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IVA for Visually Impaired People Using Raspberry Pi

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Abstract: Disability is a condition in which a person must rely on others for their basic needs. One of a person's limitations is a visual impairment. To date, a number of ways for improving the lives of visually impaired and blind persons have been proposed. Purchasing groceries in the store without the assistance of others remains a difficult task for them. We offer a camera-based assistive text reading system that can help blind persons read text labels and product packaging on common objects. We rest present an ancient and active motion-based way to define a region of interest (ROI) in the video by requesting the user to shake the object to isolate it from cluttered backdrops or other surrounding objects in the camera view. Audio guidance based on real-time situations will aid them inside the supermarket. The ultimate goal of this system is to eliminate all other forms of assistance for visually impaired shoppers and to give them with a convenient and sophisticated environment. When this method is implemented, it makes shopping easier for blind people, saves time for customers, and increases business sales. We look at user interface difficulties and evaluate the algorithm's ability to extract and read text from objects with complex backgrounds. In this Shopping trolley technology to identify the product placed due to machine learning and accuracy location.

Keywords: Optical Character recognition, Raspberry Pi, Button System, Ultrasonic Sensor, Motor Driver.

I. INTRODUCTION

A special-purpose computer system built to execute one or a few dedicated functions, frequently with real-time processing limitations, is known as an embedded system. It's frequently found as part of a larger gadget that includes both hardware and mechanical components. A general-purpose computer, such as a personal computer, on the other hand, can do a wide range of functions depending on the programming. Embedded systems have become increasingly significant in today's world, as they manage many of the items we use on a daily basis. An embedded system is a set of hardware and software that works together to complete a single task. Embedded systems are computer systems that monitor, respond to, or control an external environment via sensors, actuators, and other input/output (I/O) interfaces. The embedded system must adhere to the environment's time and other constraints. Because the embedded system is dedicated to a single mission, design engineers can optimize it to reduce the product's size and cost while also improving its dependability and performance. Some embedded systems are mass-produced, allowing for cost savings. Embedded systems can range in size from small portable devices like digital watches and MP3 players to massive fixed installations like traffic lights, factory controllers, and nuclear power plant control systems. With a single microcontroller chip, complexity is low; with several units, peripherals, and networks mounted inside a huge chassis or enclosure, complexity is very high.

II. LITERATURE SURVEY

TITLE 1: Effective Shopping Method for Visually Impaired People using Optical Character Recognition

AUTHOR: S.Meera, R. Sharmikha Sree, K .Valarmathi

YEAR: 2019

DESCRIPTION: Visually impaired people are unable to perform all tasks as well as regular people, particularly when shopping in supermarkets. A text reading method with the use of a camera is presented to assist blind persons in recognising items. The existence of the object is detected using a motion detection approach. The blind user receives audio instructions regarding all of the objects and their locations in the supermarket, which allows them to walk around freely within the store. The proposed solution attempts to make purchasing in a sophisticated environment more convenient for blind people. This technique also makes shopping easier for customers, saves them time, and so forth. Artificial intelligence and OCR technology are used in the implementation of the proposed system.

TITLE 2: Design of Smart Shopping Enabler For Visually Challenged People

AUTHOR: S. Keerthana, S. Ainul Inaya and S. Abarna

YEAR: 2018

DESCRIPTION: The four-decade-old definition of blindness in India has been revised to "A person who is unable to count the fingers at a distance of 3 metres rather than the previous count of 6 metres." This aims to minimise the number of blind individuals in India and to bring the country into compliance with the World Health Organization's requirements (WHO). The number of blind persons will be reduced from 1.20 crore to 80 lakh as a result of this. This large populace, not only in India but also in many other nations, has a huge challenge: autonomous shopping. They strive to be self-sufficient. They must rely on others to purchase the items they require. Our project intends to make it easier for visually impaired customers to identify products in the supermarket, guide them through all of the categories, and automate billing. The user does not have to wait in a long line to be billed for the things purchased. This eliminates customer assistance and creates a welcoming retail atmosphere.

