

## IoT Based Virtual Classroom

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**Abstract** — This work puts forth an idea on live streaming to improve the quality of teaching towards the technology generation. All students in the class may not be able to attend all the lectures by time due to this some students would lag behind from others. The proposed system involves the use of raspberry pi which with the help of a camera can shoot videos during the lecture and also it uploads those videos to the cloud storage, this can be achieved by using IoT. Hence the lecture can be watched live from remote location else the video can also be downloaded from cloud and watched later. This will greatly improve the continuity of the lectures and can assist in creating a virtual class.

**Keywords**—Live streaming; Virtual classroom; IoT classroom; Raspberry pi with webcam.

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### I. INTRODUCTION

Teaching and learning system now-a-days includes technology as a major part and the Internet of things (IoT) plays a crucial role towards the wireless systems by which it can connect systems, devices, sensors without the need of machine-to-machine communication. IoT will revolutionize everyday life applications and it is expected that by 2020, 20 billion devices will be connected with the Internet. The Internet of things presently is being used in the fields of automobiles, agriculture, security surveillance, building management, smart-homes, and health care.

In existing systems, the institution will provide classroom for the students were the teacher has to come to the classroom to take their lectures. If any important topic is going to be taken, the lecture will be recorded and upload the videos manually to the net, after sometimes the video have been taken. If any of the students is not able to attend the class he/she will miss the lecture and will lag behind from others. Hence to provide the solution for this problem here introducing the virtual classroom with live streaming concept. Virtual classroom is a web-based environment for online learning and in other words it can also be called distance learning. Whereas the live streaming can telecast the videos in real time online, similar to the lectures going on in classroom. Once the lecture gets over the video taken

Will be upload to the cloud storage by using the concept of IoT.

### II. SYSTEM ARCHITECHTURE

The system involves Raspberry pi 2 and webcam where the Internet connections to the pi can be shared from the resources via Ethernet cable [6] and the webcam is interfaced with the pi through the USB cable to USB port.

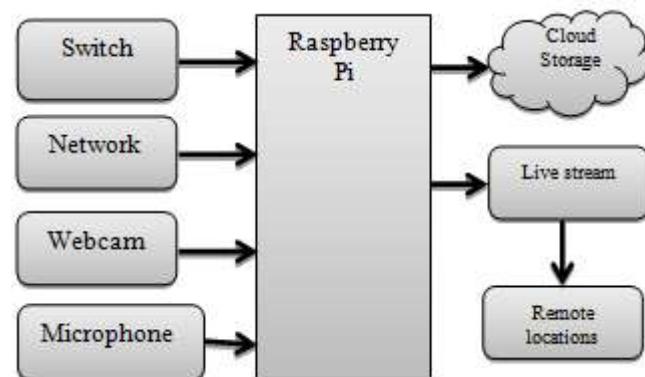


Fig.1 - Block diagram

### III. HARDWARE DESCRIPTION

The major hardware for this project includes Raspberry pi, Webcam.

#### A. RASPBERRY PI

Raspberry pi [5] is a credit card sized fully functional computer and it has all trappings of the computer with a dedicated processor, memory, USB ports, AUX port and graphics driver for output through HDMI. The pi will be connected to the external display or laptops for the system interface. Languages like python, scratch are used for programming the raspberry pi. Pi requires a constant power of 5V to stay on and it doesn't offer internal storage rather it provides the SD card slot as flash memory for the entire system. The Pi has a inbuilt Ethernet port which allows easy access to any network with little setup. Model B raspberry pi has a quad-core ARM Cortex-A7 CPU with 1GB RAM.



Fig.2 – Raspberry pi

## B. WEBCAM

Webcam is a video camera which records the stream of images as videos. Webcam is generally used for the communication between two remote locations with connected over internet for live communication. Webcam is connected to the system through USB cable. Here zebronics lucid plus webcam which is having 24MP camera with built-in microphone. The maximum resolution is 640X480 with 2P+1R lens manual focus.



Fig.3 – Webcam

## IV. SOFTWARE DESCRIPTION

### C. RASPBIAN OS:

Raspbian is a free operating system optimized for the raspberry hardware. The OS will have a set of basic programs and utilities that makes raspberry pi to run. Raspbian comes with over 35,000 packages, pre-compiles software bundled in a format for the easy installation of raspberry pi.

### D. PUTTY

Putty is a free, open source emulator terminal for network file transfer applications. This emulator terminal is used for commenting the raspberry pi in Microsoft windows OS as same as terminal in Linux. Here the telnet network protocol for serial port connection.

