IoT Based Lecture Delivery System Using Raspberry Pi

Shaik Yusuf Baji Saheb, Gharade Abdul Mueed,Haider Choudhary,Ziauddin Ansari

B.E, Computer Engg., Anjuman-I-Islam's Kalsekar Technical Campus, Navi Mumbai, Mumbai University, Maharashtra, India

Abstract:this paper illustrates the implementation of the SMART CLASS which is extended version of SMART LECTURE DELIVERY SYSTEM using a low cost credit cardsized single board computer called as RASPBERRY PI. Insidethe PI, we have used NOOBS operating system. Recording is triggered by the faculty through their android phone by a python application in raspberry pi. Camera module is used for recording video stream whereas audio is captured by a wired or wireless microphone. After Recording, the audio and video files are merged and sent to the server through FTP protocol from where we can host it ondedicated website or an android app. We can further extend its functionality by adding the attendance capturing functionality It can alsobe used to monitor the behaviour of the student in the class andused to control any misconduct happening in the class.

Keywords: Raspberry Pi, Raspbian, Mini Board Computer, Smart lecture delivery system, Smart class

I. INTRODUCTION

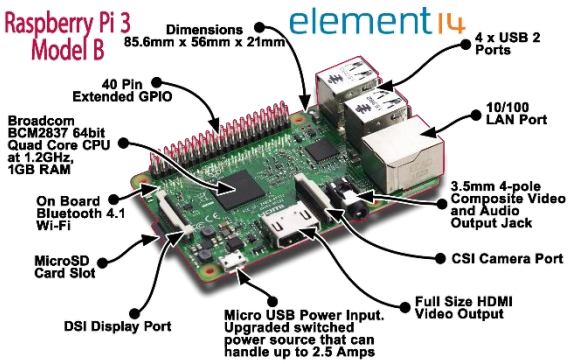
In the digital era of technology, we can see the involvement of machines and automation of process done by normal human beings. [1] A term arises called as IoT, termed as Internet of Things, which says connectivity of devices in same network which are in sync with one another. A general definition is it is a proposed development of the internet in which everyday objects have network connectivity, allowing them to send and receive data.

Devices connected in the same network operate smartly allowing the user to control all these devices at once. IoT has enabled automation of many processes that a normal human beings do in their daily life. On a higher level, IoT is the ability for things that contain embedded technologies to sense, communicate, interact and collaborate with other things, thus creating a network of physical things. Best example of IoT can be seen in the home automation system where all common electrical appliances like microwave, refrigerator, and television set etc. Which are needed to operate manually are converted into automated devices. They take input from the environment and manipulate the output based on it without involvement of the user physically.

Raspberry Pi, developed in the United Kingdom found by RASPBERRY PI foundation to promote smart learning and teaching base computer science among the young generation. Pi got its name from old tradition. Raspberry name of a fruit was given as a part of naming computers in the name of fruits. Pi stands for python interpreter which is a programming language. Python was the first
Programming language which was ported in RPi so the name Pi. It operates on many operating system based on

Linux operating system like Raspbian, Windows 10 IoT core. In collaboration with a tech company [2] Broadcom, they started producing the minicomputer boards in the year 2012. In the same year First Pi model 0 was released. This credit card sized mini board computer is capable of performing many tasks what a standard desktop or a computer can do sans the size. It can be plugged to any display with an HDMI port or through a separate LCD display.

Raspberry Pi is a bare bones personal computer, incredibly cheap, it focuses on encouraging people in learning, Its cost make it more accessible to the people to those with low income or living in a poor community. Since our society is becoming more reliable and more and more reliable on computers, it becomes necessary to encourage such technology, combining it with IoT technology make it more resourceful as ever.



II.

III. OVERVIEW OF RASPBERRY PI

The proposed system uses Raspberry Pi 3 Model B single board computer specifications are listed below:

- 1.2 GHz 64 bit Quad core ARM v8 CPU
- 802.11n wireless LAN module
- Inbuilt Bluetooth 4.1 module
- Micro SD card slot, 1GB RAM
- 10/100 Ethernet Port, 4 USB ports
- 40 GPIO pins
- VideoCore IV 3D graphics core
- 5 MP Camera Module capable of full HD video @30 fps

At first Raspberry Pi was configured as normal desktop with an external monitor which is connected through HDMI port and camera module.
Raspberry Pi runs the Raspbian OS is programmed using python programming language

Fig II: Raspberry Pi with camera module connected

Camera module in fig II is capable of capturing a High definition videos and still images and it can be connected with Raspberry Pi directly with the CSI (Camera Serial Interface).
Unlike using USB camera for this purpose, it takes much less power input and better frame rate. Also it has its own GPU which reduces load on the CPU.The cost of the whole setup is 80$ including other components like microphone, audio converter.

Raspberry Pi Operating System

For this setup, we have formatted the external SD card with the Raspbian OS, a Debian based OS optimized for Raspberry Pi hardware. Comes with 35000 packages, pre compiled software bundled in a format.

