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Third Eye Navigator for Visually Challenged

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ABSTRACT: Conventional system has reading book to voice converter through the speaker using camera. But in case of accuracy , can detection loss are taken in the amount, unsatisfaction feel for blind people. Nowadays all educational novels articles are available in reading ebook format. Subscriptions are added, soft eBook available in all format. By use this need for proposed system that reads ebooks data convert into voice through speaker by using the multimedia high efficiency controller. The proposed system successfully tested the text and temperature data to voice using raspberrypi
.

KEY WORDS: LCD, Raspberrypi, Android 4.3, Digital Thermometer.

I.INTRODUCTION

Eighty to ninety percent of legally blind people have some measurable vision or light perception. Majority of the visually impaired face difficulties in accessing public transports and also while learning. In addition, health monitoring system for the visually impaired is also implemented.
Public transport is the only viable mobility option for visually challenged people to seek education, work and social connectivity. They face major difficulties in independently accessing public buses since they cannot read the route number and unaware about the physical location of the bus. The bus detection prototype using Radio Frequency Identification (RFID) for the blind uses an Auto-ID technology. But, Auto-ID technology usually comprises of Bar Code Systems, Biometric Systems, Optical Character Recognition (OCR) and RFID which makes the system larger. In addition, using RFID System is bad for human health due to continually bombard with electromagnetic energy [1]. Another bus detection system using RFID consists of two detection subsystems; one on the buses and the other on the bus stations, database system and a website. However, regular maintenance is required for both the subsystems [2]. Bus identification system presents a braille keyboard which gets the input from the user. However, it is difficult and useless for the user if he/she does not know braille language [3]. RFID and GPS integrated navigation system for the visually impaired, which is a Smart Robot (SR). The SR guides the user in both familiar and new environments. But, it is not cost effective [4]. Though RFID is feasible and cost effective, it provides only one way communication and very short range of identification [5]. Passenger bus alert system has introduced wireless sensor networks (WSN) which creates a communication between bus and bus station. However WSN is advantageous than RFID, PDA's in WSN which is used for GPS tracking is not cost effective [6-8].
E-book portable reading device presents the prototype of the TactoBook, which is a computer-based system that translates fast and automatically any eBook into Braille code. The braille version of the eBook is then stored in USB memory drive. However, the translation of eBook to Braille code is unexplained [9]. Low cost e-book reading device involves two electronic refreshable Braille display units for conversion of alphanumeric character into Braille character. Secure Disk (SD) card is used for file storage. Characters are printed with a speed of 2 characters per second. Since two electronic refreshable Braille display units are used, the prototype becomes bulky [10]. The portable eBook reader for the blind is same as the reference [10] but the only difference is the full device is only 1kg by mass and its compact dimensions (20 * 15 * 10 cm) which makes it easily carried by the user [11]. Finger-Eye, a wearable text reading assistive system has a small camera, which is placed on the blind person's finger to process images using a developed Optical character recognition (OCR) method. This allows the translation of text to braille or audio. But, the conversion of text to audio is not properly explained [12]. Blind reader, and intelligent assistant for blind uses a haptic method where the user uses his fingers to move around the screen over a document and get the information audibly. But, it is very difficult for the visually challenged to use smart phones effectively [13].

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CMOS based Temperature Sensor presents a low power and efficient cost design of temperature sensor. In addition, temperature sensors were added to ICs providing feedback of excessive thermal conditions. Circuits have been designed using diodes, thermistors, A/D converters, transceiver chip etc., that occupies space [14-15]. The main advantage of smart temperature sensor is cost. However, the penalty for this is less accuracy and limited temperature range. Wireless Temperature Sensor System describes main principles applied in a set of mobile temperature data logger and portable interrogator with wireless transfer of digitized temperature values. Though this sensor is highly sensitive, it is easily degradable when the temperature overcomes the maximum temperature limit.

II. SIGNIFICANCE OF THE SYSTEM

This paper proposes an advanced technology which is user-friendly for visually impaired to achieve ease while accessing public transports and learning. In addition, this proposed system helps them to be aware of their health condition whenever needed. The study of literature survey is presented in section III, Methodology is explained in section IV, section V covers the experimental results of the study, and section VI discusses the future study and Conclusion.

III. LITERATURE SURVEY

Over the years, there has been an evolution of various techniques of guiding visually impaired persons, thus, toward attaining their self-independent by freely moving around their environment without guidance from others; some of these are:

A. Smart walking stick by Mohammed H. Rana and Sayemil(2013):

This is based on ping sensor for detecting obstacle, wet electrode, vibration motor and the buzzer. The obstacle is detects by the ping sensor and the obstacle distance is communicates to the visually impaired by the vibration of the motor [2].

B. The electronic travelling aid for blind navigation and monitoring by Mohan M.S Madulika (2013):

This is arm7 controller based that used ultrasonic technology for detecting the obstacle and inform the obstacle distance to the visually impaired, and also used the GPS and GSM technologies for localization of the visually impaired [3].

