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Android and Portable Camera-Based Assistive Text Reading System from Images and Messages Using Raspberry Pi Processor

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Abstract:
In nowadays, we must make use of various high-tech tools and equipments to get our jobs done and make our life comfortable. In this presented paper we introduced an advanced portable camera based text or message reading system specially for physically challenged. The portable system which captures the images and text written which are placed in front of the Pi camera can be read out or announced out using speakers/head phones interfaced to the Raspberry Pi processor. The Raspberry Pi processor takes the responsibility for authentication of the image which is fed as input to it and also alerts the blind person through voice messages using speakers or head phones. The proposed system aims at designing an innovative system which is very helpful for the physically challenged like blind persons to recognize the text from captured images and also from messages reading which are texted from android mobile and read out using speakers or head phones connected to raspberry pi processor.

Index terms: ***ARM-11Raspberry Pi Processor, Pi camera, speakers, Bluetooth module.***

I. INTRODUCTION:

The survey which was conducted in 2009 by World Health Organization on disability, there are 269 million visually impaired and 45 million blind people worldwide. Ageing populations and lifestyle changes means that chronic blinding conditions such as diabetic retinopathy are projected to rise exponentially. Without effective, major intervention, the number of blind people worldwide has been projected to increase to 76 million by 2020 if current trends continue. There are many traditional and advanced navigational aids are available for visually impaired and blind people.

Reading devices read text out loud for visually impaired individuals. A variety of reading machines exist, from portable to desktop solutions and computer-based to standalone solutions. ATR has an option to fit a blind user's needs.

Recent assistive systems use digital video cameras as vision sensor along with other multiple sensors. These systems are quite bulky and involves physical interface with the subject. Captured images are re-sized, processed further and converted to speech, audio beeps, musical sound or vibrations. In such systems frequency of sound shares some relationship with the orientation of pixels. Some advanced systems use Global Positioning System (GPS) integration with the main system. GPS receiver is useful for understanding the current location of the subject and nearby landmarks.

Although many advanced electronic navigation aids are available these days for visually impaired and blind people, very few of them are in use. Therefore user acceptability assessment of such systems is very important. The most influencing parameters in this regard are size, portability, reliability, useful functionalities, simple user interface, training time, system robustness and affordability in terms of cost. Considering all these user expectations and requirements, a tailor made low cost and reliable portable label and text reading system is proposed in this paper for visually impaired and blind people.

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In nowadays, we must make use of various high-tech tools and equipments to get our jobs done and make our life comfortable. And the mobile phone is the inseparable part of human lives today. With the help of mobile phones human can done many works related to their civil life. At today's repaired technology the mobile phone is also become smart one. With the help of this smart gadget we can make our home smart one. Some products are commercially available in market which allows home appliances controlling through internet, GSM, Bluetooth, RFID, and Wi-Fi wireless technologies. But it lacks the true sense of real mobility, security and some limited range of connectivity.

Figure- 1.Image of Easy product Label reading system for blind in shopping malls

We proposed a new technology using Android mobile and develop a messages reading system using Bluetooth wireless communication interfaced with speakers or head phones connected to raspberry pi processor. Android is a multi-process system, in which each application (and parts of the system) runs in its own process. Most security between applications and the system is enforced at the process level through standard Linux facilities, such as user and group IDs that are assigned to applications. Additional finer-grained security features are provided through a "permission" mechanism that enforces restrictions on the specific operations that a particular process can perform, and per-URI permissions for granting ad-hoc access to specific pieces of data. The officially supported programming language on the Android platform is Java. We can also use XML as the descriptor file as well as the user interface of an application is based on that.

As the Linux kernel of the Android platform is based upon an ARM processor architecture it would also be possible to write code in C or other languages and compile it to ARM native code.

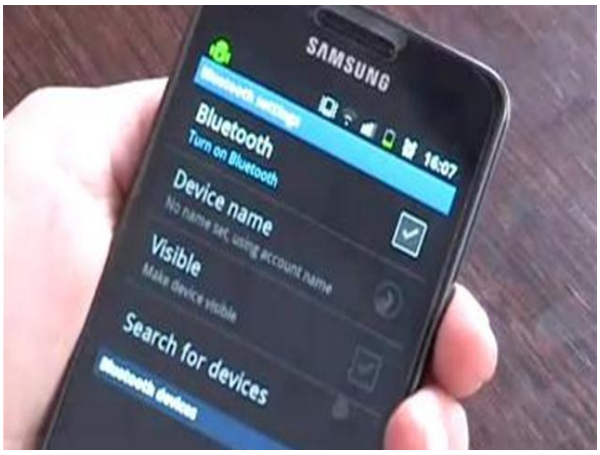

Figure- 2.Image of Android based text messages using Bluetooth wireless communication

II. RELATED WORK:

Automation is the most frequently spelled term in the field of electronics. The hunger for automation brought many revolutions in the existing technologies. This project makes use of an onboard computer, which is commonly termed as **Raspberry Pi** processor. It acts as heart of the project. This onboard computer can efficiently communicate with the output and input modules which are being used.