### E. VNC VIEWER

Virtual Network Computing is a graphical user interface for sharing the keyboard, mouse activities from one system to another by using Remote Frame Buffer Protocol. VNC is platform independent and compatible with any OS. This interprets commands from the viewer and carries out to the remote system.

### F. PYTHON

Python is a free open source dynamic programming language widely being used as same as normal C programming languages. Python supports multiple programming paradigms including object oriented approach.

## G. WAMP SERVER

Wamp server is a platform for the development of dynamic web page applications by using Apache 2 server, PHP scripting language and SQL database. It works only for windows operating system. The server will create a webpage with PHP Myadmin database in system.

## V. SYSTEM METHODOLOGY

Raspberry pi is installed with raspbian OS and the initial update and upgrading process [1] is done. The webcam is interfaced with pi. Raspberry pi is connected to the switch through the GPIO pins available in the system. When the switch is being pressed the webcam will start the video recording and again when the switch is pressed the video recording will be stop.

For the live streaming [2] concept, the video URL that is the port address of the raspberry pi will be uploaded to the protected webpage where the registered users can login to the page to get those links and watch the ongoing classes live [3] from the remote locations [4] as virtually. Once the video recording stops the video sample will be stored in pi first, then the video will be uploaded automatically to the cloud storage. Later the videos can be downloaded from the cloud anytime for reference and verification.

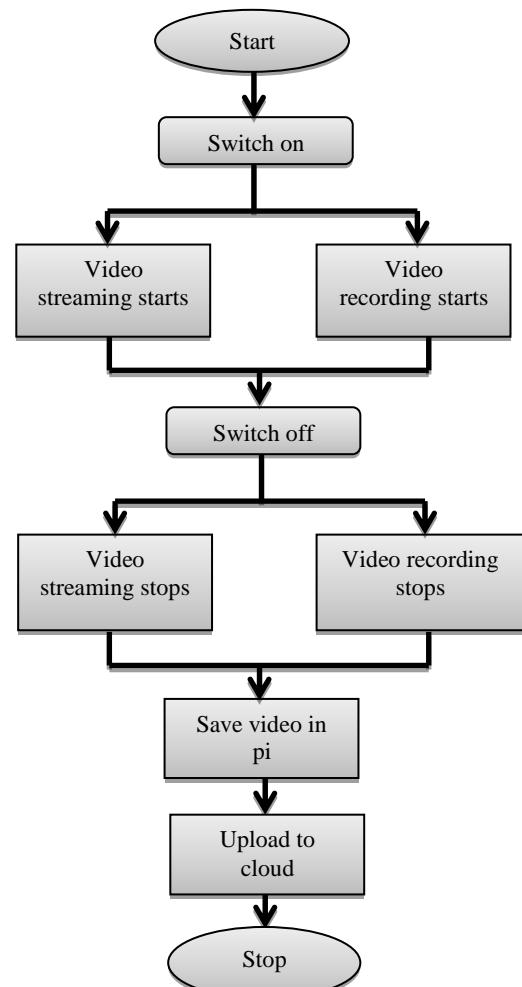


Fig.4 – System flow chart

## VI. SYSTEM ARRANGEMENT

The hardware arrangement includes the use of webcam and a push button which is interfaced to the raspberry pi via USB port and GPIO pins respectively.

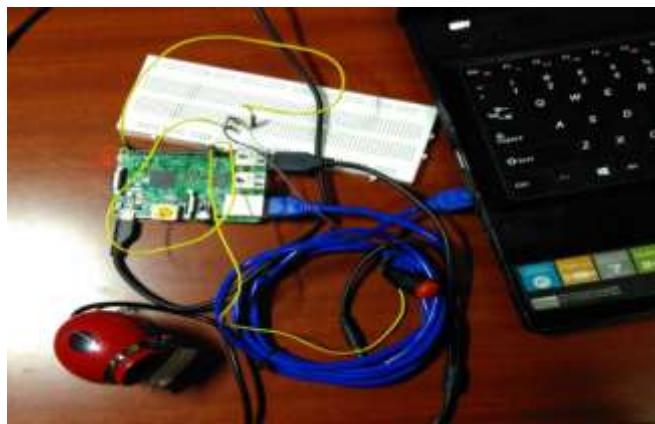


Fig.5 – Hardware setup

## VII. OUTPUT

The terminal window shows the motion detection starts and stops when the switch is being pressed and released respectively.

