Environmental Parameters Monitoring via Smart Glass

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Abstract—The maturing field of wearable computing aims to interweave computing devices into everyday life. This project focuses on smart glasses, one of the categories of wearable computing devices which is present in the media and expected to be a big market in the next years. It analyses the differences from smart glasses to other smart devices, introduces many possible applications for different target audiences and gives an interestingly natural way of interacting with the digital world. Therefore, smart glasses or lenses are the only devices which can alter or enhance the wearer's vision no matter where they are physically located and where the user looks. There are three different paradigms of how to alter the visual information a wearer perceives, which are Virtual Reality (VR), Augmented Reality (AR) and Diminished Reality (DR). The proposed conceptual model is developed, which demonstrates the underlying mechanisms that drive smart glasses to help collect data and in-depth analysis of the surrounding, the ongoing work will lay the groundwork for developing complex augmented reality applications that will enhance the way its users see the world.

Index Terms— Raspberry Pi zero, EnviroPhat, OLED Display, HUD Technology.

1 Introduction

THIS Raspberry Pi based project is an optical head mounted display designed in the shape of a pair of glasses, also called as smart glasses. Smart glasses are computing devices worn in front of the eyes. This glass is a wearable computer glasses that add information alongside or to what the wearer sees. [7]. Alternatively, smart glasses are sometimes defined as wearable computer glasses that can change their optical properties at runtime. They superimpose information onto a field of view achieved through an Optical Head Mounted Display (OHMD) or Heads-Up Display (HUD) or Augmented Reality (AR) overlay that has the capability of reflecting projected digital image as well as allowing the wearer to see through it or see better with it. Like other computers, smart glasses may collect information from internal and external sensors. It may retrieve data from other instruments or computers. It may support wireless technologies like Bluetooth, WI-Fi, GPS.

In combination with accelerometer the devices can determine exactly what the wearer is looking at with spatial coordinates. The device is used to get crucial information about the user's interests, activities, surroundings and occupation which enhances the natural environments or situations and offer perceptually enriched experiences. The information about the surrounding real world of the user becomes interactive and digitally manipulate able. Information about the environment and its objects can be virtual or real. Augmentation techniques are typically performed in real time and in semantic context with environmental elements. Immersive perceptual information like scores over a live video feed. This combines the benefits of augmented reality technology and the HUD technology.

With the explosive popularity of smart glasses, new technologies capable of extending their functionality and applications become extremely important. Our proposed idea introduces a computing device which is worn in front of the eyes and evidently the display moves with the users head/eye orientation while also displaying many information like R, G, B values, Temperature, Pressure, X, Y, Z coordinates and many possible applications for different target audiences and gives an interestingly natural way of interacting with the digital world.

2 Literature Survey

As Initial the wearable devices and technologies are defined as microcomputers and electronic devices that are incorporated into clothing items and accessories and can be comfortably worn. They can perform many of the computing tasks s mobile phones and personal computers. However, they can be more beneficial in certain contexts and can outperform some hand-held devices [1], [3]. This smart glass is an optical head mounted display where it measures the data. In [4] Author has come up with a technique that communicates the request to the computer and informs the partner as to the wearer's use of the machine.

Environment is made up of multiple parameters, including air, temperature, atmospheric pressure, humidity, precipitation, solar radiation and wind. Each of these factors can be measured to define typical weather patterns and to determine the quality of local atmospheric conditions. The environmental

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conditions produced by different weather parameters have an impact on the quality of the surrounding ecosystem. [10] Environmental monitoring can establish a database of typical conditions. When one or more weather elements deviate from this standard, the information can be used to explain or predict weather events. Monitoring weather conditions is important not only as an environmental baseline, but to maintain quality working conditions.

This paper includes some of the sections which explain glass technologies, working, advantages and disadvantages.

3 EXISTING SYSTEM

In present days most of the people have different sensors and hand-held devices to measure the environmental parameters. To measure the parameters separately there are separate components/sensors and devices. These components when clubbed to together to take readings of many parameters might end up creating the device; they are mounted on to be much bulkier and heavier. As there are separate devices, there will be much cost and effort into making a device to get a reading.

