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Smart Eye Glasses for Visually Impaired People

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***Abstract*— Blind mobility is one of the major issues that people with vision impairment must deal withThe primary objective of this paper is to help them with the help of technology. The smart eyeglass for visually impaired people includes obstacles detecting module, processing unit and a power supply. The processing unit consists of ATmega328P Microcontroller (MC). Through earphones, information is transmitted to the blind person after being collected from the environment. Information from the environment is gathered using the Subscriber Identity Module (SIM) 800L for the Global System for Mobile Communication (GSM)/General Packet Radio Services (GPRS). The system has a switch linked that can be utilized for urgent tasks like alerting the guardian when someone is in danger. The user-friendly smart glasses might simply direct individuals to avoid hazards.**

Keywords*— Smart glasses, laser distance sensor, MC, Visual impairment

I. INTRODUCTION

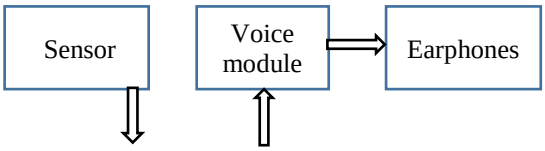
Smart glasses are eye- or head-worn wearable computers that give the user practical capabilities. The number of persons who are visually impaired has been rising over the past few years. The World Health Organization (WHO) estimates that there are around 253 million people who have vision impairment. Every day, these persons with visual impairments encounter difficulties engaging with their environment. It is quite difficult for a blind person to go out alone. Few studies have been conducted during the past few years to create a useful tool for persons who are visually impaired. Some of the products created include a lightweight smart glass system with audio assistance and an electronic travel aid. Wearable devices are most useful among all the assistive devices as they are hand free.

This research introduces a novel smart eyewear design that can do a variety of activities at a very low cost. The sight impaired are directed by this technology and given accurate directions.

II. THE PROPOSED MODEL

Fig. 1 depicts the block diagram of the model we've suggested. The system consists of laser distance sensor, earphones, switch, GSM/GPRS SIM800L module, voice module, Global Positioning System (GPS) module with an ATmega328P microcontroller.

For the purpose of detecting obstacles, the wearable device's laser distance sensor is positioned in the middle. This allows the barrier to be seen from the front. The sensor measures the obstacle distance as the user of these smart glasses approaches it and communicates the value to the MC. The ATmega328P is a single-chip MC created by Atmel. It has an 8-bit RISC processing core with a modified Harvard architecture. It has 16 Mega Hertz (MHz) clock frequency. The data from the laser distance sensor is processed by ATmega328P MC. To teach the user through the headphones in accordance with the sensor data, the voices are recorded in the voice module apr33a3. The system's switch is utilized for emergency tasks including alerting the user's guardian when they are in danger. The GPRS SIM800L module uses the internet to gather location information. The MC processes the data that the GPRS SIM800L has collected. When the switch is pressed, a message with the subject "I am in danger" and the location is sent to the guardian. The tool makes the impediment more understandable to the blind. Therefore, the visually impaired person can travel without any assistance and can overcome the difficulty of colliding to the obstacle. Liquid Crystal Display (LCD) is used to display the information whether the sensor detected the obstacle or not. An LCD, a specific type of flat panel display, relies heavily on liquid crystals to function.



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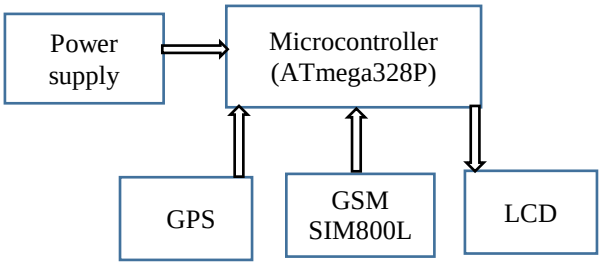

fig.1: Block diagram

A. Power Supply:

An electrical device known as a power supply delivers electricity to an electric load. Here the power is given according to the requirement of the circuit. +12Volts(V) is required for the GPRS and the other components need only +5V. We regulated the source voltage as per the circuit requirement.

