VOICE BASED ASSISTANCE FOR BLIND PEOPLE USING MACHINE LEARNING

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ABSTRACT

Blindness is a common and crippling disability that many people face. The World Health Organization estimates that one million people throughout the globe are visually impaired. Assistance with interior and outdoor navigation, real-time obstacle identification and avoidance, and location monitoring is the goal of the suggested system for the visually handicapped. One component of the suggested system is a camera-visual detection hybrid that works effectively in low light; this device would aid visually impaired people in recognizing their surroundings and avoiding obstacles. An easy-to-understand and -use system that helps the visually impaired recognize objects in their surroundings and translate them into spoken language for better understanding and navigation.In addition to this, there's depth estimation, which determines how far away an object may be safely touched, empowering the user to do more without help. Tensor Flow and pre-trained models were important in its success in generating this model. Our proposed method is trustworthy, affordable, doable, and dependable.

Keyword: nodemcu, machine learning,IOT.

1. INTRODUCTION

The field of research known as "machine learning" seeks to train algorithms that can analyze data, spot patterns, and provide predictions. Numerous fields can benefit from this technology, such as computational advertising, visual object identification, autonomous navigation, medical diagnostics, and countless more. There are people all around us in the actual world who can learn anything thanks to their incredible capacity for experience-based learning, and there are also computers and other devices that can carry out our commands. Does this mean that machines can't learn from their own mistakes and previous data just like humans? Thus, the function of Machine Learning is now at hand. Machine learning is a branch of AI concerned with teaching computers new skills by analyzing their own data and drawing on their own experiences. The phrase "machine learning" was initially used in 1959 by Arthur Samuel. The following might serve as a summary: Machine learning allows computers to learn from data, gain experience, and make predictions without human intervention. Machine learning algorithms take training data, which is a subset of historical data, and use it to build a mathematical model that can make predictions or judgments without human intervention. Machine learning integrates computer science and statistics to create prediction models. Machine learning entails the creation or use of algorithms that learn from past data. The more details we supply, the better the results will be. With the use of training data and historical information, a machine learning system may construct prediction models and use them to make predictions about future data. In turn, the accuracy of the anticipated output is affected by the quantity of data used to construct a better model. Assume for a moment that we are faced with a difficult prediction task. Generic algorithms may construct logic from data and anticipate outputs without requiring any code to be written. Because of machine learning, our view on the matter has evolved.

1.1 OBJECTIVE

Aiding the sight handicapped in doing daily tasks independently through the use of local object recognition for independent exploration. In the past, finding something required nothing more than sensing its presence and then ringing an alarm. In this setup, the camera (on laptops) captures photos in real-time and transmits them to a computer Networked Server, which then processes the images, identifies them, and provides vocal response in real-time. This revolutionary system serves as a voice assistant for those who are visually challenged. The most crucial phone functions may be accessed by the visually impaired with the aid of this technology, which improves the system's quality through the use of speech-to-text and various bespoke layouts.

2. SYSTEM ANALYSIS

2.1 EXISTING SYSTEM

Numerous techniques are employed in the current system. The current system relies on infrared sensors and the yolo algorithm to alert the visually impaired to the presence of certain things in their immediate vicinity. Only a buzzer or vibrating system is available in the current setup. The object is photographed using the pi-cam and then uploaded to the system for recognition.Just by vibrating or making a buzzing sound, it alerts the user to the presence of an object, allowing them to respond appropriately. One or two items at most can be deduced by it. On rare occasions, it fails to provide a warning when the item is too close, putting the user in danger of colliding with it. Additionally, dust particles might obstruct the IR-Sensor, making it unable to provide accurate instructions.

2.2 PROPOSED SYSTEM

The current navigation systems rely on detectors and buzzers, but this design proposes a more straightforward and efficient machine literacy-based system that can be used to describe an object and get accurate distance calculations and real-time voice feedback with all the necessary details. More efficiency and dependability are features of the suggested system. All computations are carried out by the system, which is configured to capture frames in real-time. The class of the object will be converted into real-time voice notes when the speech module is tested. These notes will also be communicated to those who are visually impaired so they may receive help. With the item discovery and the accompanying alarm system, we can now calculate an estimate. However, it will generate voice-grounded orders and distance units regardless of whether the blind person is actually close to the frame or far away at a safer region. The goal of computer vision is to identify relevant features in images and objects (in this example, by constructing rectangular boxes around them). Along with providing precise distances, we can also turn tagged words into audio responses. Reliability, efficiency, affordability, and doability characterize our approach.