4 PROPOSED SYSTEM

The proposed system (Fig 1) consists of a Raspberry Pi module which is connected to the EnviroPhat module. The Raspberry Pi is installed with Raspbian OS and then interfaces to the OLED Display. The OLED screen is hooked on top, using jumper wires on the extended header [2], [6]. To measure the parameters such as Temperature, Color, Light Intensity, True north and also providing the motion axis based on accelerometer readings [8].

Number to switch off we simple hold a finger over the light sensor for 5 seconds and it will execute a shutdown command on the Pi – the light levels pretty much never hit zero unless the sensor is entirely covered as this would be more efficient than adding in a shutdown button.

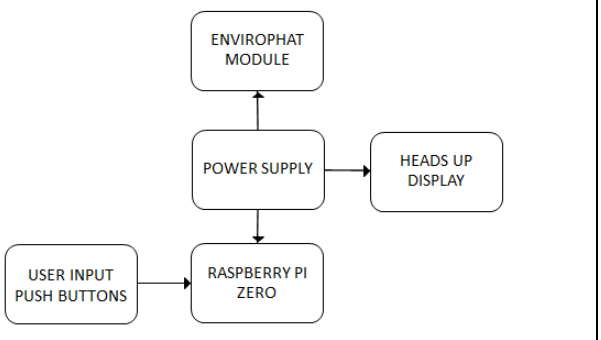

Fig. 1. Block diagram of the proposed system

4.1 Hardware

4.1.1 Raspberry-Pi

The Raspberry Pi (Fig 2) is a series of small single-board computers developed in the United Kingdom by the Raspberry-Pi foundation to promote the teaching of basic computer science in schools and in developing countries. The original model became more popular than anticipated, selling outside of its target market for uses such as robotics. Peripherals have been included in several official and unofficial bundles.

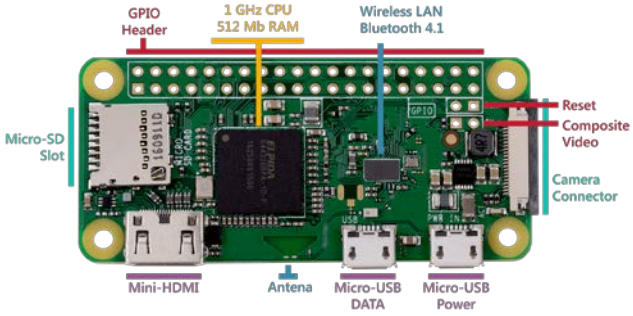

Fig. 2. Raspberry-PI

4.1.2 EnviroPhat

Theorems EnviroPhat (Fig. 3) packs 4 different sensors, letting to the measurement of temperature, pressure, light level, color, 3-axis motion, compass heading and analog inputs.

It's ideal for monitoring conditions in the house, garage or galleon. Set up a web server with a Flask and remotely monitor everything from anywhere.

As EnviroPhat works with all of the 40-pin Raspberry Pi variants but using it with the Pi zero makes for a super-tiny package.

Features:

- BMP280 temperature/pressure sensor
- TCS3472 light and RGB colour sensor
- Two LEDs for illumination
- LSM303D accelerometer/magnetometer sensor
- ADS1015 4-channel 3.3v, analog to digital sensor (ADC)

