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Blind-Assist

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***Abstract* – The recent survey on the issues faced by the visually impaired suggested self-reliant movement in urban areas as challenge. It also becomes difficult for them to stay a track of their routine environments. So, we proposed a completely unique way of assisting the visually impaired to acknowledge e various objects and to detect obstacles. The system detects obstacle before of the person and also recognize them to assist aid a visually impaired person. This paper proposes an efficient system for both obstacle detection and beholding. We employ image-based recognition supported the visual information obtained from a pi-cam to detect objects. Ultrasonic sensors are accustomed aid the obstacle detection. Ultrasonic waves are emitted by the ultrasonic sensors to detect the presence of an obstacle and therefore the distance thereto. Raspberry pi is common medium for obstacle detection and beholding. Raspberry is connected to ultrasonic sensor via a breadboard and pi-cam is direct connected to Raspberry pi. Raspberry Pi is employed to implement artificial vision using python language on the OpenCV platform, presence of third-party modules, open source, extensive support libraries like characteristics of python adds advantages to the processing part. This paper proposed a modified YOLO algorithm in OpenCV using Python language and COCO dataset which has an additional module for obstacle detection. The camera captures the image of the item and extract the item alone by clearing off the encompassing. The image is them compared with the predefined dataset to spot the item particularly. The output information regarding the item are provided via a headset or ear-bone. Experimental analyses also are provided to match various methods and draw some meaningful conclusions. In obstacle detection, the presence of an obstacle is known via buzzer sound. The system is especially introduced by keeping in mind the most aspects and therefore the difficulties faced by the visually impaired in their day-to-day life.**

***Keywords* – COCO, Object Recognition, Obstacle Detection, Ultrasonic Sensor, YOLO.**

I. INTRODUCTION

Visually impaired people represent a significant population segment, currently the number being estimated to tens of millions around the globe. Their integration in the society is an important and constant objective. A great effort has been made to assure a health care system. Various guidance system techniques have been developed to assist the visually impaired people in living a normal life. Often, these systems are designed only for specific tasks. Nevertheless, these systems can greatly contribute to the mobility and safety of such people. The development of state-of-the-art guidance systems to assist visually impaired people is closely related to the advanced methods in image processing and computer vision as well as to the speed performance of the devices and unit processors. Regardless of the involved technology, the application needs to operate in real time with quick actions and decisions, as the speed might be critical for tacking actions. Basically, picking up the best solution is a trade-off between the performance of the software component and the hardware capabilities. Optimum parameters tuning is required. During the indoor or outdoor movement of a visually impaired person, one of the main objectives for the assisted system is to automatically detect and recognize objects or obstacles followed by an acoustic alert. The integrated guidance system for visually impaired people developed includes two basic platforms:

- Raspberry Pi platform, with an ARM Advanced RISC Machine; and RISC - Reduced instruction set computing technology. Object detection and recognition is performed using a camera as source and the software is OpenCV based.
- Ultrasonic sensors are used for obstacle detection which uses ultrasonic signals to detect the presence of an obstacle and the distance to it.

The vision module for image processing proposed in the paper is an integrated part of the platform dedicated to guide visually impaired people. The vision-based guidance system proposed is designed, developed and validated throughout experiments and iteratively optimized. The module is compliant to the principle of developing a highly performance device but cost effective with practical usage. The module is using disruptive technology and allows for updating and inclusion of new functions.

Procedure for Paper Submission

- **Related Works**

Techniques for the obstacle detection and recognition victimization supersonic sensors and image process

technique utilized by various papers are delineated briefly.

In paper "Raspberry Pi based mostly vehicle collision rejection system" advanced navigation system that detects and avoids the article, is employed in autonomous vehicles to securely navigate through the path [9]. It detects the obstacle before of the vehicle, alarms the system and moves away. Camera is employed for the aim of sleuthing moving or stationary objects. The supersonic device is confined with this technique to figure the space of time period moving and therefore the stationary object. The alarm is given to the system within the vehicle concerning the obstacle before so the system helps in collision rejection. By fusing each these device values the obstacle is detected and therefore the distance is additionally accurately measured.

In the paper projected by Tepelea, L., Buciu, I., Grava, C., Gavrilut, I., & Gacsadi, "A Vision Module for Visually Impaired individuals by victimization Raspberry PI Platform" [3], uses OpenCV library to perform image process that helps within the detection of objects. The paper describes a vision based mostly platform for real-life indoor and out of doors object detection so as to guide visually impaired individuals. the applying is developed victimization Python and functions from OpenCV library and, ultimately ported upon Raspberry PI3 Model B+ platform. A multi-scale version approach is projected to scale back the interval and conjointly to increase the detection distance vary for correct traffic sign recognition in indoor/outdoor environment [6]. The experimental half self-addressed the finding of the optimum values for model and image supply dimension, still because the scaling issue.

