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VR Based Monitoring System

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Abstract: we describe the design and development of hardware and software of a portable Virtual Reality in this research paper. The easy access of the device is achieved using a small credit-card sized, yet a powerful computer, Raspberry Pi. It is responsible for the execution of the main software and display of the rendered images on the screen. The Inertial Measurement Unit (IMU) present in the device tracks the user's head movements and communicates with Raspberry Pi. This technology focuses on developing a dedicated hardware platform for the Virtual Reality purposes. Throughout the design phase of the project, cost is kept minimal without compromising on the performance of the system.
Keywords: Virtual Reality, Augmented Reality, Head Tracking, Portability, Camera Mount.

I. INTRODUCTION

In the past few years, researchers have been working on Virtual Reality (VR) and Augmented Reality (AR) systems. These systems create a visual sensation to the user in the form of virtual or mixed reality. The rendered images are updated on the screen of the Head Mounted Display (HMD) according to the movement of the user. The HMDs available in the market are bulky and wired to the user's computer that executes the software. These systems require a processor with a good computational power and a Graphic Processing Unit (GPU). Due to the above mentioned constraints, the user cannot move around wearing the headsets. In this paper, we discuss an alternate approach for the hardware and software design, aimed at making the system portable and compact, enabling user's movement while wearing the headset.

II. RELATED WORK

In 2012, Oculus launched the first version of VR headset for development purpose that was named as DKI. This product has great impact in the VR industry. Various commercial products that were built based on the technology used personal computers (PC) for processing the data and display it on the HMD. Thus, one of the major limitations in the existing technology is portability of the device. Some of the devices available in market use phone's internal processing capabilities and display, for VR purpose. The processing speed and graphics also limited by the phone's hardware.

III. HARDWARE DESIGN

Figure1shows the block diagram of the proposed portable VR headsets. It contains of three major components namely-the tracking unit, the computing unit, and the display unit. Research shows the maximum angular velocity and linear acceleration of the user's head does not exceed 180 deg/s and 2g (user is not jumping) respectively. Raspberry Pi hardware and Linux software platforms were used for computations. The processed data is displayed on the display screen in mobile phones. A pair of lenses is used for proper visualization of the rendered image on the screen. In fig1, the tracking unit tracks the movement of the user's head. The sensors data consists of the coordinates of the user's orientation. The data is fed to the computing unit which generates the real time rendered images. The rendered images are then displayed on the screen, thereby creating stereo visual sensations.

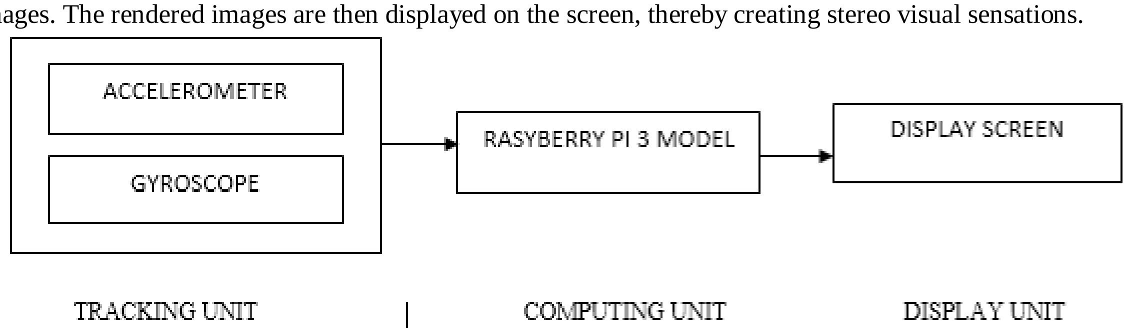

Fig1. Hardware Design

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A. Raspberry Pi 3

Raspberry Pi 3 is a credit-card sized single board computers. In our project we used Raspberry Pi 3 Model B. This version of Raspberry Pi is based on Broadcom BCM2837 processor. It has 1GB of RAM which is also shared with the GPU and an ARM Cortex A53 processor running with a clock of 1.2GHz. It has the capability to communicate with display unit having a resolution of 1900*1200 pixels using HDMI port. There is also a provision of placing a micro SD card on the board that has the Operating System (OS).The dimensions and weight of the computer is approximately 90mm * 60mm and 45gms, respectively. The power rating of the device is 5V~1A.The OS installed on the device is Linux based Raspbian version.

Fig2. Raspberry Pi 3

B. Raspberry Pi Cam

It attaches to Pi by the way of one of small sockets on the board upper surface and uses the dedicated CSI interface, designed especially for interfacing to cameras. The camera is supported in the latest version of Raspbian, Raspberry Pi's preferred operating system. It also weighs just over 3g, making it perfect for mobile or other applications where size and weight are important.