C. Haptic shoe for the blind:

A haptic device that can be installed in a shoe vibrating alert feature benefit for deafness. This device receives GPS information from a smartphone and provides vibration feedback at the right, left, front and back for the shoe in order to provide guidance to a destination. A proximity sensor in the front of the shoe can detect objects up to 3 metres and provide vibrational feedback.

D. Multi-dimensional walking aid by Olakanmi. O. Oladayo (2014):

This system uses ultrasonic detection technology and the voice module, the obstacle is detects by the ultrasonic sensor and the direction of the obstacle is communicates to the user through voice output [5].

E. 3D ultrasonic stick for the blind by the Osama Bader Al-Barm (2014):

The system uses ultrasonic sensor for detecting the obstacle in three directions (i.e front, left and the right sides of the visually impaired), and the vibration motor which vibrate with the intensity depending on the obstacle's distance. It also uses GPS and GSM for localization of the visually impaired [6]. In this paper, design and development of intelligent electronic travelling aid for visually impaired is presented. The device employs ultrasonic detection, GSM, GPS, voice recognition and voice synthesis technologies. The design process comprises of two parts; the first part is the obstacle detection and voice generation unit design using ultrasonic detection technology and voice synthesis technology respectively, and the second part is the localization and monitoring unit design using GPS technology GSM technology, as well as the voice recognition technology. The two units are then combines to form the complete device.

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IV. METHODOLOGY

Raspberry Pi is a credit-card sized computer manufactured and designed in the United Kingdom by the Raspberry Pi foundation with the intention of teaching basic computer science to school students and every other person interested in computer hardware, programming and DIY-Do-it Yourself projects.

The Raspberry Pi is manufactured in three board configurations through licensed manufacturing deals with Newark element14 (Premier Farnell), RS Components and Egoman. These companies sell the Raspberry Pi online. Egomanproduces a version for distribution solely in China and Taiwan, which can be distinguished from other Pis by their red coloring and lack of FCC/CE marks. The hardware is the same across all manufacturers.

The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, VideoCore IV GPU and was originally shipped with 256 megabytes of RAM, later upgraded (Model B & Model B+) to 512 MB. It does not include a built-in hard disk or solid-state drive, but it uses an SD card for booting and persistent storage, with the Model B+ using a MicroSD.

The Foundation provides Debian and Arch Linux ARM distributions for download. Tools are available for Python as the main programming language, with support for BBC BASIC (via the RISC OS image or the Brandy Basic clone for Linux), C, Java and Perl.

II. 1. Boot Process

The Raspberry Pi does not boot as a traditional computer. The VideoCore i.e. the Graphics processor actually boots before the ARM CPU.The boot process of the Raspberry Pi can be explained as follows:

- When the power is turned on, the first bits of code to run is stored in a ROM chip in the SoC and is built into the Pi during manufacture. This is the called the first-stage bootloader.
- The SoC is hardwired to run this code on startup on a small RISC Core (Reduced Instruction Set Computer). It is used to mount the FAT32 boot partition in theSDCard so that the second-stage bootloader can be accessed. So what is this ‘second-stage bootloader’ stored in the SD Card? It’s ‘bootcode.bin’. This file can be seen while mount process of an operating system on the SD Card in windows.
- Now here’s something tricky. The first-stage bootloader has not yet initialized the ARM CPU (meaning CPU is in reset) or the RAM. So, the second-stage bootloader also has to run on the GPU. The bootloader.bin file is loaded into the 128K 4 way set associative L2 cache of the GPU and then executed. This enables the RAM and loads start.elf which is also in the SD Card. This is the third-stage bootloader and is also the most important. It is the firmware for the GPU, meaning it contains the settings or in our case, has instructions to load the settings from config.txt which is also in the SD Card. We can think of the config.txt as the ‘BIOS settings’.
- The start.elfalso splits the RAM between the GPU and the ARM CPU. The ARM only has access the to the address space left over by the GPU address space. For example, if the GPU was allocated addresses from 0x000F000 – 0x0000FFFF, the ARM has access to addresses from 0x00000000 – 0x0000EFFF.
- The physical addresses perceived by the ARM core is actually mapped to another address in the VideoCore (0xC0000000 and beyond) by the MMU (Memory Management Unit) of the VideoCore.
- The config.txt is loaded afterthe split is done so the splitting amounts cannot be specified in the config.txt. However, different .elf files having different splits exist in the SD Card. So, depending on the requirement, the file can be renamed to start.elf and boot the Pi. In the Pi, the GPU is King!
- Other than loading config.txt and splitting RAM, the start.elfalso loads cmdline.txt if it exists. It contains the command line parameters for whatever kernel that is to be loaded. This brings us to the final stage of the boot process. The start.elf finally loads kernel.img which is the binary file containing the OS kernel and releases the reset on the CPU. The ARM CPU then executes whatever instructions in the kernel.img thereby loading the operating system.