In paper "Real Time Object Detection, Tracking, and Distance and Motion Estimation supported Deep Learning: Application to sensible Mobility" visual perception and chase victimization CNN (Convolutional Neural Network) is described [10]. it's 2 massive challenges: detection of objects in pictures and estimation of their position, and estimation of their category. it's supported the mix of sensors (RADAR, LIDAR, cameras, etc.) and algorithms that guarantee vehicle, driver, traveler and pedestrian safety supported completely different parameters like traffic, weather etc. It aims on the event of perception system based mostly object detection-based deep learning with completely different approaches like YOLO V3, and SSD. 2 of the foremost in style strategies within the one-stage class are Single-Shot Detector (SSD) and you merely Look Once (YOLO). one amongst the two-stage strategies giving the simplest results is RCNN (Region-proposal Convolutional Neural Network) and its improved versions, based on 2 freelance neural networks: a region-proposal network and a classification network. Results show that the article are detected with high accuracy and is taken into account as glad result.

Table –I: Consolidation of Related Works.

SI	*Technique*	*Remarks*	*Advantage*	*Disadvantage*	*Percentage*
1	*Traversal Median Algorithm*	*It is used to detect the presence of obstacle and to and to calculate the distance*	*Fast and Efficient, Not effected by irrelevant features.*	*It has more difficulties in reading reflections from soft, curved, thin and small objects.*	95
2	*CNN Algorithm*	*It is used in object recognition*	*accuracy in image recognition problems*	*High computational cost.*	93
3		*It is used object recognition and identification*	*Reliable, easy to implement*	*Missing Symbolic loops, it requires fundamental knowledge of advanced calculus and linear algebra along with a good understanding of machine learning also.*	92

- **Final Stage**

Since the planned system is principally utilized by visually impaired folks with the help of the thing recognition and obstacle detection.

Object recognition could be a laptop vision technique for distinguishing objects in pictures or videos. beholding could be a key output of deep learning and machine learning algorithms [8]. once humans examine a photograph or watch a video, we are able to without delay spot folks, objects, scenes, and visual details, similar approach is employed in our project to acknowledge the thing from a photograph And to convey it to a visually impaired person with the assistance of headsets wherever the output is an audio of what the thing is[1]. beholding is completed with the series of image process steps. Image classification involves assignment a category label to a picture, whereas object localization involves drawing a bounding box around one or additional objects in a picture. Object detection is more difficult and combines these 2 tasks and attracts a bounding box around every object of interest within the image and assigns them a category label. along it's spoken as beholding.

The planned style makes use of supersonic detector that detects objects by causing a brief supersonic burst so listening for the echo. The Raspberry Pi connected to the

sensors calculates the space from the thing supported the time the echo took to return back. Next, we have a tendency to generate a Text output supported the space calculated [7]. This Text output is born-again into AN Audio Format, that is then relayed to the visually impaired mistreatment AN headphone or a Speaker.
This system is formed from four main components:
(1) supersonic Sensors, (2) Raspberry Pi, (3) Power supply, and (4) Ear-bone.
1) supersonic Sensors: The supersonic Sensors belongs to a class of sensors that emits ultrasound i.e. sound of frequency quite twenty kilohertz. Initially, a trigger pulse is given as AN input to the supersonic detector mistreatment Raspberry Pi. The supersonic detector then emits a brief forty kilohertz supersonic burst signal. This burst signal travels through the air at more or less 343ms-1, hits AN object so bounces back to the detector leading to AN output pulse. This output pulse is captured by Raspberry Pi. Then mistreatment the time taken by the heartbeat to come back we have a tendency to calculate the space from the obstacle. The detector consists of 4 pins: (1) VCC, (2) Trigger, (3) Echo and (4) Ground once you submit your final version, when your paper has been accepted, prepare it in two-column format, together with figures and tables.
VCC - it's wont to offer 5V power to the detector.
Trigger (Trig) - Takes in Input Pulse to trigger the detector.
Echo - it's wont to receive the Output Pulse i.e. the echo from the thing detected.
Ground (GND) - It connects detector to the bottom. supersonic detector (HC-SRO4).
2) Raspberry Pi: Raspberry Pi could be a master card sized single board, low price laptop. It takes input from the GPIO pins, which might be hooked up to LEDs, switches, analog signals and alternative devices.
we connect the GPIO pins to the supersonic sensors. It needs an influence supply of 5V to be operational and that we got to insert a small Coyote State memory card in it, that acts as its permanent memory. For our style Raspberry Pi three Model B+ is used [8]. It contains four USB ports, a HDMI port, AN audio jack port And an LAN port. The LAN port helps the device connect with the web and install needed driver Apis. it's a 700 MHz single core processor and supports programming languages like Python, Java, C, and C++ etc. [5]. This mini laptop runs our rule, that helps to calculate the space from the obstacle supported the input it receives from the sensors. Then a Text-to-Speech driver API is employed to convert the text message (distance) to speech, that is relayed to the person carrying the earphone [2]. Raspberry Pi3 Model B+. Earphone/Speaker Earphone/Speaker is employed to create the visually impaired person conscious of the obstacles that are there, by telling the direction and distance from the obstacle [3]. supersonic sensors are utilized in try as transceivers i.e. one detector will each send and receive signals. The transmitter emits eight forty kilohertz pulse, this pulse when touch the obstacle is received back at the receiver. This rule is employed to calculate the space between the obstacle and therefore the person, by recording the amount between the heartbeat sent and pulse received.

