IoT Based Smart Projector

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Abstract - *Due to the development of technology, electronics have become intertwined with our daily lives. The dependence on various types of user-friendly and technologically savvy products; in regards to which, improving the currently existing available technologies is very crucial. An instance of such a case for vast areas of improvement is the most commonly used projectors. In many places, projectors have become an indispensable instrument for presentations or teaching, we will improve the traditional projector by applying the idea of IoT which concentrates on lowering the cost and upgrading the nature of traditional projector, by connecting IoT based module to it. The proposed system will substitute traditional PCs and Laptop with Raspberry Pi which won't just drastically reduce the cost of developing IoT module for the projector, but also will accomplish the nature of reliability as the framework will consume a little measure of energy, yet will give indistinguishable application from whatever other similar framework does.*

Key Words: **Projector, IoT, Raspberry Pi, Remote Access, Storage Component.**

1. INTRODUCTION

Innovation has become the dominant point of view in colleges and universities, with study material being shown by utilizing PowerPoint slides and Portable Document Files (PDF), giving better bits of knowledge into the topic. For this, there is a need to incorporate tablets that should be associated with projectors and compact gadgets like a pen drive is actively needed [1]. Two notifications pertaining to the accompanying wasteful aspects in this practice are-

1. The requirement of a tablet for every last class, bringing about expanded cost.
2. Required to bring along convenient gadgets each time.

Along with this, there comes out a need to make a gadget that promises to decrease the general cost and also disposes of the need to bring across a convenient gadget each and every time to the class [2]. A general goal of this venture is to utilize Raspberry Pi and its SD storage and web interface to receive documents that have been sent from remote computers or servers and view these documents on the projector [3]. When Raspberry Pi has been set up and is prepared to be used as an ordinary PC, applications can be introduced in this manner give power going to view all the records.

2. PROBLEM SCENERIO

To better understand the problem, think about the present situation in any one department of an institution. If the department has five classes and professor in each of this class uses a projector, this brings in the requisite of one laptop for each class. Now, if at the same time five classes require laptops, the cost of laptops and computers to be invested by the department would approximately account to Indian Rupees 1,50,000 - for each PC it will cost approximately 30,000 and 30,000*5 = 1,50,000 Rupees. This will be a huge amount that the department would need to invest in teaching efficiently. Nowadays, any school, college or university has at least 4 departments in it, thus the cost sums up to Rupees 6,00,000. Hence, college or university spends such a huge amount of money which when compared to the intent behind it does not seem to be cost-effective. By reducing this amount spent on buying Portable PC's and Tablets, the saved amount can be further used by the department for some research or any other beneficial task. Using this paper the problem is addressed efficiently, in regard to this problem. The system proposed using this paper here is referred to as "IoT Based Smart Projector", and it makes use of a Raspberry Pi – a credit card sized computer that would provide a cost-effective and energy-efficient solution to the above-stated problem [4]. Cost-effective as Raspberry Pi costs only one-tenth of a laptop (less than 4000 Indian Rupees) and energy-efficient as it consumes much less power (5V) as compared to required by a laptop [5].

3. LITERATURE SURVEY

Table -1: Existing System Survey

Reference	Description	Methodology
"Designing the Chromecast and its Out-of-Box Experience" by Noor Ali-Hasan, Google [6].	This Paper provides information about the Chromecast, working of Chromecast, its features, its configuration and the user experience about the Chromecast and it also guides to how to set it up.	Uses Iot module Marvell Armada 1500-mini 88DE3005 based on a chip running an ARM Cortex-A9 processor.

"Instructional Screencast: A Research Conceptual Framework" by Muhamad Razuan Abdul Razak Anda Ahmad Zamzuri Mohamad Ali, University Pendidikan Sultan Idris, Malaysia [7].	The use of Screencast as an instructional media for teaching and learning can be very effective in terms of visual studies because it helps to understand things more practically. But the literature survey indicates that the use of screencast as a teaching and learning media is not effective for all types of students.	Survey on screencast and the impact of it on the student.
"An Experimental Study of the Effect of Using the Overhead Projector in a College" by Lida Weed Myers, Central Washington University [8].	The purpose of this experiment was to investigate the possibility that visual materials "custom tailored" to a professor's specifications and integrated with his lectures might improve student achievement on standardized objective tests. The visual materials, transparencies projected by a 10X10 overhead projector, were designed and executed to meet the requirements of a professor teaching.	Uses of an overhead projector to meet the visual requirement of teaching
"Do screencasts help to revise prerequisite mathematics? An investigation of student performance and perception." by Birgit Loch, Camilla R. Jordan, Tim W. Lowe and Ben D. Mestel [9].	The purpose of the screencast is to show a visual learning approach to the mathematics. As the visual approach helps to better understanding and knowledge processing to the student.	Screencasting for the visual study of any domain of teaching.