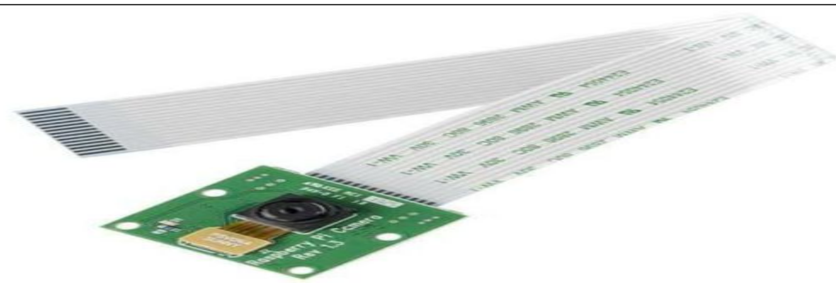

Fig3. Pi 3 Camera

C. Axis Pan Tilt Camera Mount

2 Axis Pan Tilt Camera Mount for Camera/Sensors are a servo based 2 axis pan and tilt mechanism for mounting wireless/wired camera and sensors on robot assembly. Rotating, twisting axis rotation and tilting are achieved by controlling Servo motors using PPM pulses. It is suitable for DIY panning and tilting application in projects. It provides 1.8 kg/cm torque at 4.8V and 2.2 kg/cm torque at 6V.Supports varied array of sensors and measurement device for different project applications.

Fig4. Pan and Tilt camera mount

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IV. DISPLAY UNIT

One of the requirements of the design is that the screen must cover the field of view of the user to achieve proper visualization of the image. A five-inch display screen was a good choice, as it covers most of the user's field of vision when placed at a distance of 4-5cm from the eyes. The driver for this device is present behind the screen itself. This makes the system compact. Resolution is this screen is 800*480 pixels which are sufficient for VR purpose. Peak current rating of this display is600milli Amps, which can be further be reduced by adjusting the intensity of the backlight.

V. RESULTS AND DISCUSSIONS

Figure5 shows the interfacing of Raspberry Pi with camera. The Raspberry Pi has a Mobile Industry Processor Interface (MIPI) Camera Serial Interface Type 2(CSI-2), which facilitates the connection of a small camera to the main Broadcom BCM2835 processor. It is a very simple interface and with a little reverse engineering with an oscilloscope, it is possible to figure out the pin out. The CSI-2 version of the interface was popular and used on almost all the mobile phones and devices currently found. MIPI CSI-2 version 1.01 supports up to four data lanes, where each lane has a maximum of 1Gbps bandwidth, to provide a total bandwidth of 4Gbps.The data connection is one-way, from camera to processor. Raspberry Pi has a camera interface (ZIF 15) where a ribbon cable connects to establish the communication bus. The CSI connector consists of two interfaces. One to transfer of data and clock signals from the camera to processor only. The second interface consists of SCL/SDA lines.