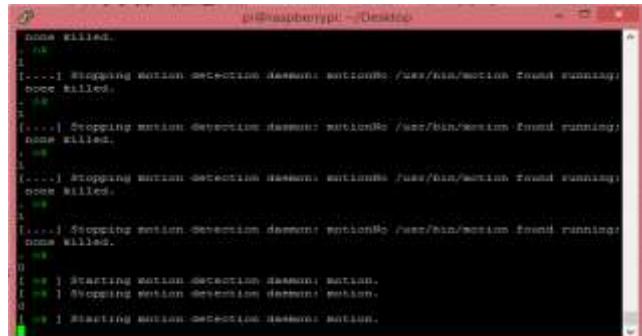


Fig.6 – Putty terminal

The video samples recorded and saved in raspberry pi.

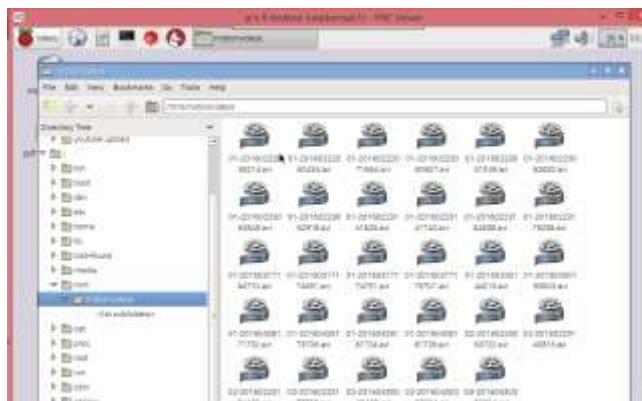


Fig.7- Video samples

The live video can see from the remote location by using the raspberry pi port address.



Fig.8 – Live streaming

A protected webpage with username and password credentials where the link will be shared.

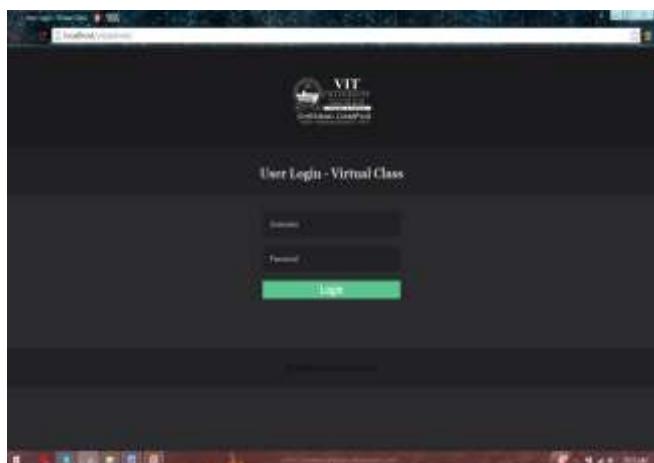


Fig.9 – Webpage

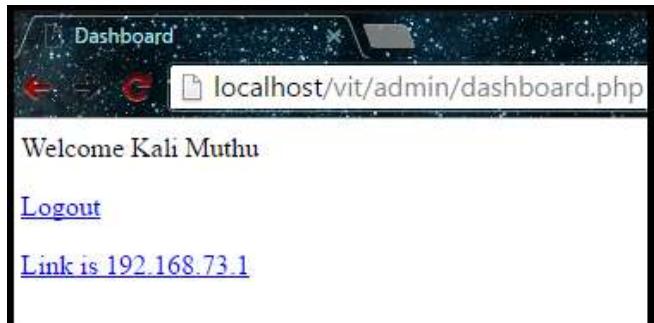


Fig.10 – Dashboard

## VIII. CONCLUSION

The proposed system involves the use of raspberry pi along with webcam which records the lectures for live streaming and also it uploads it to the cloud storage automatically to watch later. This system can greatly improve the learning, among the students and provides the best solution those who are not able to attend the class. So the students cannot miss the class and also if any queries raises they can refer through the video lectures by downloading from cloud storage. The system can be extended to use of four webcams interface to single raspberry pi. This system can also be used for remote motion activate web based surveillance by attaching the camera to dashboard of our cars.

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## IX. REFERENCES

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- [5] About Raspberry Pi: [www.raspberrypi.org](http://www.raspberrypi.org): This is the official website of the Raspberry Pi project.
- [6] Configuring Raspberry Pi over the Ethernet LAN: [www.instructables.com/id/Configuring-the-Raspberry-Pi-ethernet-port-for-rem/](http://www.instructables.com/id/Configuring-the-Raspberry-Pi-ethernet-port-for-rem/) : Instructable is a place that lets you explore, document, and share your creations. It originated at the MIT Media Lab as the future founders of Squid Labs built places to share their projects, connect with others, and make an impact on the world.