After starting the operating system, the GPU code is not unloaded. In fact, start.elf is not just firmware for the GPU, It is a proprietary operating system called VideoCore OS (VCOS). When the normal OS (Linux) requires an element not directly accessible to it, Linux communicates with VCOS using the mailbox messaging system

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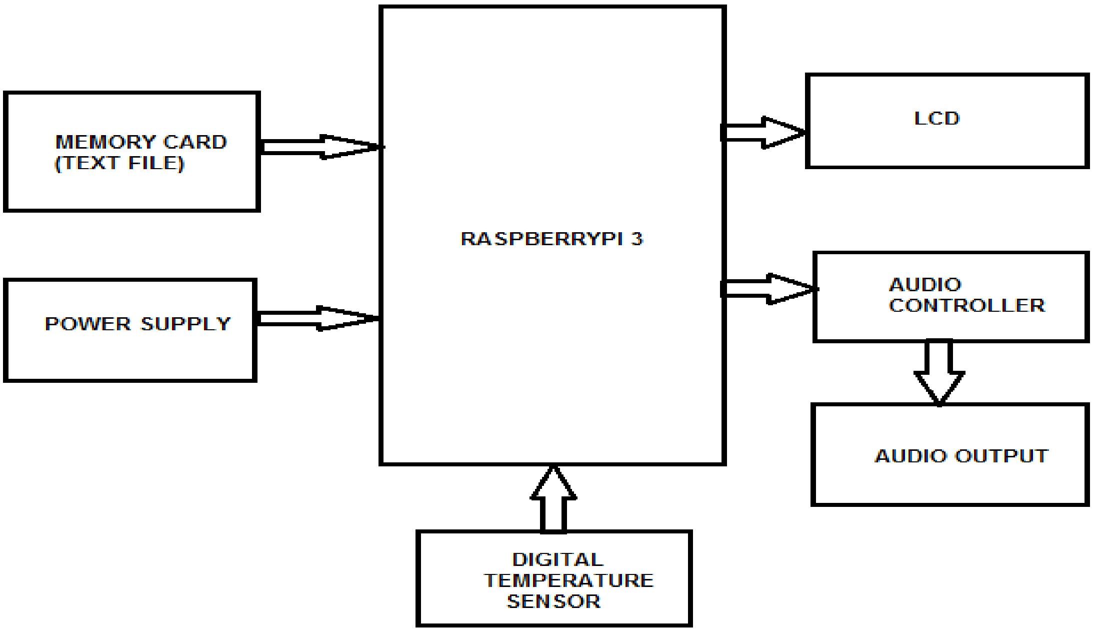

Fig1. System Design

V. EXPERIMENTAL RESULTS

It is implemented on a training dataset consisting of five legitimate messages and five spam message. The true rate and false rate for spam and good messages for the proposed system is calculated from equation .True rate is number of messages truly classified as spam message and good message. False rate is number of messages falsely classified as spam message and good message. Spam Messages:

- True Rate = (No of spam messages truly classified / total no of messages) *100% (1) (4/5) *100% = 80%
- False Rate= (No of spam messages Falsely classified – True rate) *100% (2)(80-60) * 100% = 20% Good Messages:
- True Rate = (No of good messages truly classified/ total no of messages) *100%
- False Rate= (No of good messages Falsely Classified / total no of messages) * 100% (4) (100- 60) = 40%.

Based on the true rate and false rate values of spam and good message, the following graph is generated.

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Fig 2: The Raspberry pi which controls the overall operation of this proposed system

Fig 3: The body temperature of the user in LCD display.

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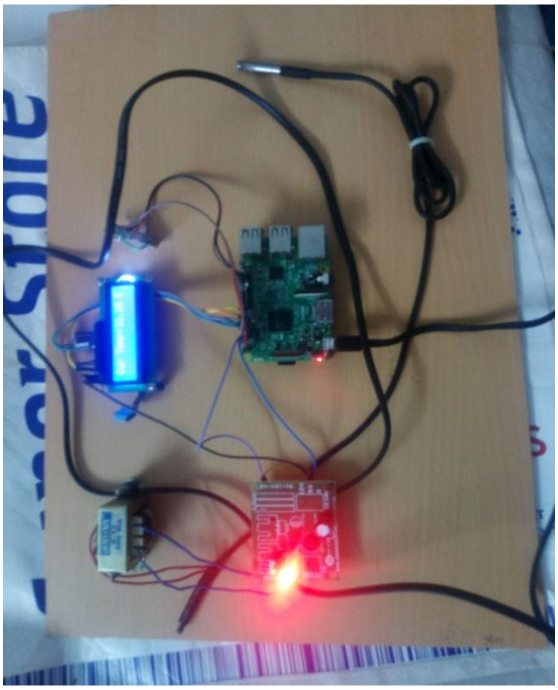
Fig 3: The overall hardware result.

VI.CONCLUSION AND FUTURE WORK

The Third Eye Navigator developed to improve the ability of the visually impaired to live independently, and to perform his day to day activities easily, and more safely by providing the following functionalities.
As said above, this system has four assistive technologies, which helps them to overcome major difficulties.

- An android application for bus tracking system helps the visually challenged to access public transport independently.
- The tangible reader helps the visually challenged students to learn effectively without anyone's guidance.
- Another android application for health monitoring system helps the visually impaired to be aware of their health condition.

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