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Mini LED Projector Using Raspberry Pi

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ABSTRACT: Projector or an image projector usually these are used to project an image on the screen. (Image, video or anything). There are many such projectors that create an image on the screen passing a light source using a transparent lens (through which the light passes). The virtual retinal display projectors project the image directly on retina without the use of projection screen. Now-a-days we use the video projectors and these are digital one and are replaced in place of the slide projectors and old projectors. The video projectors came into being in the early 1990's-2000's but somewhere the old analog projectors are still being used. The new types of projectors use the laser or LED equipment to project the screen and are handy. When there is more light in the surrounding then the projected screen can't be visible clearly. We are working on Mini LED projector that can be assisted in e-learning and can be very handy and also used for portable applications. The projector consists of LCD which gives high lumen output and a low cost price, a raspberry pi (mini computer) is used for the interfacing of LCD and Raspberry pi. In this project we have provided the facility of running PPT's and also the Wi-Fi facility is given to the projector.

I. INTRODUCTION

Raspberry Pi is a mini computer it was designed for the purpose of teaching basic computer science in schools. It was developed by the Raspberry Pi foundation in UK. Raspberry Pi is a system on Chip (SoC) having Broadcom BCM2835 which includes an ARM1176 JFZ-S700 MHz processor, Video Core version IV GPU and also 512 MB of RAM. It uses a SD card for storage of data and for booting up files instead of using a local disk or hard disk drive. The features of Raspberry Pi are so useful that the projectors can be accessed anywhere due to it. Due to raspberry pi we have bypassed the use of computer. The USB and Wi-Fi facility provided allows us to download the PPT's or any data on the spot and project it on the screen. The writing pad or keyboard can also be interfaced using the USB port. USB has the feature of carrying data between devices and the same feature is applicable here. In this era of using handy things and not much complicated and heavy devices this projector proves a boon for all misery. And also using PC or laptop can give rise to a huge wastage of power.

II. LITERATURE SURVEY

As in [1]; The Raspberry Pi is a low cost, credit card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like scratch and python. It's capable of doing everything you'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games, The Raspberry Pi is a low cost, a credit-card sized computer developed in UK by the Raspberry Pi Foundation with the intention of stimulation the teaching of basic computer science in school. The Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity and peripheral device support.

As in [2]; A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p-n junction diode, which when activated. When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons. This effect is called as electroluminescence, and the color of the light is

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determined by the energy band gap of the semiconductor. An LED is often small in area and integrated optical components may be used to shape its radiation pattern. Modern LEDs are available across the visible, ultraviolet, and infrared wavelength, with very high brightness. Early LEDs were often used as indicator lamps for electronic devices, replacing small incandescent bulbs. They were package into numeric readouts in the form of seven-segment displays and were commonly seen in digital clocks.

As in [3]; DLP is a revolutionary new way to project and display information. Based on the Digital Micro mirror Devices, DLP creates the final link to display digital visual information. DLP technology is being provided as subsystem” engines” to market leaders in the consumer, business, and professional segment of the project display industry. In the same way, the compact disc revolutionized the audio industry, DLP will revolutionize video projection. DLP technology is based on an optical semiconductor, called a Digital Micro Mirror Device (DMD), which uses mirrors made of aluminum to reflect light to make the picture. The DMD is often referred to as the DLP chip. The chip can be held in the palm of your hand, yet it can contain more than 2 million mirrors each, measuring less than one-fifth the width of a human hair. The mirrors are laid out in a matrix, much like a photo mosaic, with each photo mosaic, each piece of it holds a tiny, square photograph. As you step away from mosaic, the images blend together to create one larger image.

As in [4-5]; High-power LEDs are extremely energy efficient and provide excellent lumens per watt performance compared to alternative technologies. For example, a standard high-power LED can offer 80 lumens per watt compared to 70 lumens per watt for CFL (compact fluorescent lights) and just 15 lumens per watt for incandescent light. A typical high-power LED consumes between 1W to 10W of energy. These are low energy consumption figures when compare to 40W for a low-power appliance bulb and 60W for the standard florescent fixture. In some instances, the energy consumption of 60W incandescent CFL is 15W, which is much closer to that of high-power LEDs. However, high-power LEDs mercury-free consumption is typically an important factor. CFLs contain small amount of mercury and currently, many cities, states, and countries worldwide are working to restrict the use of mercury-containing lamps.