IV. IMPLEMENTATION

In this Project components which includes raspberry pi, RPi camera module, microphone, USB to Audio converter, Power Supply to Pi through a 5 V charger, SD card for memory of Raspberry Pi.
Raspberry Pi is powered up by a power supply of 2.1 Amps 5V charger, OS is loaded in the memory card
As shown in earlier figure of Raspberry Pi different ports available for connecting audio and video devices like microphone, camera module. We require a USB to audio converter for connecting the microphone. Camera module is connected to the dedicated CSI port for the camera module. For network connectivity for the Pi, we can connect it using Ethernet cable or we can use Wi-Fi to connect with the Pi with internet.

It starts with the interaction of teacher with the interface for the Raspberry Pi on their android phone. The user will have to login to the Pi's display through VNC Server, an android application which allows user to cast Pi's screen on their respective android phones. By this, the user can access the interface in Pi on their phone. Through this application, Teacher selects the subject, class, topic name and starts the recording. After Recording is completed, the faculty can stop the recording through the same interface. Below fig. shows the designed interface for the faculties.

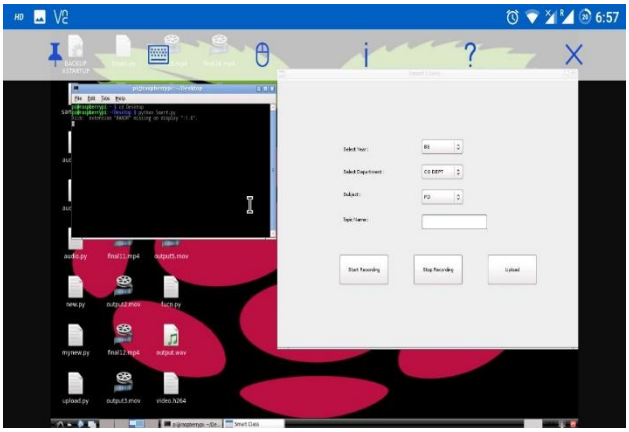


Fig III: Python Application for the faculties accessed using VNC application on android phone

Audio and video files are separately recorded by the respective input devices in .wav and .h264 format respectively. After the recording is completed, the video file is converted into mp4 format as the camera module has H264 format. Then the two files are merged by running python script in Raspberry Pi and converted into final file of .mov format.
This video file is then sent to the server to by using FTP protocol. After sending the feed to the server. It is hosted on the website and an android applicationwhich is end user interface for the students as well as for the teachers.

V. FUTURE SCOPE

It's not just content delivery we kept in mind, but also other functionalities which can be added, making it more useful than before. Many of the components we have used like wired microphone for sound input can be replaced with a Bluetooth microphone or a wireless mic, making system more robust. As the technology advances, hardware advancement gives an opportunity to increase the project working further. Increased functionality add into popularity of this project, and expected to raise more. There is a possibility, better system proposals may rise up but they may find this system helpful for extension.

VI. CONCLUSION

This proposal is an extension for the Lecture Delivery System based on setup of Raspberry Pi with its camera module. But this proposal is far from being perfect and there is lot of room of improvement as the field of IoT is improvising day by day, we can expect much more features added in the current proposed system.In Future, we plan to extend this much more from lecture recording to other added up features like attendance module using face detection technology. Considering hardware advancements, there is possibility of using much more powerful and compact computer board or future models of

Pi.

ACKNOWLEDGEMENT

This paper is an efficient contribution of its authors to the field of IoT and encouraging the technology of mini computers like Raspberry Pi. The work done here is expected to bring a change in the current trend of the system by switching to this method. Not just switching, but also enhancing it with better features.

REFERENCES

[1] Raspberry Pi https://en.wikipedia.org/wiki/Raspberry Pi
[2] Ansari Imaran Bhatkar Firoz Choudhary Faisal and Khan Sharukh "Smart Lecture DeliverySystem using Raspberry Pi" International Journal Of Advanced Research in Computer EngineeringTechnology(IJARCET) vol 4 issue 3, March 2015
[3] Huu-Quoc Nguyen, Ton Thi Kim Loan, Bui Dinh Mao and Eui-Nam Huh "Low Cost RealTime System Monitoring Using Raspberry Pi" IEEE 2015 Seventh International Conference onUbiquitous and Future Networks (ICUFN)
[4] Sunil Kanzariya "Real Time Video Monitoring System Using Raspberry Pi" InternationalJournal of Advanced Engineering and Research Development" 2015
[5] Raspberry Pi 3 Model B https://www.raspberrypi.org/products/raspberry-pi-3-model-b/
[6] Knowing Raspberry Pi Camera https://www.raspberrypi.org/products/camera-module/
[7] Raspberry Pi Camera and its operation https://github.com/iizukanao/picam
[8] Synchronizing audio with video in raspberry pi http://raspberrypi.stackexchange.com/questions/25962/sync-audio-video-from-pi-camera-usb-microphone
[9] Connecting Raspberry Pi with Android https://www.raspberrypi.org/documentation/remoteaccess/vnc/20

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