fig.2: Power supply

B. GSM/GPRS SIM800L Module:

A digital cellular system used for mobile devices is called the Global System for Mobile communication (GSM). It is a global mobile standard that is popularly utilised for long-distance communication. There are several different GSM modules on the market, including the SIM900, SIM700, SIM800, SIM808, and SIM5320. The SIM800L module enables users to make and receive voice conversations, send and receive short messages (SMS), and transmit and receive data over GPRS. The GPS/GPRS module communicates with the microcontroller or PC terminal using Universal Synchronous/Asynchronous Receiver/Transmitter (USART) protocol. The module can be configured in a number of different modes and used for a number of different tasks, such as making calls and uploading data to websites, using AT commands.

fig.3: GSM/GPRS SIM800L Module

The ATmega328P MC's 2-number and 3-number pins are connected to the module's TX and RX pins, respectively. The MC can communicate with the module with this configuration. The main source (+12V) and negative terminal of the main source are linked to the module's VCC and ground, respectively.

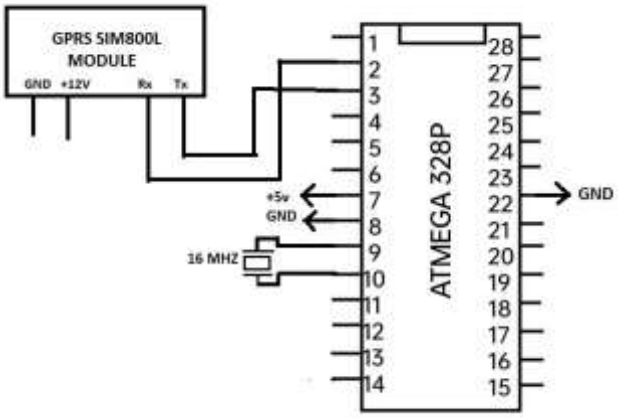

fig.4: GPRS Interfacing

C. Earphones and Switch:

To receive the alert message audio earphones is used. Earphones is connected to the voice module. An electric switch is a device that resists the electron flow in the circuit. Switches have simple design and they are binary devices that is either fully on or off. When we turn off the switch the power flow gets interrupted and ultimately circuit breaks. A source of power and load are components of the circuit. Here we are using push button. It is attached to the MC's 11-number pin.

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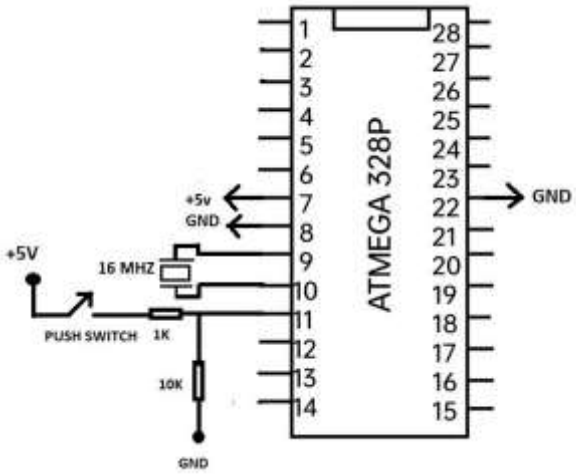

fig.5: Switch interfacing

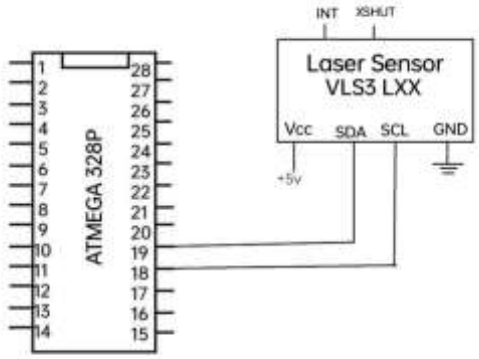

fig.7: Sensor interfacing

D. Some Common Mistakes

Different laser sensor setups are available, some of which detect presence and others of which measure distance. Although it is frequently used to detect the existence of a part, a proximity type laser sensor also known as a laser photoelectric sensor is not the subject of this discussion. The focus is on laser distance sensors, which, as their name suggests, measure distance, both metaphorically and literally. They can detect any solid object and provide a signal independent of substance, colour, or brightness that is proportionate to the measured distance.

fig.6: Laser distance sensor

E. Microcontroller:

An embedded system's microcontroller is a small integrated circuit that controls a single process. On a single chip, a typical microcontroller has a CPU, memory, and input/output (I/O) peripherals. To control a single device function, a microcontroller is integrated into a system. It accomplishes this by utilizing its core CPU to evaluate data that it receives from its I/O peripherals. The microcontroller receives temporary data that is stored in its data memory, where the processor accesses it and employs programs memory instructions to interpret and apply the incoming data. It then communicates and takes the necessary action using its I/O peripherals.