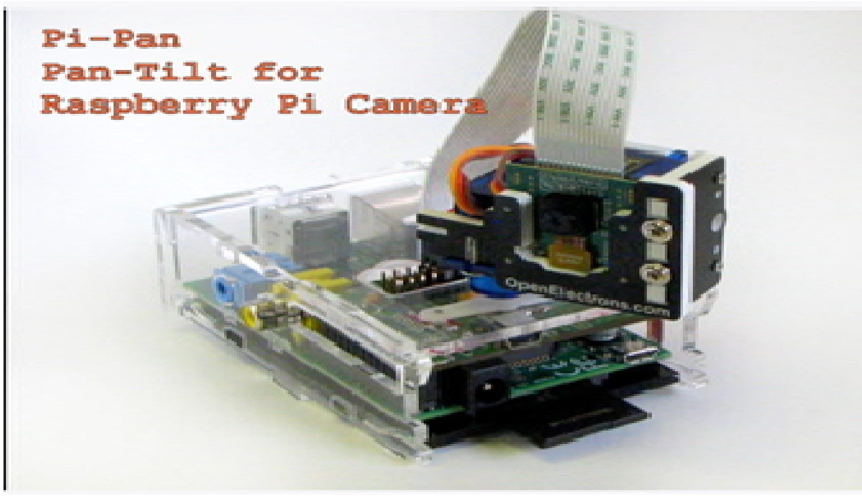


Fig 5.Functional Prototype of Device

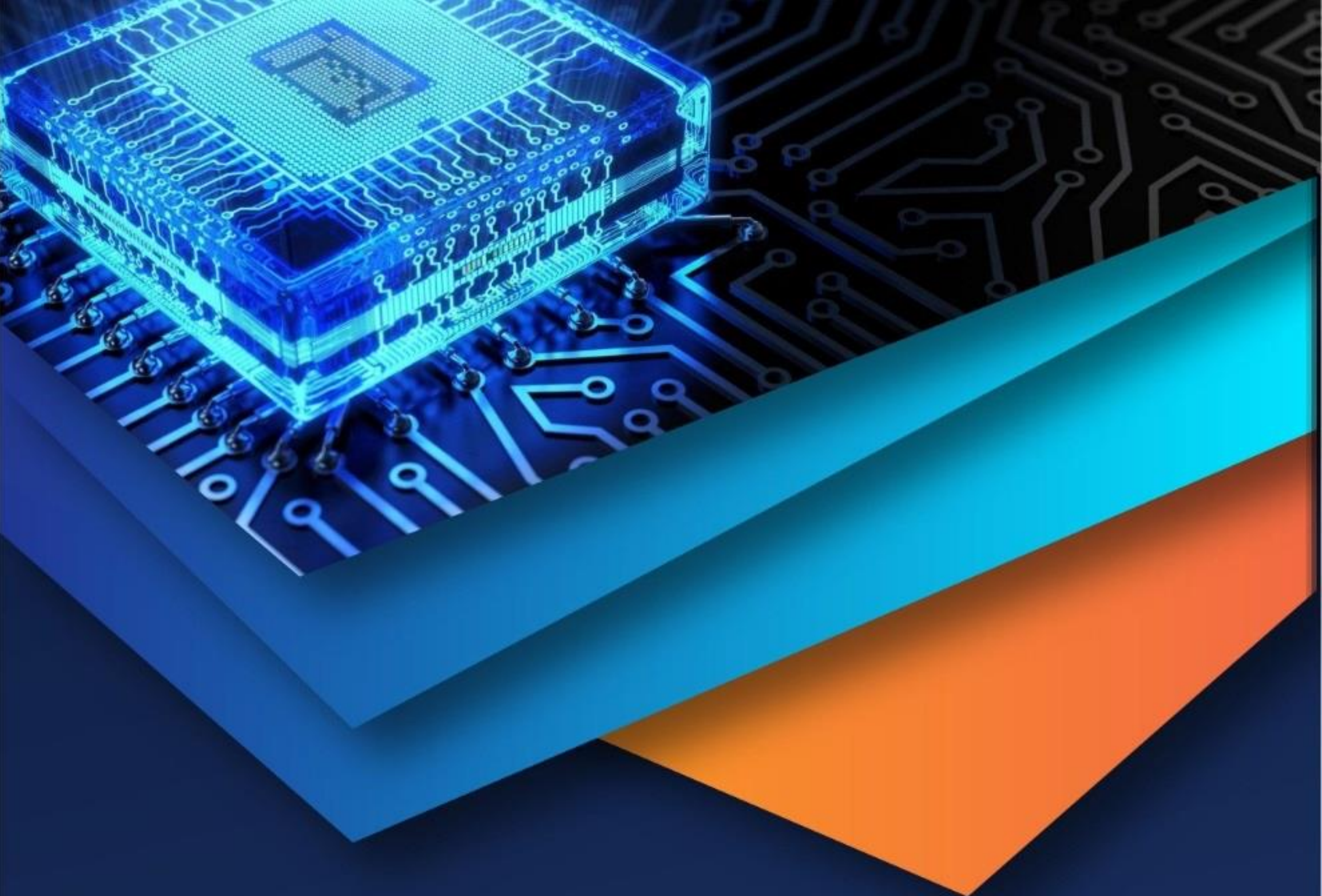
In this functional prototype, we used Raspberry Pi as the main processing unit running Linux OS (Raspbian version).Hence the software was developed in Python and Open CV libraries.

. VI. CONCLUSION

The key motivation for developing this product was to design and develop a dedicated hardware and software for VR purposes to make portability possible. Available devices use either the phone's processor and display or Personal Computers hardware. The upcoming design of the device will be developed with better display to address the problem of aliasing. The casing design for the device will be optimized for shape and mass. We also plan to incorporate cameras in the device to make AR possible. The device will capture the images from camera and place these images in background to render in real-time. This will enable superimposing the real world images, thereby giving an entirely new viewing experience.

REFERENCES

[1] http://msl.cs.uiuc.edu/vr/,2015
[2] https://www.oculus.com/en-us/,2015.
[3] http://www.visusvr.com/,2015.
[4] https://www.raspberrypi.org/documentation/hardware/rasberrypi/,2015.



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