As in [6]; The Raspberry Pi is a low cost credit card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard or mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. It’s capable of doing everything you’d expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, wordprocessing and playing games.

The Raspberry Pi is developed in UK by the RPi foundation with the intention of stimulating the teaching of basic computer science in schools.

The Raspberry Pi has a Broadcom BCM2835 system on a chip which includes an ARM1176JZFS 700MHz processor, Video Core IV GPU and 256 megabytes of RAM. It does not include a built-in hard disc or solid-state drive but uses an SD card for booting and long term storage. The Foundation’s goal is to offer two versions, priced at US\$ 25 and US\$ 35.

Also planned are tools for supporting Python as the main programming language, with support for BBC BASIC, C, and Perl.

What’s more, the Raspberry Pi has the ability to interact with the outside world and has been used in a wide array of digital maker projects, from music machines and parent detectors to weather stations and tweeting birdhouse with infra-red cameras.

As in [7]; The HDMI technology is a global standard for connecting high-definition equipment. HDMI is the intelligent, all-digital interface that delivers both dazzling quality and unmatched ease of use. It transmits crystal-clear digital videos, multi-channel surround audio, and advanced control data through a single cable. It can query each component connected and verify the capabilities and automatically adjust themselves for optimal viewing. A TV and a DVD player, for example, can auto-negotiate settings like resolution and aspect ratio.

As in [8-9]; USB 3.1 is a successor to USB 3.0. Identifiable by its bright turquoise port, USB 3.1 doubles the transfer speed of 3.0 to a whopping 10 Gbps. USB Power Delivery 2.0 makes a big step forward as well with up to 100W of power. And like previous versions of USB, it is fully backwards compatible with its predecessors. When used with Type-C connection, things get really interesting for 3.1. The 100W of PD v2.0 is enough to power and charge full sized notebooks, which means the proprietary AC port may soon be replaced by this universal alternative.

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III. RELATED WORK

3.1 Existing Method:

During the 1980's there evolved the DLP projectors having the DLP chip in it. This technology constituted of many tiny mirrors in it having the size of 1/5 the size of human hair. Every mirror in it had the special adjustment to move back and forth and adjust itself to give a better light pixel. Color is fed to this device through a source of light and it then passes through the chip. Not directly given but indirectly fed using a spinning wheel. The colour wheel consists of major colours red, green and blue and the secondary sources are Cyan, magenta and yellow supported by the advanced colour wheel. These chips can create upto 16.7 million colours and a DLP projector with 3 chips can give upto 35 trillion colours. When colour reaches the DMD chip then it is given to the lens and then onto the projector screen.

IV. PROPOSED SYSTEM

LED projectors define the lighting of projected screen and not the display technology. Some of the DLP chip projectors are LED projectors having illumination source of solid state. The Pico projector which also uses LED technology is another example for it. This Pico projectors are handheld lamp devices using LCoS and DLP technology. In this case, the projector replaces the traditional lamp with longer-lasting and more efficient LED colored in red green and blue. The LED in a LED projector have much longer life than traditional projector lamps, rated at 10,000 or even 20,000hours.