TITLE 3: Implementation Of Blind Trolley Using Iot

AUTHOR: Sharmikha Sree R, Meera S, Sukavanesh L, Sriram R, Priyadarshini S.

YEAR: 2021

DESCRIPTION: Disability is a condition in which a person must rely on others for their basic needs. One of a person's limitations is a visual impairment. To date, a number of ways for improving the lives of visually impaired and blind persons have been proposed. Purchasing groceries in the store without the assistance of others remains a difficult task for them. We presented a system that consists of several modules, including product recognition and section information, and will run on a Raspberry Pi 3 model. Optical Character Recognition (OCR) and Text to Speech software are examples of product recognition software that can assist users in identifying products. By utilizing Bluetooth (HC-05) technology, users will be able to obtain section information. The ultrasonic sensor will identify the impediment and make a beep to inform the user.

III. EXISTING SYSTEM

- 1) Manual operation
- 2) Time requirement more
- 3) Chance of material misses
- 4) Not display bill status
- 5) Less Efficiency
- 6) They are used RFID Technology

A. Limitations Of Existing System

- 1) Braille system is very slow and not very practical.
- 2) Existing OCR systems are not automatic.
- 3) IR sensor is used.
- 4) Pic microcontroller is used.

IV. PROPOSED SYSTEM

We've presented a prototype system for assisting blind people by reading printed text on hand-held devices. We presented a motion-based method to detect the object of interest while the blind user just shakes the object for a few seconds to overcome the typical aiming difficulty for blind users.

To ensure the effectiveness and robustness of the entire system, the automatic ROI detection and text localization methods were separately verified as unit tests. We then used photos of hand-held objects captured by ten blind people in person to test this prototype system of assistive text reading.

To prepare for the system test, two calibrations were used. First, blind individuals were asked to place a hand-held object inside the camera's vision. This approach can also be used to find any product on a department store shelf. If a product is detected, this system will direct you to the location where the item you're looking for is available. This proposed approach benefits not just the visually handicapped but also the elderly and non-impaired. We are also including a button system in trolley for blind people to reach their section

A. Advantages of the Proposed System

- 1) A low-cost, automated system for reading text books will be implemented, which will not only convert printed books to digital text but will also read them out loud
- 2) Extract text information from both hand-held objects and adjacent signage using our suggested method, which can handle complex backgrounds and various patterns.

B. System Requirements

1) Hardware System Requirements

- a) Processor - Raspberrypi3
- b) Speed -1.1GHz
- c) RAM -1Gb(min)
- d) Hard Disk -1.5