In Existing Traditional Projector System, we need laptop or desktop to display our study related resources which in turn leads the requirement of carrying those machine everywhere, and attaching laptop and computer to every single projector makes learning costly for education administrator and also leads to costing higher to the student.

The different existing systems are as follows:

1. Anycast: This system is a wireless module that directly connects to a projector and connects wirelessly to smartphones and laptops or another system with wifi module [10].

The drawback of this system is that we can not directly connect any external media store with this, we need to store our file firstly on smartphone or laptop that only you can access those devices, furthermore there is no internet access or application to access file which is stored on cloud storage and emails.

2. Chromecast: This system is a wireless module that directly connects to projector and tv, connects wirelessly to smartphones and can have internet access. This device is used for entertainment purpose but it can't access a file stored on a smartphone or any machine [11].

3. Yehua: it is similar to Anycast with an additional feature, that one can connect chrome browser too; including screencast through smartphones [12].

4. PROPOSED SYSTEM

The proposed system will use the IoT module-Raspberry Pi 3B+ model. Why Raspberry Pi? because Raspberry Pi is a microprocessor-based mini computer along with inbuilt Wi-Fi and Bluetooth modules, also the Raspberry Pi is the size of a pocket credit card. As for its small size, one can easily fix Raspberry Pi along with any type of traditional projector. This module will make a traditional projector to a smart projector [13]. The process to access the documents and files with the help of the Raspberry Pi module using external media storage and the internet is duly explained. It explains the use of Desktop computers and laptops reduces drastically. We propose a new architecture for remote control and access through smartphones and laptops too, which allows sharing of displays between projector, smartphone, laptop. The various platforms must be taken into consideration and specifically done using the Wi-Fi range.

Also Raspberry Pi possesses the features and functionality of a computer, it can be set up on a network which will act as a node to access data or files via LAN (Ethernet connection) and with the help of internet access on Raspberry Pi, one can give live counseling to listeners.

Features of Proposed System:

1.Wireless Display.

2.Files on external devices can be accessed.

3.Files on smartphones can be accessed.

4.Files on the internet can be accessed easily.

5.Files on multiple desktops can be accessed via a shared folder using an ethernet connection

6.Can perform a task like- Demonstration of live program coding, live counseling, graphical and visual studying approach.

7.Low cost.

8.Low Power Consumption.

5. IMPLEMENTATION DETAILS

5.1. About Raspberry Pi

Raspberry Pi - The Device:

Raspberry Pi is a credit card sized mini-computer. The Raspberry can be regarded as a mini PC that can enable to access all the powerful features similar to that of a traditional Desktop computer [14]. Functionalities such as word processing, playing several formats of audio/video plus games are some well-known examples. It has become a widely used device for learning programming for quite a while now.

Fig -1.Raspberry Pi 3B+ model

The above figure is of Raspberry Pi 3B+ model with 4 USB ports and 1 ethernet port. Along with this, IoT module consist of VGA, audio out port, touch display and camera port.

Specification:

The Raspberry Pi is a 3.370 X 2.125 motherboard with a 1.4 GHz CPU and a 400 MHz GPU with 1GB of RAM. The presence of the Ethernet ports provides access to the Internet and remote accessing. Furthermore, there is an HDMI port which can be used to easily access any form of displays such as a computer monitor or projector, as in our case. The Raspberry Pi provides with a couple of USB ports that provide the connectivity of pen drives and mouse/keyboard. The Raspberry Pi includes a set of pins that are generic in nature and are popularly regarded as GPI/O or the General Purpose Input/Output pins which can be modified and controlled through software and programming methodologies.

