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IJIEMR Transactions, online available on 4th Sept 2022. Link :http://www.ijiemr.org/downloads.php?vol=Volume-11&issue=Issue 09

DOI: 10.48047/IJIEMR/V11/ISSUE 09/04

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Volume 11, ISSUE 09, Pages: 29-36

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Blind, Deaf and Dumb Assistive Device Using Raspberry-PI through Speech Recognition

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Abstract:

Addressing the needs of people with visual, hearing, and vocal impairments with a single aiding system is a difficult task. Many modern-day studies focus on one of the aforementioned challenges, but not all. The work focuses on developing a one-of-a-kind technique that assists the visually impaired by allowing them to hear what is represented as text. This is accomplished through a technique that captures an image with a camera and converts the text into voice signals. The paper provides a method for people with hearing impairments to visualise / read information that is in audio form using a speech to text conversion technique, as well as a method for the vocally impaired to represent their voice using a text to voice conversion technique. All three solutions were modulated to form a single distinct system. All of these activities are coordinated using the Raspberry Pi. The Tesseract OCR process, which converts images to text and text to speech, benefits visually impaired people (online character recognition).

Key Words: Raspberry-pi, Speech recognition, Pyttsx3.

INTRODUCTION

There are approximately 285 million visually impaired people worldwide, with 39 million being blind and 246 having low vision. Approximately 90% of the world's visually impaired are low-income people, with 82% of people living with blindness being elderly or older.

According to global estimates, the number of people who are visually impaired due to eye diseases has decreased over the last 20 years. In which 80% of all visual restitution is preventable or curable. India is thought to be home to the world's largest blind population.Around 37 million people worldwide are blind, with 15 million coming from India.

There have been many successful researchers in this universe, but the visual impairment could not be permanently removed. To help these people, we developed an assistive device for blind people who do not want the help of their neighbours. Our project's development enables a large number of people to be free and independent.

Around 9.1 billion people worldwide are deaf and mute. They face numerous communication challenges in their daily lives.Sign language is a linguistic process used to communicate between normal people and people with disabilities.

Sign language relies on sign patterns such as body language and arm movements to help distinguish between the great unwashed.

Deaf and hearing-impaired people do not need to learn specialised sign language; the main issue is that they can communicate with the general population.

It is also impossible for the general public to learn sign language in order to understand what is said through gestures. As a result, Communication gaps between the deaf and the dumb persist. Dumber people can simply distort the message by employing sign language that others may not understand. To solve these problems with visually and vocally impaired people, we used the raspberry pi, a tiny credit card-sized computer. With this device, we provide a solution for people who are blind, deaf, or dumb. For blind people, Tesseract software converts the image to voice, and deaf people receive their content via message as soon as the opposite person speaks out. The deaf people used text rather than sign language, which is delivered via e-speak, to convey their message. We've taken the necessary steps to resolve the situation issues.

Inside the well-designed layered 3D printed case is the frequently-chosen Raspberry Pi 4, along with a PiSugar power supply board and 5,000 mAH battery and a 4.3″ touchscreen display. The keyboard has seen a lot of care and attention, featuring high-quality tactile switches that follow the Miryoku keyboard layout. He says it’s a thumb-typing keyboard, but anyone looking for more can either adapt the design to their liking or simply plug in an external board when faster typing is needed.

We like the pad computer trend as it offers useful computing power in a far more convenient format than a laptop, and we think this is a particularly nice one. It would be nice to see where people take this design, and who knows, we might give one a try for writing some Hackaday articles. If you’d like to see more pad computer goodness, we recently showed you one built in the shell of a classic Amstrad.

The older populace is generally prone to different types of physical disabilities including vision issues, immobility, and hearing loss. Hence, the demand for various types of assistive devices in being increasing by this population pool in order to carry out regular activities such as reading, listening, and movement. This factor is expected to generate significant growth opportunities in elderly and disabled assistive devices market during the forecast period, state analysts of a report by TMR.

The elderly and disabled assistive devices market in North America is prognosticated to gain notable avenues for growth during the forecast period owing to several important factors including a rise in the adoption of next-gen products in the regional

healthcare industry, increase in the older population, and improved spending power of the regional populace.