2) Software System Requirements

- a) Operating System – RaspbainOS
- b) Language Used c - Python ide

V. SYSTEM ARCHITECTURE DESIGN

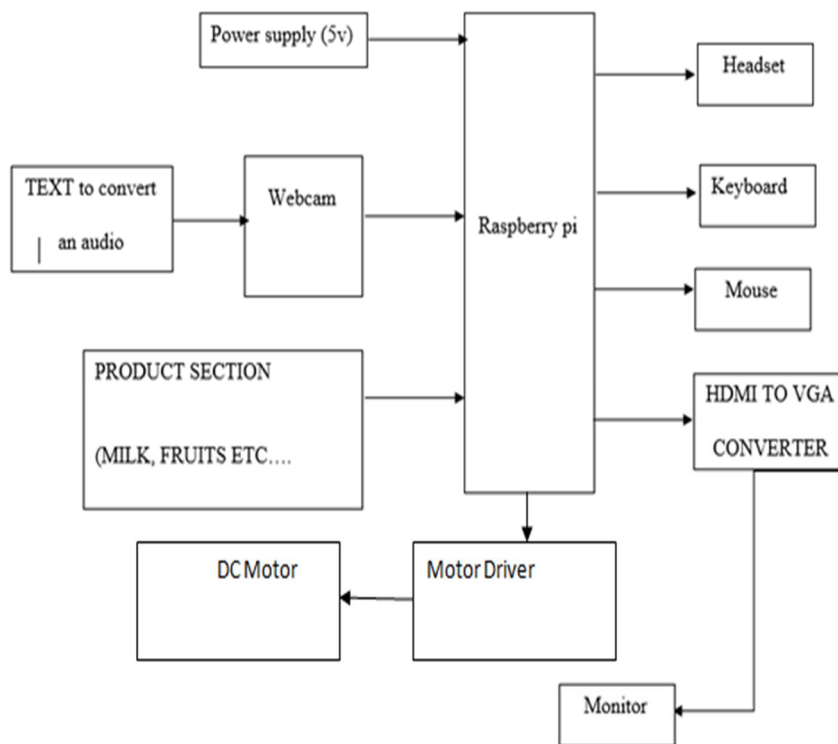


Fig. 1. System Architecture

The following important modules are included in the system design: Trolley movement (a) Text Recognition (b). The L293D driver, which is connected to the Raspberry Pi, is primarily responsible for the trolley movement. It functions as a current amplifier, driving the trolley based on inputs. The trolley came to a halt because the input logic was 00 or 11. 01 or 10 is the input logic. The trolley can be moved forward or backward. Character recognition is used to recognize text in a document. The scanned image is converted to text using this procedure. After then, the text is turned to speech. We are also including a button system in trolley for blind people to reach their section

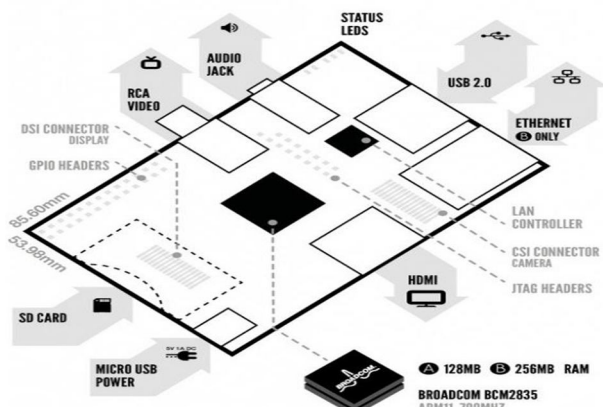


Fig. 2. Raspberry pi3 port specification

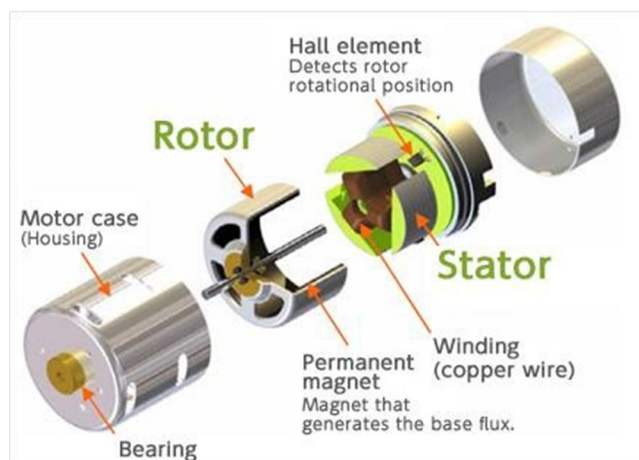


Fig. 3.D.C. motor and its working

An electric motor converts electrical energy into mechanical energy. To generate force, most electric motors employ interacting magnetic fields and current-carrying conductors, though electrostatic motors use electrostatic forces. Industrial fans, blowers, and pumps, as well as machine tools, household appliances, power tools, and disc drives, all employ electric motors. They can be powered by either direct current (such as a battery-powered portable gadget or a motor vehicle) or alternating current (such as from a central electrical distribution grid). A spinning permanent magnet in the rotor and stationary electrical magnets on the motor casing are used in brushless DC motors (figure 4.6). A motor controller is a device that converts DC to AC. Because it reduces the difficulty of delivering power from outside the motor to the rotating rotor, this design is simpler than brushed motors. Brushless motors have a long life period, require little or no maintenance, and are highly efficient. High starting costs and more sophisticated motor speed controllers are disadvantages.