Afore mentioned identification or recognition process using raspberry pi processor will change slightly between different products and systems. These Standard systems are comprised of a USB camera for the automated information resource of the portable system which captures the images and text written which are placed in front of the camera can be read out or announced out using speakers. These details were verified using Raspberry Pi processor for

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authentication. The Raspberry Pi processor system alerts the blind person through voice messages using speakers or head phones. To perform this task, **Raspberry Pi** processor is programmed using embedded 'Linux'.

Linux is a Unix-like computer operating system assem bled under the model of free and open source software development and distribution. The defining component of Linux is the Linux kernel, an operating system. The **Linux Standard Base** (**LSB**) is a joint project by several Linux distributions and is based on the POSIX specification, the Single UNIX Specification, and several other open standards, but extends them in certain areas.

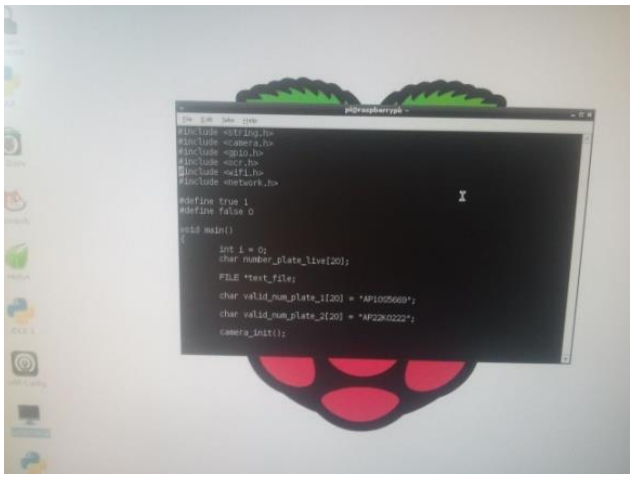

Figure- 3.Raspberry Pi programming screen shot using Linux

Advantages of Linux

- Low cost: There is no need to spend time and huge
- amount money to obtain licenses since Linux and much of it's software come with the GNU General Public License. There is no need to worry about any software's that you use in Linux.
- Stability: Linux has high stability compared with other operating systems. There is no need to reboot the Linux system to maintain performance levels. Rarely it freeze up or slow down. It has continuous up-times of hundreds of days or more.
- Performance: Linux provides high performance on various networks. It has the ability to handle large numbers of users simultaneously.
- Networking: Linux provides a strong support for network functionality; client and server systems can be easily set up on any computer running Linux. It can perform tasks like network backup faster than other operating systems.
- Flexibility: Linux is very flexible. Linux can be used for high performance server applications, desktop applications, and embedded systems. You can install only the needed components for a particular use. You can also restrict the use of specific computers.
- Compatibility: It runs all common Unix software packages and can process all common file formats.
- Wider Choice: There is large number of Linux distributions which gives you a wider choice. Each organization develops and support different distribution. You can pick the one you like best; the core functions are the same.
- Fast and easy installation: Linux distributions come with user-friendly installation.
- Better use of hard disk: Linux uses its resources well enough even when the hard disk is almost full.
- Multitasking: Linux is a multitasking operating system. It can handle many things at the same time.
- Security: Linux is one of the most secure operating systems. File ownership and permissions make linux more secure.
- Open source: Linux is an Open source operating systems. You can easily get the source code for linux and edit it to develop your personal operating system.
- Today, Linux is widely used for both basic home and office uses. It is the main operating system used for high performance business and in web servers. Linux has made a high impact in this world.

III. PROPOSED METHODOLOGY:

The proposed portable system which captures the images and text written which are placed in front of the camera can be read out or announced out using speakers. These details were verified using Raspberry Pi processor for authentication and alerts visually impaired or blind person through voice messages using speakers or head phones.

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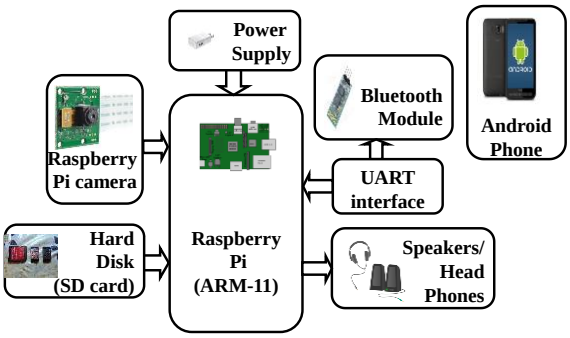

Figure- 4. Block diagram of proposed system

The objectives of the project are:

1. Product label reading from captured image
2. Usage of image authentication technology.
3. Reading out Text messages using Bluetooth wireless technology
4. Captured image text book reading
5. Voice announcements through speakers or head phones.
6. Usage of Text to Speech conversion technology from Images and messages

