].

4) HTML: Hyper Text Markup Language (HTML) is the standard markup language for creating web pages and web applications. With Cascading Style Sheets and Java Script it forms a triad of technologies for the World Wide Web .Web browsers receive HTML documents from a Web server or from local storage and render them into multimedia web pages. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document.HTML elements are the building blocks of HTML pages [8].

II.PROPOSED MODEL

A smart monitoring technology to perform task on daily basis have been proposed .The central idea is to design and implement a cost effective and easy to use traffic monitoring and surveillance system.Internet of things (IoT) has enhanced the flexibility for incorporating discrete components and supervise the same through a website .The proposed system consists of Raspberry Pi board which acts as a central unit of the system, to which one webcam is interfaced using the two USB ports of the Raspberry Pi.

A router is also connected to the Ethernet port of Raspberry Pi which is used to provide IP address to the Raspberry Pi and also transfer the data of the webcam to any portable device connected to it. After setup, the Raspberry Pi establishes the login form written in building 'index.html' file of Raspberry Pi on its designated IP address following the default address of the Raspberry Pi. After the completion of the verification of the user, a fresh page appears comprising of live streaming data from the webcam placed at the desired location and the capture button in order to take the picture. Therefore, system which can monitor traffic on roads, or manage location of

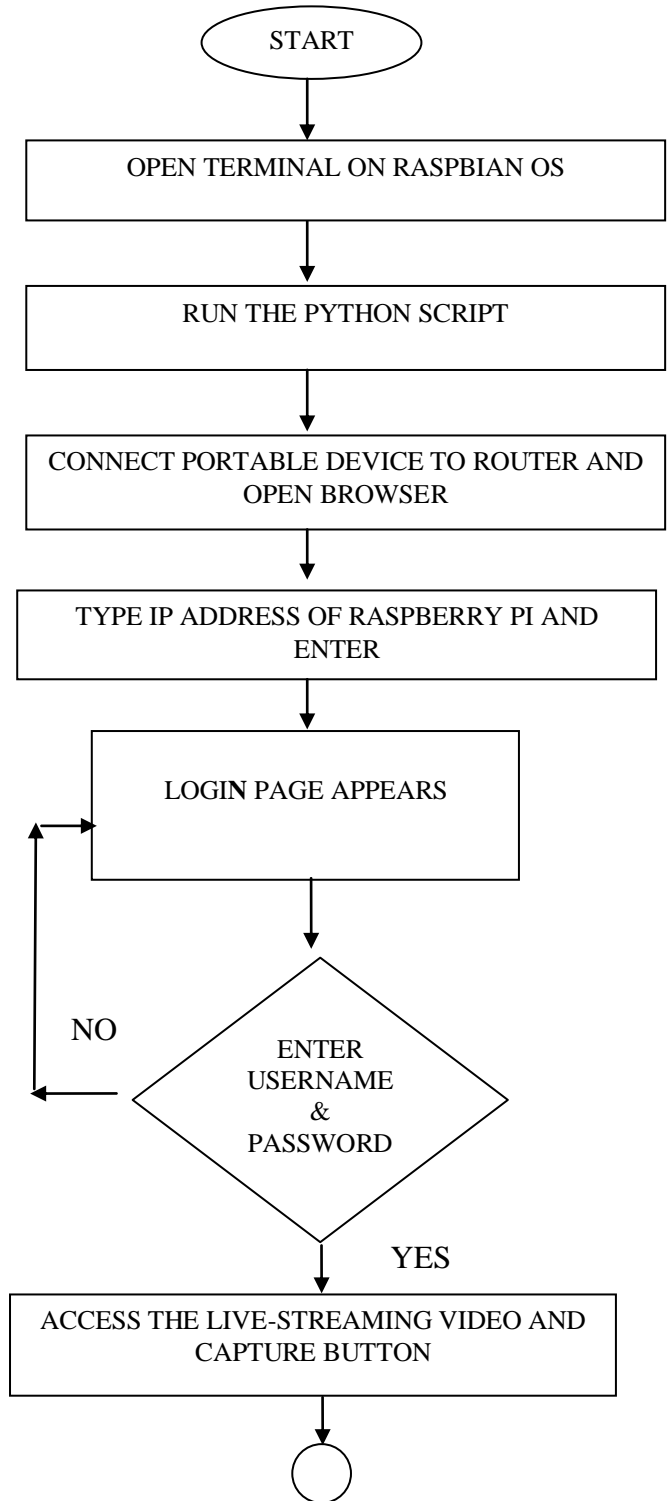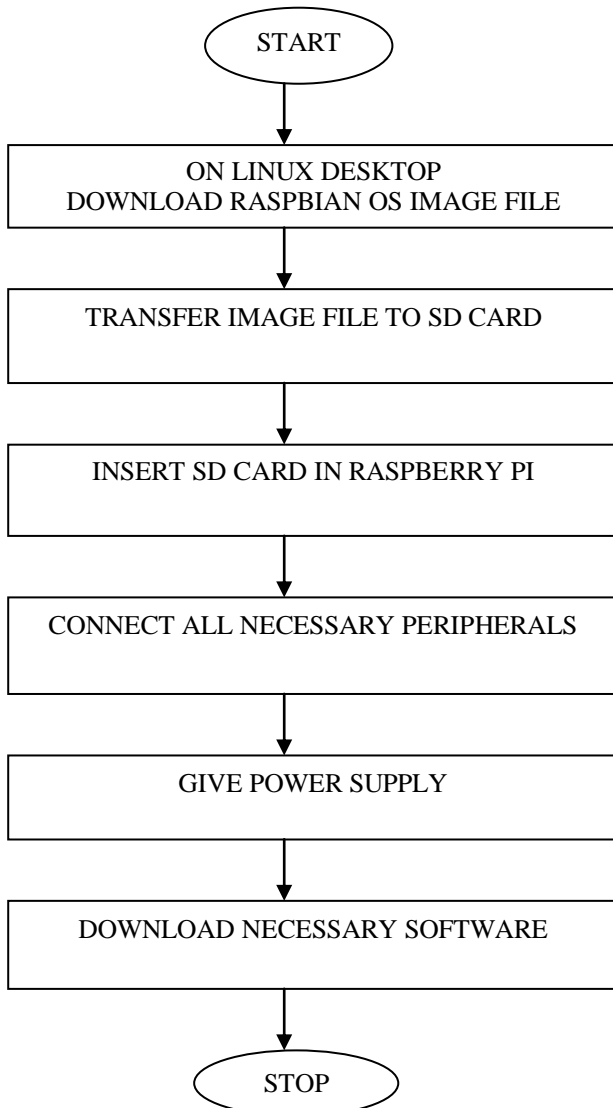the Chief Minister's convoy and also ambulance etc is developed.