The Raspberry Pi also has an SD card slot, which can act as internal storage and can also store an image of the Operating System [15].
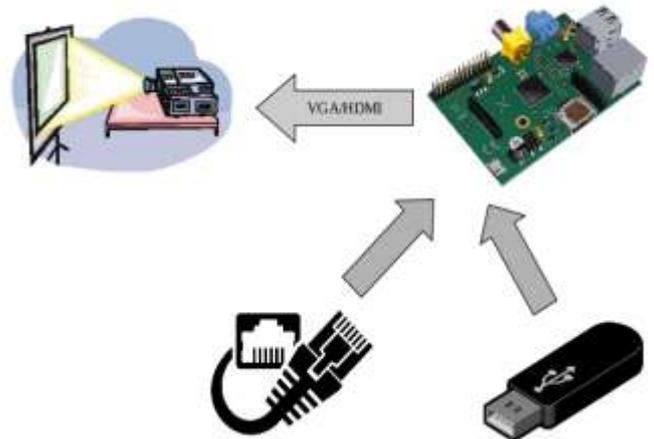
5.2. Architecture

Fig -2. Proposed System

Fig. 2 show the proposed architecture for the smart projector. The traditional projector will be connected to the Raspberry Pi 3B+ model integrated with the screencast feature and configure over a network that will help to access data from a remote computer by Data sharing over LAN, also with this module one can access data over the Internet.
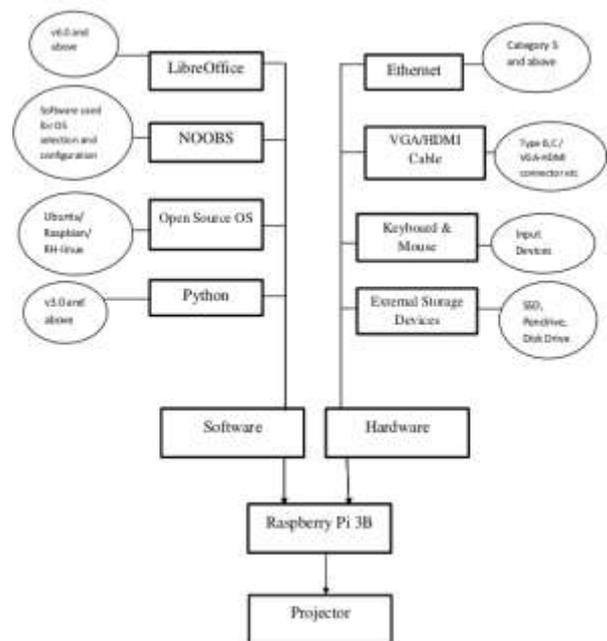

Fig -3. Design Details

Fig. 3 show the software, hardware and programming language used to build the system. Open source programming language, Python is used to create an interface to screencast, LibreOffice is an office tool used for accessing documents, NOOB is Operating system configuration tool for

Raspberry Pi, Open source operating systems are used to minimize the cost of IoT module, VGA to HDMI Connector & HDMI cable is used to connect Raspberry Pi with Projector, Ethernet is used for data transfer, External device storage is required for accessing data from a remote machine.
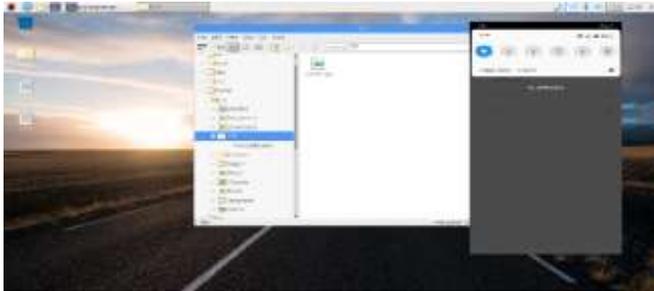
5.3. Results

Fig -4.Casting

Fig. 4 show the result of casting service implemented on Raspberry Pi. Implementation of the casting services to match with the currently available technology is done, ensuring that the wireless connectivity of the mobile phone and tablet devices is made available and the study related resources to be accessed and viewed on the projector efficiently and effectively.

Fig. 5 presents the result of a application interface created for better user interaction. Nobody wants to use something that does not look good, for that reason and to make the user experience and user interface as seamless as possible, the GUI is developed. Python, an open source language is used to combine both form and function and make available a smooth and ease of access to all the available features on the system.
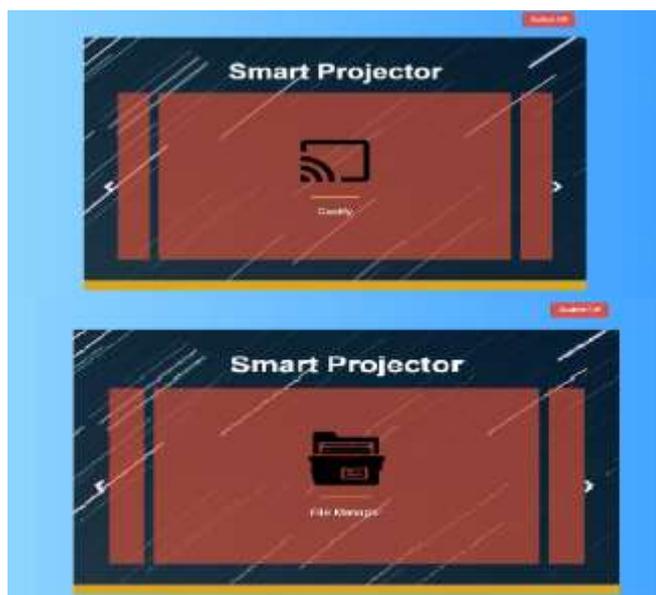