Companies operating in the global market for elderly and disabled assistive devices are focusing on R&Ds in order to develop innovative products. In addition, several elderly and disabled assistive devices manufacturers are using organic and inorganic strategies including mergers, acquisitions, and partnerships in order to stay ahead of the competition. Moreover, players in the elderly and disabled assistive devices market are focusing on the launch of next-gen products so as to expand their product portfolios. Such factors are expected to help in overall growth of the elderly and disabled assistive devices market during the forecast period.

LITERATURE SURVEY

[1] Chucai Yi, Student Member, IEEE, Yingli Tian, Senior Member, IEEE, and Aries Arditi "Portable Camera-Based Assistive Text and Product Label Reading From Hand-Held Objects for Blind Persons" 2013 IEEE.

We propose a camera-based assistive text reading framework to help blind people read text labels and product packaging from hand-held objects in their daily lives. We first propose an efficient and effective motion-based method for defining a region of interest (ROI) in the video by asking the user to shake the object in order to isolate the object in the camera view from cluttered backgrounds or other surrounding objects. The moving object region is extracted using a background subtraction method based on a Gaussian function mixture. To obtain text information, text localization and recognition are performed in the extracted ROI. To automatically localise text regions from the object ROI, we propose a novel text localization algorithm that learns gradient features of stroke orientations and distributions of edge pixels in an Adaboost model. Using commercially available optical character recognition (OCR) software, text characters in the localised text regions are binarized and recognised. Blind users are spoken the recognised text codes. The performance of the proposed text localization algorithm is quantitatively evaluated using the ICDAR-2003 and ICDAR-2011 Robust Reading Datasets. The results of our experiments show that our algorithm outperforms the competition. The proof-of-concept prototype is also tested on a dataset collected by ten blind people to assess the effectiveness of the system's hardware. We look into user interface issues and assess the algorithm's robustness in extracting and reading text from a variety of objects with complex backgrounds.

[2] Vasanthi.G and Ramesh Babu.Y Department of ECE, DMI College of Engineering, Chennai, India. "Vision Based Assistive System for Label Detection with Voice Output"Jan-2014.

A camera-based assistive text reading framework is proposed to help blind people read text labels and product packaging from hand-held objects in their daily lives. We propose an efficient and effective motion-based method for defining a region of interest (ROI) in a video by asking the user to shake the object to isolate it from cluttered backgrounds or other surrounding objects in the camera view.

To obtain text information, text localization and recognition are performed in the extracted ROI. To automatically localise text regions from the object ROI, we propose a novel text localization algorithm that learns gradient features of stroke orientations and distributions of edge pixels in an Adaboost model.
Text characters in the localised text regions are then binarized and recognised by optical character recognition software that is available on the market. The recognised text codes are spoken to blind users.

[3]Dharanikumar Chowdary. M, M. Narasimhulu, G. Subrahmanya Sharma, "Advanced Embedded Chatter Box For Physically Challenging Persons" in Jan 2012.

This paper describes a proposal for a speaking device for people who are physically challenged. People who have difficulty speaking or hearing will benefit from this device. Its purpose is to help physically challenged people communicate. The size of the commercial version will be 6.7" x 5.6" x 1.25". This will include a basic 16 x 2 character LCD with a 3.3V power supply that is black on green. Nonspeaking people with fine motor skill problems, such as those with ALS (Lou Gehrig's disease), traumatic brain injury laryngectomy first stroke patients, can benefit from text-to-speech.

[4] Bhavina Patel,Vandana Shah, Ravindra k Shirsagar, "Microcontroller Based gesture Recoginition Syatem For the Handicap People"in Dec-2011.

"Speech" and "gestures" are the most commonly used expressions in human communication. Learning to use them begins in the first years of life. Speech and gestures are completely coordinated in human communication. Machine gesture and sign language recognition uses gloves to recognise gestures and sign language. For gathering information about body positioning, a variety of hardware techniques are used; typically, image-based (using cameras, moving lights, etc.) or device-based (using instrumented gloves, position trackers, etc.), though hybrids are emerging. Obtaining the data, however, is only the first step.