Fig. 2. Flowchart of initializing

A. Initializing:

DESCRIPTION:
1) Use the system having LINUX operating system and download RASPBIAN OS image file from the internet.

2) Format the SD card to FAT 32 format using G-parted software. Insert the SD card into the external slot provided in Raspberry pi.

3) After downloading OS from the internet, transfer the image file into an SD card.

4) Connect all the necessary peripherals, components to the various other ports provided on Raspberry pi.

5) Give power supply to the Raspberry pi by connecting the adapter to the power slot on the board to activate the system.

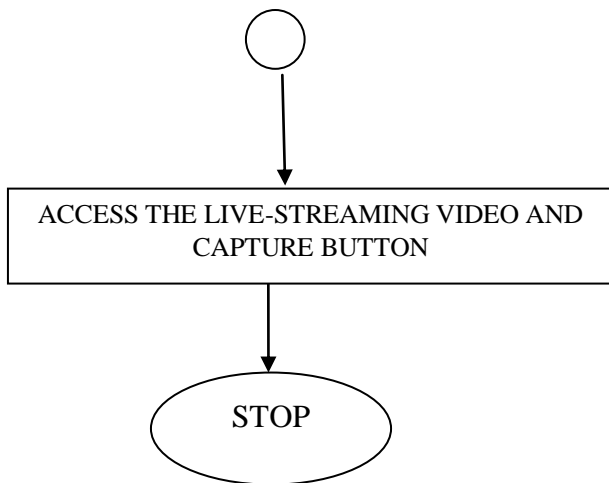6) Download necessary software required by the application.