A. Advantages

- 1) The L293D driver is used to move trolley in all directions .
- 2) The system is low-cost.
- 3) It is used to get the text information from objects.

B. Disadvantages

- 1) In L293D driver chip, there is 1.5v or more voltage drop.
- 2) Handwritten documents and images in dark are not easily recognized by OCR

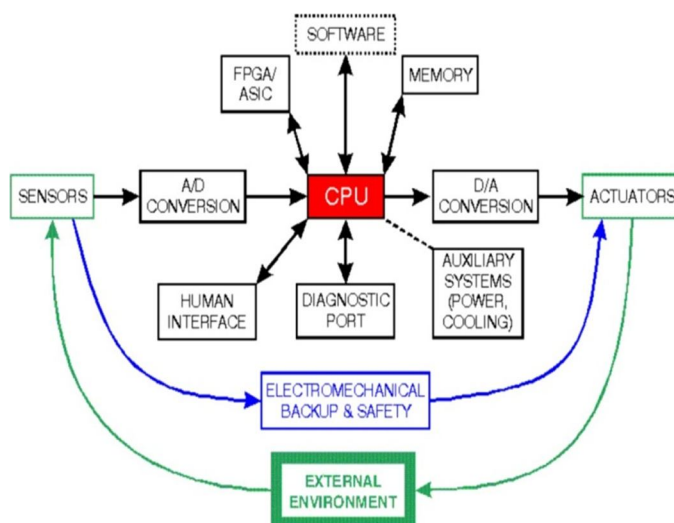


Fig. 4. Block diagram of a typical embedded system

An embedded processor is frequently found in a system. Embedded systems are used in many items that have a digital interface, such as microwaves, VCRs, and automobiles. An operating system is included in certain embedded systems. Others are very specialized, resulting in the implementation of the complete logic as a single programmed. These systems are integrated into a device for a specific purpose other than general-purpose computing.

VI. METHODOLOGY

Using OCR and OpenCV, a reading aid for the blind has been created. The identification of printed characters using photoelectric devices and computer software is known as optical character recognition (OCR). It converts images of typed or printed text into machine-readable text, which is then turned into audio. OCR is utilized in cognitive computing, machine translation, text to speech, key data, and text mining, among other applications. The character code in text files is OCR'd using a Raspberry Pi device, which detects characters using the tesseract method and Python programming, and then listens to the audio output. In the design and development of a virtual digital library, we use information in grid format for pattern recognition and Document image analysis (DIA). Python is promoted as the primary programming language. Text to Speech for the Visually Impaired is an assistive content reading system that enables visually impaired persons to read writings on a variety of topics in their daily life. Steps like dark scale and binarization, as well as question of curiosity acknowledgment, are all part of the pre-handling process. The use of an OTSU calculation to convert a dim scale image to a binary image. Optical character recognition programming is then used to separate and perceive the content districts from the captured image (OCR). The basic calculation in OCR, specifically MODI, is used here. This fragmented content of various textual styles and sizes can then be viewed individually before being combined into a word and rendered as sound. Using SAP libraries for text-to-discourse.

VII. CONCLUSION

The suggested solution will allow visually challenged persons to buy in supermarkets without assistance. It is possible to construct a specific gadget for product identification, Section Information, and obstacle detection. It employs RFID and Raspberry Pi technologies to create a smart environment for visually impaired people. We created a motion-based technique to recognise the items of interest to overcome the typical targeting difficulty. The orientation of the stroke and the distribution of edge pixels are used to extract text. Optical Character Recognition is used to recognise text characters, and the text codes are converted into voice for blind people.

VIII. FUTURE ENHANCEMENT

Our future work will extend the text localization algorithm with further more features and we will address the human interface issues associated with text reading by the blind user.



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