The second step, recognising the sign or gesture after it has been captured, is much more difficult, particularly in a continuous stream.

Video games are a great way to unwind while also increasing your heart rate.

However, unless you're playing Dance Dance Revolution, the controls almost always require the use of both hands. Even the old Atari controller benefited from the support of the other hand.

But what if you don't have both hands available? Or do you suffer from a repetitive stress injury? Or do you simply want to eat cheese curls with chopsticks while playing? [Akaki Kuumeri] has you covered with one of the best 3D printing applications we've seen: a one-handed PlayStation DualShock 4 controller. If this looks familiar, it's because [Akaki] released a PS5 controller version not long ago, but who can get one of those?

Despite the fact that [Akaki] does the majority of the demonstrating in the video below with their left hand, they were kind enough to create a right-handed version as well. The symbol buttons and right trigger are actuated with the left hand in the left-handed version, and the right joystick is used by moving the entire controller against your leg, the table, the arm of the couch, or whatever you want.

[Akaki] even created some optional pieces, such as a leg strap. The D-pad is used instead on the right-hand version. But how should the arrow buttons be arranged? [Akaki] chose the standard DDR after much deliberation.

[5].Assistive Translator for Deaf & Dumb People

In our country, 6% of people are visually impaired, and 2.78% are unable to communicate. These two people's main flaws are their vision and voice. Sign The deaf use language as a form of communication. Sign language is a method of communication for the deaf and hard of hearing. To communicate with the rest of the world, the majority of these physically challenged communities rely on sign language translators. As a result, these people find themselves socially isolated. As a result, one of the most rapidly growing fields of study today is sign language recognition. A sign language is composed of various gestures formed by physical movement of the body. parts such as the hand, arms, or facial expressions. In this project, a method for recognising Indian sign language using hand gestures is proposed. Hand gesture recognition systems provide us with an innovative, natural, and user-friendly way of interacting with computers that is more familiar to humans. The only means of communication between the deaf and the visually impaired is through their expressions and hand gestures. This project presents various methods for blind and deaf people to recognise hand gestures and sign language.

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EXISTING SYSTEM

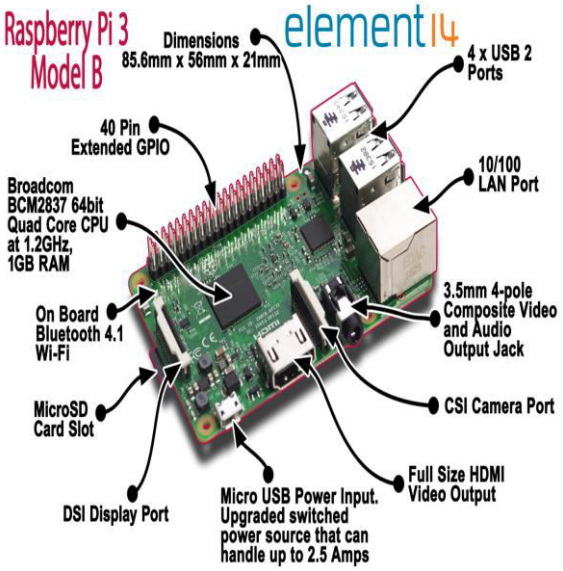
Previously, blind people were served with the fundamentals of the Braille system. Braille is a system of rising symbols that has been used by the great unwashed who are blind or partially sighted for over 150 years. The language in Braille will run across the page from left to right, just like printed words.