3. Block diagram

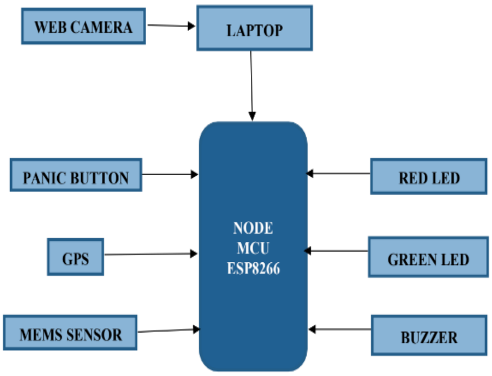

Figure 3.1 Block diagram.

3.1 NODE MCU ESP8266

To prototype your Internet of Things (IoT) device with just a few lines of Lua script, you may use the Node MCU, an open-source firmware and development kit. Espressif Systems created a microcontroller with the model number ESP8266. In addition to a plethora of pin-outs, this module has an integrated USB port. Similar to Arduino, the Node MCU devkit may be easily flashed by connecting it to a laptop via a micro-USB cable. It is also suitable for use with breadboards right away. An inexpensive microcontroller unit (MCU) with integrated Wi-Fi is the ESP8266. When coupled with a host microcontroller, such as an Arduino, it can provide Wi-Fi networking for a rudimentary foundation for developing Internet of Things applications. In addition to its many other features, including as an Analog-to-Digital converter, 16 general-purpose input/output (GPIO) pins (4 of which are PWM enabled), SPI and I2C interfaces, and a 32-bit 80 MHz CPU, the ESP8266 may even function as a standalone microcontroller unit (MCU).

Figure 3.2 Node MCU.

3.2 GPS

One such American space-based navigational system is the Global Positioning System (GPS). At all times, day or night, and in any location on or near Earth, it reliably offers locating, navigation, and timing services to users all over the globe. There are three components that make up GPS: a constellation of 24–32 satellites in Earth's orbit, four ground-based control and monitoring stations, and individual GPS receivers used by consumers. Position information in three dimensions (latitude, longitude, and altitude) and the current time are transmitted by satellites in orbit by the Global Positioning System (GPS).

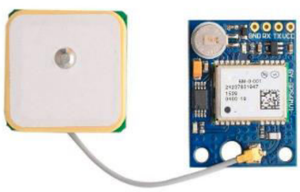

Figure 3.3 GPS.

3.3 BUZZER

Mechanical, electromechanical, or piezoelectric buzzers or beepers are all examples of auditory signaling devices. Buzzers and beepers are commonly used in alarm systems, timers, and to validate user input (e.g., keystrokes or mouse clicks). In 1831, Joseph Henry came up with the idea for the electric buzzer. Musical chimes, which had a gentler tone, gradually replaced them in early 1930s, and they were mostly utilized in doorbells after that. A buzzer is a device that makes a loud noise by converting audio signals into sound waves. Typically, DC electricity is used to power it. Its acoustic capabilities find extensive application in a variety of electronic equipment, including alarms, computers, printers, and more. In the circuit, the letters "H" and "HA" indicate the piezoelectric and electromagnetic buzzers, respectively. Depending on its design and intended application, buzzers can produce a wide range of sounds, including music, sirens, alarms, and electric bells.

3.4 Buzzer.

34 MEMS SENSOR

Micro electro-mechanical systems (MEMS) technology has evolved from a cool scholarly pursuit to a ubiquitous component of several everyday items. However, MEMS technology's actual deployment has been delayed, as is typical with most new technologies. In this essay, Harvey Weinberg from Analog Devices describes the design problems involved in creating a successful MEMS device, namely the ADXL2O2E. Initially, MEMS systems utilized a multi-chip design, with the signal conditioning circuitry located on a separate chip from the sensing element (MEMS structure). There are a lot of drawbacks to this method, even though it is easier from a procedural perspective: Integration, as we know from past experience, is the best, most cost-effective way to achieve high performance. As a result, Analog Devices sought a method for MEMS that combines the sensor with signal conditioning circuitry on a single chip.

Figure 3.5 MEMS Sensor chip.

4. FLOW CHART:

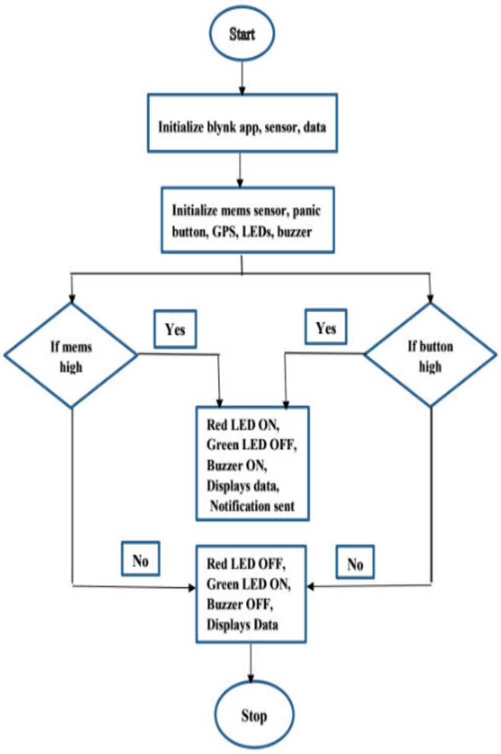

Figure 4.1 Detailed Flowchart.