- **Working**

The procedure begins when force is provided to the Raspberry Pi. As Raspberry Pi boots up its working framework, it triggers the ultrasonic sensor to begin imparting burst sign. All the sensors are activated at around a similar time hence, there is extremely less postponement. After the sign returns back to the beneficiary of the sensor as a reverberation, the Raspberry Pi ascertains the time taken from transmitting and getting the reverberation. Utilizing this time, we compute the separation of a snag from any of the sensors. Next, it checks if any of the separation determined is not exactly the base separation indicated for example 0.5m for our situation. On the off chance that none of the sensors have separation not exactly the base separation, the whole procedure begins once more. Be that as it may, regardless of whether one of the sensors recognizes separation under 0.5m, it triggers the pre-characterized conditions.

D.Figures

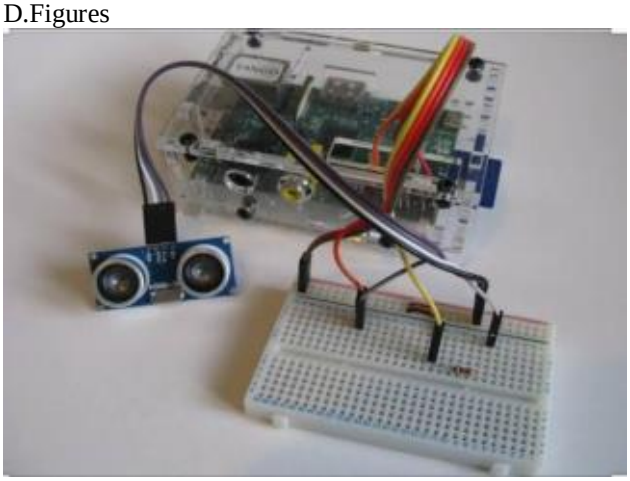

Fig: Obstacle detection connection

Fig shows the connection done in this paper

1. The system consists of ultrasonic sensor, Raspberry pi and pi cam
2. Fig shows the Data Flow Diagram of the system
3. The figure shows the internal flow of data in this system. It shows how the data is being transferred from one position to another

- **Tables**

1. Hardware Requirements

Components	Specification
Raspberry pi	Pi 3 B+
Pi cam	8MP
Ultrasonic Sensor	HC-SR04
Buzzer	Piezoelectric buzzer
Speaker or Ear-bone	
SD card	32GB

2. Software Requirements

- OS: Raspbian
- Python 3
- OpenCV
- NumPy
- SciPy
- YOLOV3

II. UNITS

1. Sound of frequency of signal is more than 20 kHz.
2. The ultrasonic sensor emits a short 40 kHz ultrasonic burst signal.
3. The burst signal travels through the air at approximately 343ms-1.
4. Raspberry pi requires power source of 5V to be operational.
5. Raspberry pi has a 700 MHz single core processor.
6. The transmitter emits eight 40 kHz pulse.
7. Minimum distance specified is 0.5m.
8. Speed of sound taken as 343 meter/sec

III. HELPFUL HINTS

1. Abbreviations and Acronyms

- YOLO – You Only Look Once
- OpenCV – Open Source Computer Vision
- COCO – Common Object in Context
- CNN – Convolutional Neural Network
- SSD - Single-Shot Detector
- RCNN - Region-proposal Convolutional Neural Network
- GND – Ground
- SD – Secure Data
- GPIO - General Purpose Input/output
- OD: Distance between an obstacle and the person in meters

2. Equations

Distance Formula: distance = speed * time
OD = {[Speed of Sound * Time Taken] / 2}, where Time Taken: It is the time interval between the pulse emitted and the pulse received.

IV. CONCLUSION

In this paper, we've come up with a good idea to assist the visually impaired. the most objective is to assist a visually impaired person with the utilization of Ultrasonic sensors, Raspberry pi and pi-cam. This paper proposes to develop a device within the form a Raspberry Pi white cane employing a system of Raspberry Pi and various other components (sensors, earphones, etc.). it's the subsequent features:

- a tool that helps visually impaired people as walking assistance.
- Uses sensors to assemble information of obstacles.
- a tool which will be used without Internet connectivity.
- a tool that's cost effective, easy to use and portable.
- a tool that notifies the user about obstacles within the kind of speech.

Enhancements might be done to form the system more mobile as compared to the present design. It may be made more compact so on make it easier to hold. additionally, if a GPS is installed onto the device, it could also help navigate the person in outdoor environment.

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