ACCESS THE LIVE-STREAMING VIDEO AND CAPTURE BUTTON

STOP

Fig. 3. Flowchart of Working.

B. Working:

DESCRIPTION

1)   Open the terminal on RASPBIAN OS after switching on the Raspberry pi.

2)   Run the python script where the program for application has been written.

3)   Connect Raspberry pi to the router, once internet is accessible, open any web browser.

4)   Type the IP Address of Raspberry pi and press enter.

5)   A login page appears asking for username and password. Enter the valid details.

6)   If the username and password are incorrect, you will be asked to enter again the valid ones.

7)   Once the username and password is matched and found correct, another tab opens where the live streaming video can be seen. Also a capture button for capturing the required image.

C.Block Diagram

   DESCRIPTION

   • Raspberry pi board is having various ports for connecting external peripherals to it.

   • An adapter is connected to the power slot on board; the display unit (MONITOR) is connected to the HDMI port of board directly or via some HDMI-VGA cable indirectly.

   • Input devices Mouse and keyboard and camera are connected to the USB ports provided on the board. The monitor, keyboard and mouse are only used in development stage and later becomes redundant.

   • Raspberry pi is connected to the internet via Wi-Fi or through the Ethernet cable on to the Ethernet port provided on the board.
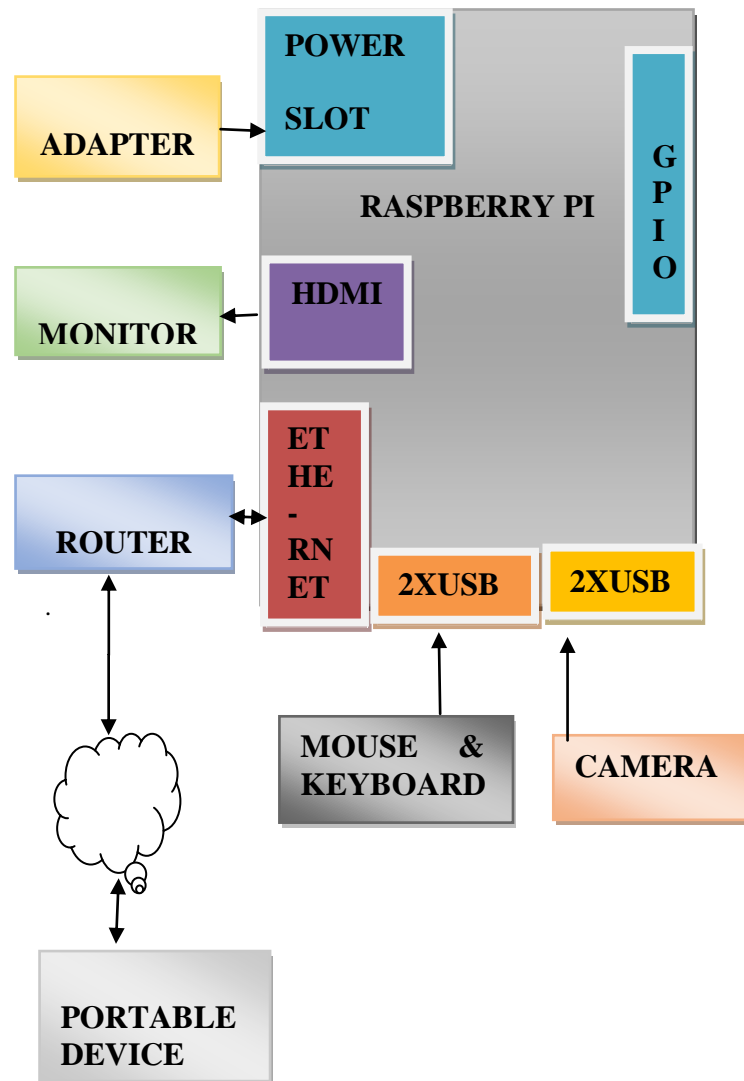
Fig. 4. Block Diagram of Proposed system

III.EXPERIMENTAL SETUP
   DESCRIPTION

   •In the following setup, Raspberry pi is the main component of the application.