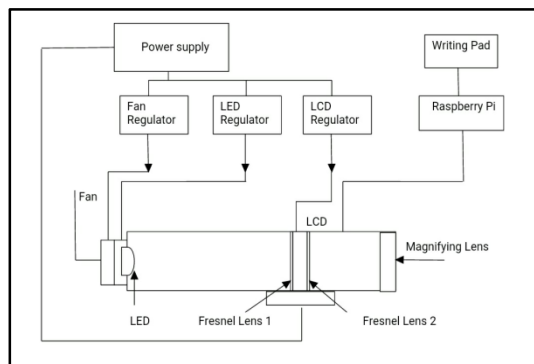


Fig 4.1 : Proposed System Block Diagram

Figure shows the general block diagram of Mini LED projector. The components used are LED, LCD, Fresnel Lens, Magnifying Lens, Fan. The Raspberry Pi is interfaced to the LCD using the programming language 'Python'. The LCD is placed in between the two Fresnel lenses. There is a 12V power supply provided to the projector as the LED consumes 12V supply. The LED is of 30W and 1.2A. Generally halogen bulbs generate lot of heat and the projector gets heated up more and it causes harm to the system. To overcome this we have used LED which gives less amount of heat and doesn't harm the projector.

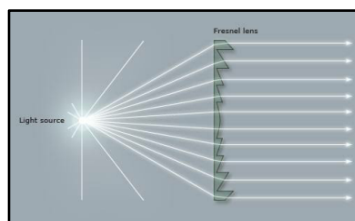


Fig. 4.2 : Basic Principle

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Figure shows the basic principle of our project. The basic components used are LED, LCD and Raspberry Pi. When the light is generated by the LED it passes through the prism used and then goes to the Fresnel lens which is placed at the front and back of the LCD. The video signal input to the LCD will be taken by the bulb (LED) and then given to the lens which projects it on the screen. The basic principle of operation is same for every projector but the complexity is of different kind. The use of Fresnel lens is to focus light which normally takes a spherical lens much thicker to focus thus reducing the space. It works on the principle of refraction. The light passing through LCD will generate the corresponding image which will pass through a magnifying lens and onto a wall or a screen. The LCD will be about 3 inch to 3.5 inch i.e., 640x480 pixels using 12V with AV input.

V. RESULTS

Figure 5.1 shows the projected screen. When we interface the mini LED projector with the raspberry pi we get to see the PPT's. The PPT's are stored in the pendrive and the program is stored in the SD card of the raspberry pi. The LED generates light when an AV input is provided to it, this light passes through the LCD and illuminates the magnifying lens which gives the desired output on the wall or screen. When the projected screen is visible to us we can say that our Wi-Fi module is working fine and we can download anything from it and store in the pen drive provided. From this we get to know that how useful, reliable and low cost product we have designed.

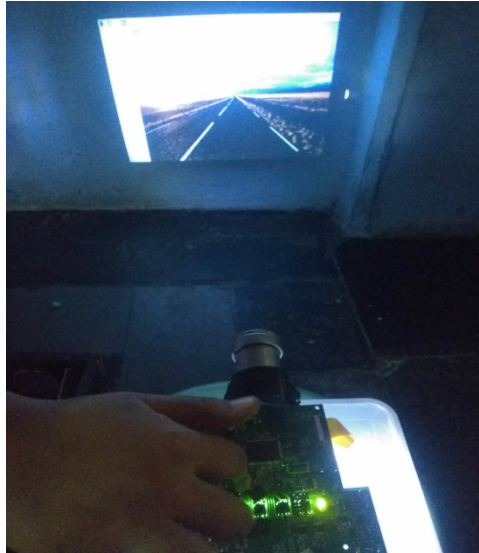


Fig 5.1: Projected Screen

VI. CONCLUSION

When the use of some device increases we look to reduce its size. Here is the same case the ease of projectors increased and thus the size reduced and became very handy. The business people and many such people who used to carry laptop or PC in later era now use the handheld projectors. This projector has found its way to be very useful in the dorm room, theatres and for the projection screen or wall while teaching in schools.

Due to the increased technology and public ease the handheld projectors were possible to produce. These projectors produce a high resolution picture with good brightness and low power consumption. It can fit into a pants pocket it means that the size is reduced and can be carried anywhere.

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Brightness is the main quality for the projectors. It is measured in lumens. These projectors can project in the range of 85 to 500 lumens. Higher the number of lumens brighter is the image.

The handheld projectors can be integrated over numerous applications. Mini LED projector have given the advancement in the enjoyment of media applications, video browsing, etc.

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