The above is a schematic depicting the blind stick's operation in great detail. Initiating the Blynk app, servers, and laptop data is the initial stage. The buzzer, LRDs, GPS, panic button, and mems sensor are all initialized at the same time. The red light will turn on, the green light will turn off, the buzzer will start beeping, the GPS will transmit the position, and the guardian will receive a notice through the blynk app if the statement about the mems sensor is correct. In addition, the red light will go off, the green light will switch on, and the buzzer will go off if the statement "Mems sensor is high" is untrue.

5. RESULT AND DISCUSSION

5.1 RESULTS OF THE OBJECT DETECTION:

The devices it ran its tests on and produced the results for are detailed below.

Figure 5.1 Detection ofthe Cup(A) and Remote(B).

Figure 5.1 (A) shows that the final distance from the frame is 0.3 units, which is too near and causes a range warning. The voice output also indicates that it is the up type. An alert is given when it gets too close to the camera's frame. (B) indicates that it is in a more secure location, the subject is far away, and the class identification voice may be heard, but no distance-based warning is sent.

Figure 5.2 Detection ofthe Bed(A) and Chair(B).

Figure 5.2 (A) shows that the object is kept at a safe distance from the camera, thus there is no distance-based warning. Instead, a voice is used to identify the object as a bed. (B) indicates that the class identification voice can be heard normally and no distance-based warning is triggered since it is at a safe distance. Multiple objects can be identified within a single frame.

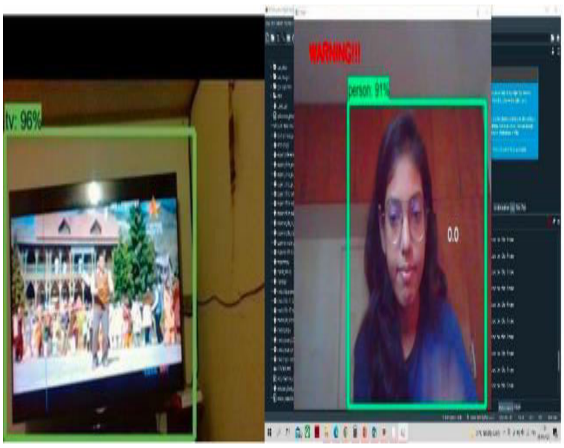

Figure 5.3 Detection ofthe TV(A) and Person(B).

Instead of a distance-based warning, as shown in Figure 5.3 (A), a class identification voice is used, with the object's name uttered as tv, to indicate that the item is at a safer distance. (B) A person's detection, together with the calculation of their accuracy and distance from the webcam, is what this refers to. To aid the visually impaired, there is warning technology that is based on distance, a voice that can be used to identify classes, and a warning message that can be created. With the proposed method, 90 objects may be identified, named, and their accuracy verified. In addition to offering audible feedback as the user gets closer to the object, this version also attempts to determine the distance between the item and the digital digicam. SSD InceptionV2 and SSD Mobile net V1 were utilized for the data evaluation. However, object identification performance was much improved and latency was significantly reduced in the SSD Mobile net V1 version.

S.NO	OBJECTS	ACCURACY LEVEL
1	Cup	99%
2	Remote	98%
3	Bed	96%
4	Chair	96%
5	Tv	96%
6	Person	90%

Table 5.1: Objects and Accuracy Level.

6. Conclusion and Future scope

6.1 CONCLUSION

We developed a Blind Assistance System to aid in object recognition using machine learning and pre-trained models. The TensorFlow API, SSD architecture, and COCO Dataset were all important in the project's successful completion. To convert the found object into audible sound, we employed object detection and depth calculation. This proposed system has several potential applications. It facilitates information acquisition, analysis, and translation for the visually impaired. Allowing those who are visually impaired to move quickly and safely is the primary goal. A visually impaired individual may use the gadget to detect objects at a distance and even identify their voice while speaking about them.

6.2 FUTURE SCOPE:

What we've learned during the course of creating this project will allow us to expand upon it in the future.

• Creating a wearable version of this software to expand its functionality.

• Making a chatbot so the user may communicate verbally.

• An all-in-one, efficient system that uses GPS to know the user's location in real time.

• Making it work as a web app.

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