   •A camera, mouse, keyboard being the input devices are connected to the USB ports provided on the board.

   •A router is for providing access to the internet is connected directly via Ethernet cable or else internet can be also accessed via Wi-Fi module present on the board.

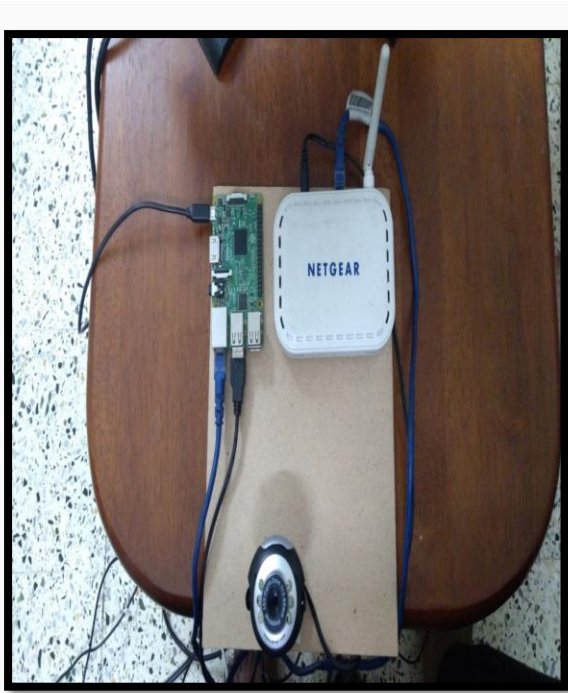   •The camera is generally placed at a remote location where we want to monitor the traffic conditions.

Fig. 5. Experimental Setup

IV.EXPERIMENTAL RESULTS

1. Open any web Browser on the Raspbian OS.

2. Type the following IP address to access the LOGIN FORM created to access the required data.

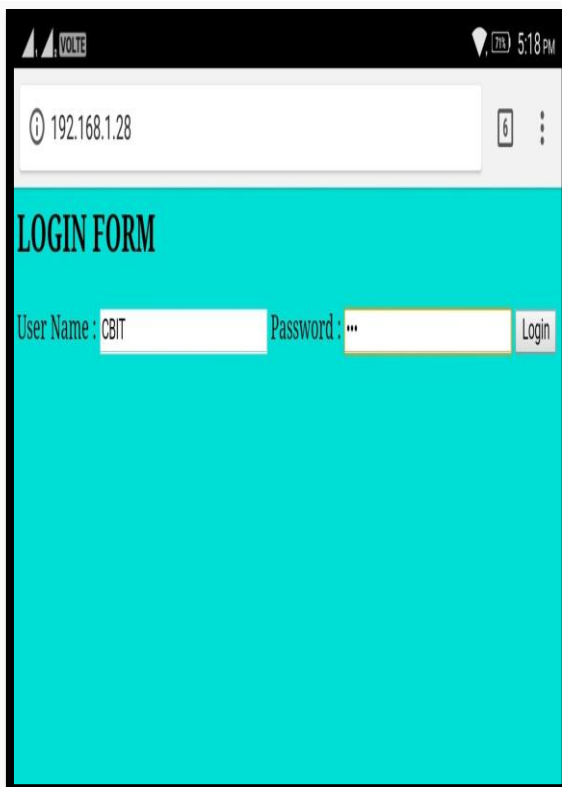3. Enter a predefined USERNAME & PASSWORD and press login.

Fig. 6. Login Form page for LAN.