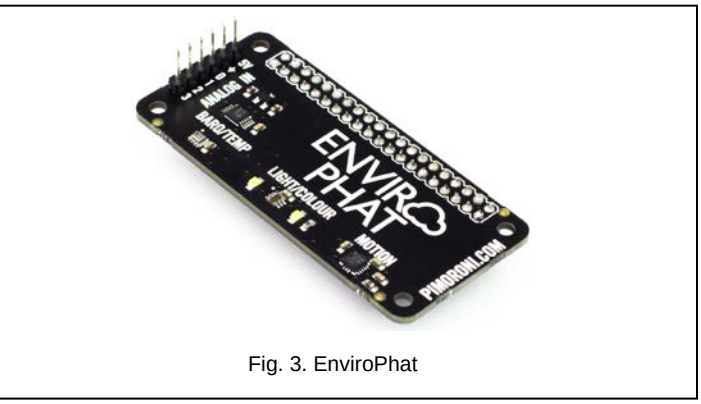

Fig. 3. EnviroPhat

4.1.3 OLED Display

An organic light-emitting diode (OLED) (Fig 4) is a light emitting diode (LED) in which the emissive electroluminescent layer is a film of organic compound that emits light in response to an electric current. This layer of organic semiconductor is situated between two electrodes; typically, at least one of these electrodes is transparent. OLEDs are used to cre-

ate digital displays in devices such as television screens, computer monitors and portable systems such as mobile phones, game consoles. A major area of research is the development of white OLED devices for use in solid state lighting application.

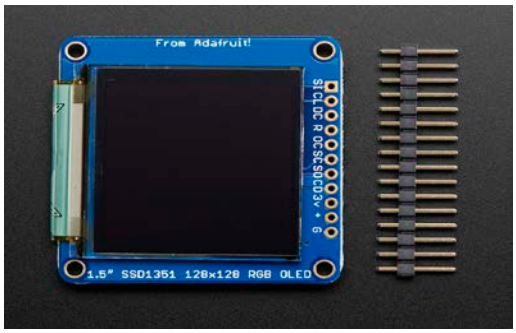

Fig. 4. OLED Display

4.2 Software

4.2.1 Raspbian OS

Raspbian is a Debian based computer operating system for Raspberry Pi. Raspbian uses PIXEL Pi improved Xwindows Environment Lightweight as its main desktop environments as of the latest update. It is composed a modified LDE desktop environment and the Openbox stacking window manager with a new theme and few other changes.

5 Results

The HUD mounted on the glasses is interfaced with EnviroPhat module. This module acts as the sensor and monitors and displays color, light level, temperature and atmospheric pressure (Fig 5).

Further features of the module also include the measurement and displaying of 3-axis motion and compute compass heading to point out the true north.

Installation of Rasbian OS on the Raspberry Pi zero and interface EnviroPhat module to get values serially and display date and time, which is displayed on the HUD and final product is made (Fig 6)

TABLE 1
PARAMETERS TO BE MEASURED

Sl.no	Parameters	Range
1	Light amount	0-255
2	Heading to north	Calculated to show the degrees to true north
3	RGB Light color	0-255 per channel
4	Temperature and Pressure	According to the environment
5	Motion	X,Y,Z

Fig. 5. Results on the HUD

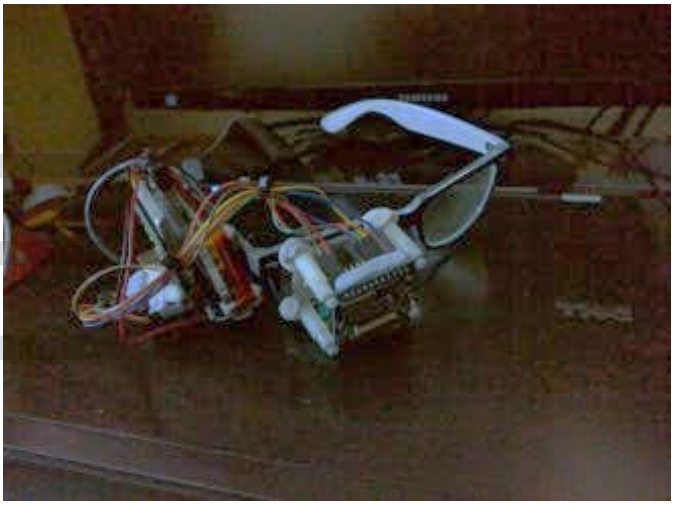

Fig. 6. Final Product

6 Conclusion

The smart glass is wearable computer, which brings ease and sophistication with ease of communication and information access even for the visually impaired people. We have designed and implemented a functional system that delivers information on what user is seeing. It gives a real time system for the automatic measurement of environmental parameters. The most important advantage of the proposed system is the universal usage that this product brings along.

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