Disadvantages:

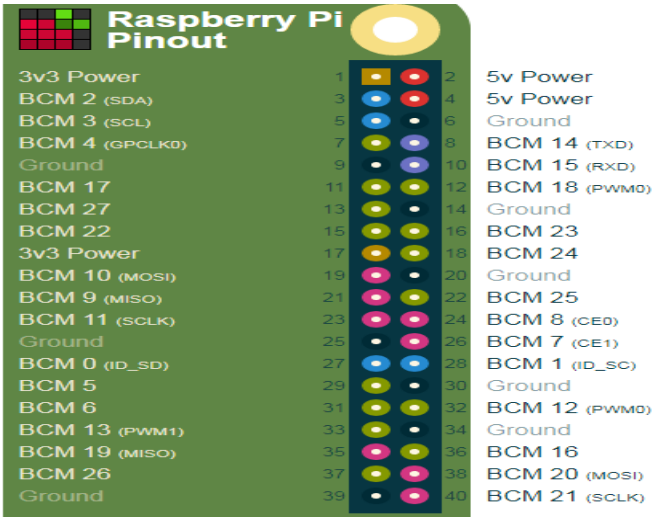
- Accuracy will be less.
- Time consuming.

PROBLEM STATEMENT

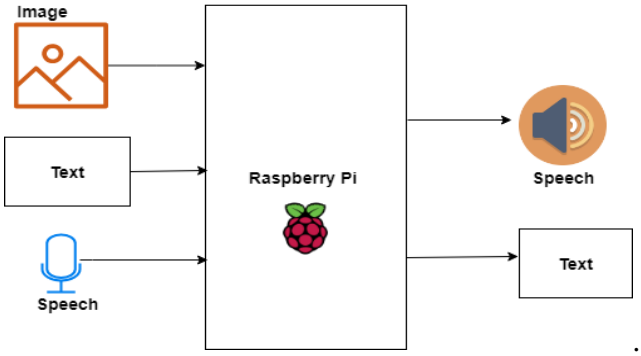
Previously, blind people were catered to with basic braille learnings. The language in braille will go from left to right across the page, just like printed words.



Raspberry Pi GPIO Pinout



Block Diagram



This course by Fred Eady will examine the Raspberry Pi RP2040 microcontroller. The Raspberry Pi RP2040 is the logical engine that powers both the Raspberry Pi Pico and the new Raspberry Pi Pico W. During this lecture series, attendees will design and assemble RP2040-based IoT hardware and write application code targeting the RP2040, Raspberry Pi Pico, and Raspberry Pi Pico W using the C programming language and Visual Studio Code for Linux.

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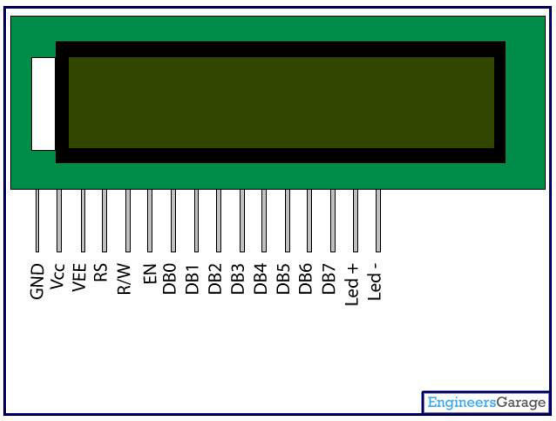
LCD Display:

- LCD (Liquid Crystal Display) screens are electronic display modules that have many applications.
- A 16x2 LCD display is a very basic module that is widely used in a variety of devices and circuits.
- These modules are preferred over Seven Segment LED and other multi-segment LED modules.
- A 16x2 LCD can display 16 characters per line and has two such lines.

Pin Configuration Of LCD



Pin Description

- GND(0) - GND
- Supply Voltage (5V) – Vcc
- Contrast adjusting through the variable – Vee
- Select command register when low, and data register when high – Register Select
- Low to write to the register, High to read from the register – Read/write
- Sends data to data pins when a high to low pulse is given – Enable
- 8-bit data pins – D0-D7
- Backlight V_{CC} (5V) – Led+
- Backlight Ground – Led-

Opencv Package

Now, we're not saying that anyone in these videos was lying, and neither is [Fletcher Heisler]. His algorithm, which analyzes video of a person and uses machine vision to pick up cues that might be associated with the stress of untruthfulness, is far from perfect. But as the first video below shows, it is a lot of fun to see it at work. The idea is to capture data like pulse rate, gaze direction, blink rate, mouth posture, and even hand position and use them as a proxy for lying. The second video, from [Fletcher]'s recent DEFCON talk, has much more detail.