Fig -5.GUI

6. CONCLUSION AND FUTURE SCOPE

The process of teaching and learning in the educational sector as well as in the corporate sector is changed using IoT based modules. The user requirements and organizational requirements are gathered and implemented. The UI is implemented in python for user interaction, Server is integrated for data sharing, Screencasting is implemented for the connection of wireless display through a smartphone or any smart device, wired and wireless input/output modules are integrated. The user can use the internet to access data stored on a remote location as the internet connectivity is provided, and by using this system the budget and efforts of carrying and implementing the old system will be reduced drastically.

The scope of the proposed module is to provide an alternative for replacing the use of laptops and desktop alongside projector with IoT module. One can simply connect Pendrive, SD Card, Internet to access remotely located files in an economic friendly manner which is very compact, the size of a smartphone. Thus to maximize the efficiency and lower the cost of running any bureau that requires such a traditional setup an alternative approach of using Raspberry Pi and making the projector "smart" which solves the majority of issues faced today is proposed.

7. REFRENCES

[1] D. Cheeda, D. Darde, and S. Chitalia "Smart Projectors Using Remote Controlled Raspberry Pi."(2013)

[2] M. Beránek, I. Lisunov, V. Vacek "Learning IoT skills in the context of student projects"(2019)

[3] N. S. Yamanoor, S. Yamanoor, C. Moreno, M. Bereng "High Quality, Low-Cost Education with the Raspberry Pi"(2017)

[4] K. Xie, H. Chen, X. Huang and L. Cui "Low cost IoT Software Development - Ingredient Transformation and Interconnection"(2016)

[5] "https://projects.raspberrypi.org/en" - Official website of the Raspberry Pi project. Accessed 16 Dec 2018.

[6] N. Ali-Hasan "Designing the Chromecast and its Out-of-Box Experience", Google.(2014)

[7] M. R. Abdul Razak and A. Z. Mohamad Ali "Instructional Screencast: A Research Conceptual Framework", University Pendidikan Sultan Idris, Malaysia.(2016)

[8] L. W. Myers "An Experimental Study of the Effect of Using the Overhead Projector in a College", Central Washington University.(1960)

[9] B. Loch, C. R. Jordan, T. W. Lowe, and B. D. Mestel "Do screencasts help to revise prerequisite mathematics? An investigation of student performance and perception."(2013)

[10] "https://any-cast.com/", about Anycast dongle. Accessed 16 Dec 2018

[11] "https://www.google.com/chromecast/built-in/", About Chromecast dongle. Accessed 23 Dec 2018.

[12] "https://www.makeuseof.com/tag/miracast-chromecast/" - About miracast and chromecast. Accessed 23 Dec 2018.

[13] D. K. Kumar and J. Sahaya Rani Alex "Screencasting from a small screen to big screen -An experimental validation", ResearchGate Conference Paper (2017)

[14] "Raspberry Pi 3 Model B+: A Delightful Next Step" by PC Magazine.

[15] "https://www.raspberrypi.org/products/raspberry-pi-3-model-b-plus" About Raspberry Pi 3B+ an official website. Accessed 27 Dec 2018.

[16] L. Coetzee, and Johan Eksteen. "The Internet of Things - the promise for the future? An introduction."IST-Africa Conference Proceedings, IEEE(2011).

[17] "The Magpy Magzine: The Official Raspberry Pi Magzine" by J. Rauch.

[18] "Learn Raspberry Pi with Linux." book by Membrey, Peter, and D. Hows, Apress Publication (2012)

[19] "https://www.jeremymorgan.com/tutorials/raspberry-pi/how-to-raspberry-pi-webserver/" Blog of J. Morgan. Accessed 27 Dec 2018.