4. If the login USERNAME &PASSWORD entered is incorrect, the system will give you two more attempts to try login.
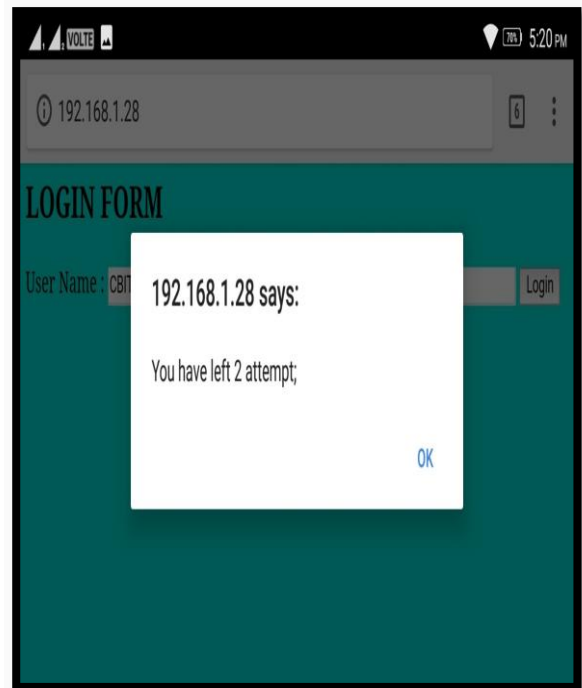

Fig. 7. Failed attempt POP-UP.

5. Once the entered USERNAME & PASSWORD are found to be correct, the prompt will be displayed saying that login is successful.
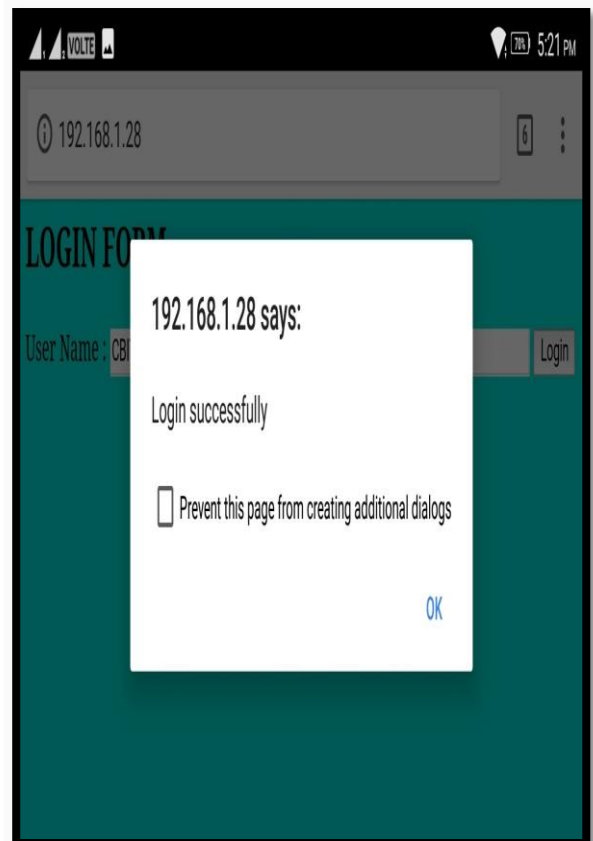

Fig. 8. Successful attempt POP-UP.

6. Now a new tab will be opened where you can see the live streaming of area of interest. Since the Application is being used for traffic monitoring, it is placed near signals or high traffic points.

7. For demonstration, we have just monitored a corridor area.

8. If any image to be captured and to be used for reviewed for examination, a CAPTURE button is placed below which will be saved in the specified directory.

Fig. 9. Control window page for WLAN

V. CONCLUSIONS

This paper presented a real time traffic monitoring system which makes use of IoT to transfer live camera data on to any portable device connected to the router. The central module of this system is the Raspberry Pi device which performs all the data transferring. This system can be utilized in innumerable places for security purposes on city roads, banks, offices and even in hotels for monitoring the staff and goods. Furthermore, this system can be enhanced by buying domain name address and monitoring a websites that the user can monitor any desired location from anywhere in the world. An image recognition technology can be implemented and various sensors can be interfaced in order to dispense more reliable monitoring to the proposed system.

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