The key to all this is finding human faces in a video — a task that seemed to fail suspiciously frequently when [Zuck] was on camera — using OpenCV and MediaPipe's Face Mesh. The subject's pulse is detected by watching for subtle changes in the color of a subject's cheeks as blood flows through them, which we've heard about plenty of times but never before seen presented so clearly and executed so simply. Gaze direction, blinking, and lip compression are fairly easy to detect too. [Fletcher] also threw in the FER library for facial expression recognition, to get an idea of the subject's mood. Together, these cues form a rough estimate of the subject's truthiness, which [Fletcher] is quick to point out is just for entertainment purposes and

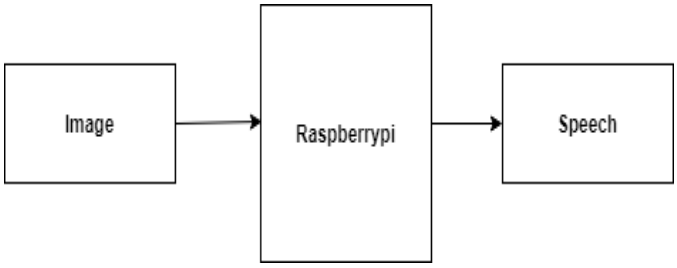
totally shouldn't be used on your colleagues on the next Zoom call.

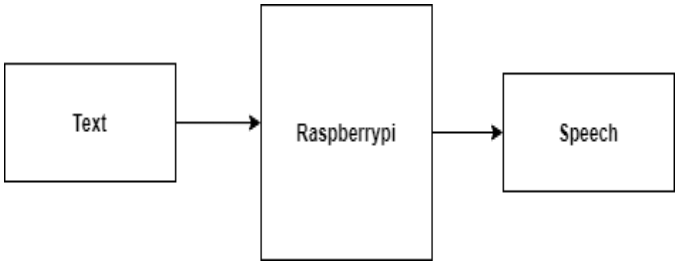
Scratch Building Raspberry Pi RP2040 IoT Devices, a free course presented by Design News, will begin on Monday, August 22 and run through August 27. Each class lasts an hour and begins at 2:00 p.m. Eastern. Participation can also earn you IEEE Professional Development Hours. If you are unable to attend the scheduled classes, the course will be available on demand.

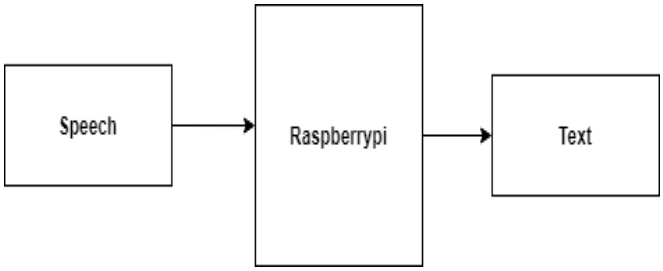
Features of OpenCV Library:

- We can use the OpenCV library to:
- Read and write images
- Capture and save videos
- Process images (filter, transform)
- Perform feature detection
- Detect specific objects in videos or images such as faces, eyes, or cars
- Analyze the video, estimating motion, subtracting background, and tracking objects in it. Analyze the video, i.e., estimate the motion in it, subtract the background, and track objects in it.

DATA FLOW DIAGRAM







CONCLUSION

We created a this paper presents a prototype model for blind, deaf, and dumb people using a single compact device. The most important aspect of this project is to assist these individuals and build their confidence in managing their sites on their own. The primary advantage is that the device is simple to remove and light in weight. The "Medical Assistive Listening Devices market research study's" objective is to give decision-makers current market information and assist reliable investment judgments. The Medical Assistive Listening Devicesmarket research study provides the most significant and insightful information on opportunities, challenges, trends, business strategies, and consequently the most recent developments in the industry. Additionally, this market research report on the Medical Assistive Listening Devicesmarket provides in-depth analyses of various market segments in terms of overall development, opportunity, and business strategies for the anticipated period from market research 2022 to 2028.

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