fig.8: Microcontroller

F. Voice Module(apr33a3):

A small, user-friendly voice recognition board is the Voice Recognition Module. Up to 80 voice commands can be supported by this speaker-dependent module. Any sound can be made to function as a command. Before the module can recognize any spoken command, users must train it. Like a library, all voice commands are gathered into one sizable

collection. Recognizer could import any seven of the library's voice commands. It indicates that seven commands are active simultaneously. The two controls for this board are a full-function serial port and general input pins (part of function). General output pins on the board may generate a range of waves in response to a voice command being recognized. Either a 5V source or a 12V supply can be used to power the gadget. Move the power switch to make a decision. We can use 8 channels (M1 to M8) for audio recording, each of which has a 1.3-minute recording time. By sliding the REC/PLAY slide button, you can select the recording or playback mode.

fig.9: Voice module

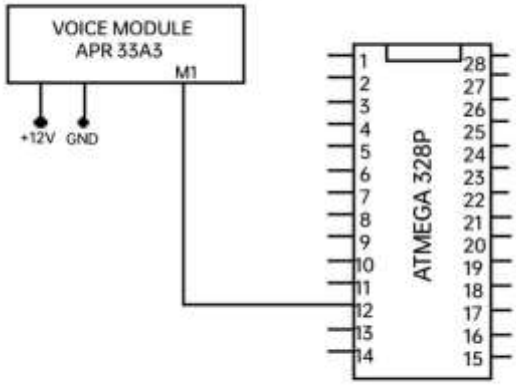

fig.10: Voice module interfacing

G. GPS:

Global Positioning System is known as GPS. It is a system of satellites and receiving equipment used to pinpoint any object's location on the planet. Location information from GPS receivers includes latitude, longitude, and altitude. In this case, GPS is being used to track the user's location.

fig.11: GPS

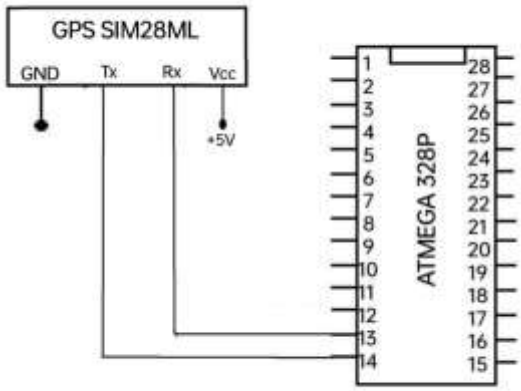

fig.12: GPS interfacing

III. Result and Discussion

The system includes a GPRS SIM800L module with an atmega328p microprocessor, headphones, a switch, and a laser distance sensor. For optimal detection, the wearable device's sensor is mounted on the front side. This makes it possible to find an obstruction. Here, an Atmega328p microprocessor processes the data from laser distance sensors. The speech module and Atmega328p microprocessor may exchange data. To train visually challenged users, voices are captured in the speech module and broadcast over headphones based on distance. The system has a switch that can be activated in an emergency to perform tasks like sending an SMS to the subject's guardian when they are in danger. The GPRS SIM800L module uses the internet to get information like location. The GPRS SIM800L module's data is processed by the microcontroller. An SMS containing the subject's location can be sent to their guardian when the switch is pressed.

fig.13: Prototype model

The distance of the object can be sensed if it is less than 300cm. When the object is detected, the alert is given to the user through earphones with the help of voice module. The user can send alert message to guardian by pressing a pushbutton. The proposed model is easy to wear and can be used as a portable model for visually impaired people.

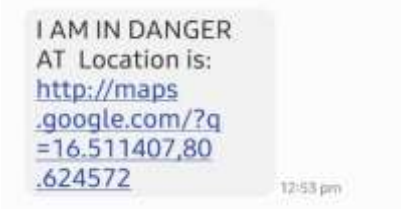

fig.14: SMS

IV. Conclusion

The one-of-a-kind smart device for those with vision impairments may assist the blind in travelling at any time while avoiding any obstacles, both inside and outside of the home. The suggested equipment is more affordable and comfier. The device's laser distance sensors are compact, lightweight, and low power users, making them user-friendly. Although the suggested model reacts swiftly, it is unable to identify objects at ground level. The tool will assist the blind individual in being more aware of potential impediments.

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