Figure- 5. Hardware implementation of the proposed system

In the proposed system we introduce a new ARM1176JZF-S 700 MHz processor. Model A has one USB port and no Ethernet controller, The model A processor costs less than the Model B with two USB ports and a 10/100 Ethernet controller. Model B Revision 2 Raspberry Pi with Mounting Points and 512MB RAM. The Broadcom BCM2835 ARM11 processor consists of 512MB RAM, 2 x USB Ports, HDMI Video Output, RCA Video Output, 3.5mm Audio Output Jack, 10/100Mb Ethernet Port for Internet Access, 5V Micro USB Power Input Jack and it has a free, versatile, and highly developed friendly Debian GNU/Linux Operating System. The present system uses an onboard minicomputer named as ARM1176JZF-S 700 MHz processor which consists of number of input and output ports, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB. The input and output port of the micro processor are interfaced with different input and output modules depending on the requirements. The current system uses USB camera as input module interfaced with the arm-11 processor, and the head phones/speakers as output modules. In other words BCM2835 system on a chip acts as a communication medium for all the modules involved in the project.

a. Raspberry Pi processor:

In the Proposed Real time system of License plate detection for car parking we used the Raspberry Pi is a credit-card-sized single-board computer developed in the UK by the Raspberry Pi Foundation. The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC), which includes an ARM1176JZF-S 700 MHz processor, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and long-term storage.

Figure- 6 Raspberry pi processor

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b. Raspberry Pi camera

The Raspberry Pi camera module can be used to take hig definition video, as well as stills photographs. It's easy to use for beginners, but has plenty to offer advanced users and are used by online people using it for time-lapse, slow motion and other video cleverness. The module has a five megapixel fixed-focus camera that supports 1080p30, 720p60 and VGA90 video modes, as well as stills capture. It attaches with a 15cm ribbon cable to the CSI port onto the Raspberry Pi Processor. They have also become a source of security and privacy issues, as some built-in Pi cameras can be remotely activated via spyware.

Figure- 7. Raspberry Pi camera

c. Bluetooth Module:

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz) from fixed and mobile devices, and building personal area networks (PANs). Invented by telecom vendorEricsson in 1994 it was originally conceived as a wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization. The module's host and slave, the host and slave pairing communication from the machine and from the machine or between the host and the host cannot communicate, communication function and computers, mobile phones and other Bluetooth pairing purchase default slave , requires that the host needs to be indicated.

Bluetooth serial module is used for converting serial port to Bluetooth. These modules have two modes: master and slaver device. The device named after even number is defined to be master or slaver when out of factory and can't be changed to the other mode. But for the device named after odd number, users can set the work mode (master or slaver) of the device by AT commands.

Figure- 8. Bluetooth Receiver module

d. Head Phones/Speakers

The output of the proposed system is provided with the announcement using head phones or speakers. The Raspberry pi has two audio output modes: HDMI and head phone jack. In the proposed system we are using head phone jack of 3.5mm Audio Output Jack.

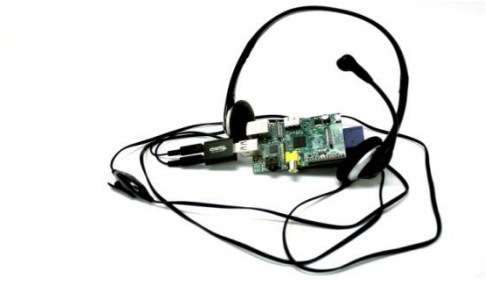

Figure- 9.Image of Audio output jack interfacing with Raspberry Pi

IV CONCLUSION:

The existing model presents an Integrating feature of all the hardware components which has been used and developed in it with Arm-11 Raspberry pi processor. The Presence of each and every module has been reasoned out and placed very carefully. Hence the contributing to the best working unit for an automatic license plate recognition system has been designed perfectly. Secondly, using highly advanced IC's like ARM1176JZF-S 700 MHz processor, Linux operating system technology with the help of growing technology, the project has been successfully

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implemented with a unique idea. Thus the project has been successfully designed and tested.

The existed paper presents "**Android and Portable Camera-Based Assistive Text Reading From Images and Messages**" which was designed such that the system captures the image of any hand held object (product) is placed in front of the Raspberry Pi camera. The captured image or text details are fed as input to the **Raspberry Pi** processor. The Processor takes responsibility to check the details and announces using voice messages using speakers or head phones for the blind person. The system also reads the text message sent through android mobile using Bluetooth wireless communication. The messages are announced out through speakers or headphones to the blind person. To perform this task, Raspberry Pi processor is programmed using embedded 'Linux'.

This project can be extended by adding sensors like Fire sensor, obstacle sensor, for providing alerts in case of emergency times like during fire accidents, or any obstacle detections with voice alerts to blind. The project can be extended using high efficiency GPS receiver which can give the location based announcements for visually impaired.

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