

A Smart Cane Using GPS Device and GSM Module

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Abstract. Blind have trouble living their life. They can't go anywhere alone. Blind people can use a smart stick to find their way around without having to ask anyone for help. It gives the person who is blind more confidence when they use this cane to help them walk. This device has an Arduino microcontroller, an ultrasonic and water sensors, an mp3 module, a buzzer, and a speaker. In order to see if there are things in front of the blind, an ultrasonic sensor is used to look at the reflection of ultrasonic waves from the things in front of the blind. Water sensor gives a signal ON, if there is a puddle in the way, you can find out before you get there. Use the MP3 module to tell people who can't see what they need to avoid. To be able to change how the sound comes out, you need to have an mp3. In order to communicate with each other, people use the GSM(Global System for Mobile Communications) system and the GPS system (global positioning system). A GPS tool helps the blind man get his location from satellites. GSM is used to send an alarm message to the blind family, telling them where he is. The system was written in the Arduino C programming language.

Keywords: Use Case Modeling, GPS, Water Sensor. GSM, MP3 module,

1 Introduction

As a gift from the Almighty Creator, we can see the beautiful world around us through our eyes, which were given to us by Alla. Without vision, our lives seem pointless and incomplete. In the world, think about how many people are living their lives and not being able to see what is pretty in the world. It looks like the universe is just a black hole to them. Every five seconds around the world, one person goes blind, and one child goes blind every minute. This is a general rule. According to the WHO, people who have vision problems are thought to number about 1.3 billion people in all of the world. Some 36 million of them can't see anything at all, though. In the United States, 217 million people have vision problems that range from mild to very bad because of refractive errors that haven't been fixed. If you believe the WHO, 87 percent of people who can't see live in places that aren't very rich. A lot of experts in eye care say that about 80% of blindness can be cured. Outside of their homes and at work, people who can't see have a hard time. Blind people can't move around on busy roads, in crowds, or in plain but unknown areas without help from others or some kind of equipment. Even if the places aren't dangerous, this is still true. When they have to do everyday things, they use their hearing to help them move. To ensure their safety, they needed to make a smart stick that could help them avoid obstacles and give them information about where they were going [1] [2]. When they use the smart stick, they get more useful help and a little bit of artificial vision. People who are blind can use a guide cane to help them interact with and feel their surroundings more easily. It looks like a fancy tool [1]. Some practical applications have now start-

ed increasing with sensor and actuator developing. Sensor give action and actuator gives the re-action, There are many sensors and actuator are available[3][4]. In this paper, proposed the blind stick based arduino microcontroller, ultrasonic sensor, water sensor, GPS receiver device, GSM module. After this introduction, the rest of the study is divided into five sections: section two reviews relevant work; section three Requirements Specifications , section four proposed system and use case model, section five the results and discussion; and section six , conclusion and future work.

1.1 Related Work

some of related works can see below:-

In [2018]. They suggests a smart system to help the blind,. The system has an Arduino UNO, an ultrasonic sensor, an IR sensor, and a voice playback module. To figure out what's behind someone, sensors measure how far away an object is from a stick. People who are blind can use a microphone to help them find their way to a certain place[5]. In [2019]. The smart walking stick that they came up with includes Arduino mega 2560, ultrasonic sensors, and IR sensors. People with disabilities who are blind can use this system to make it easier to move and make it safer. It will go off when the sensors are triggered, which means that an object has been found [6]. In [2020]. People who are blind should try out an ultrasonic sensor stick prototype. It is the goal of this study to make a tool for blind people that can help them find things. The system is made up of an Arduino UNO and an ultrasonic sensor that picks up on things. A sound and vibration are letting people know that they need to get ready [7]. Also , in the same year [2020] . A smart blind stick for visually impaired people was developed, which aimed to help the blind in moving. The system consists of an ultrasound, infrared sensors which used to detect obstacles in front of the blind, also a vibration engine and a buzzer alert . Furthermore, GPS unit and GSM unit which used to trace the location of blind and send it via phone app[8]. In [2021]. It will be made into a smart walking stick for people who can't see well. This proposed model uses Arduino as a microcontroller, an ultrasonic sensor, a water sensor, and a buzzer module to make it work. People who are blind or have low vision can be alerted by a buzzer if there is an obstruction in their way. Also, when the water sensor is near water, it makes a buzzer sound [9].

2 Requirements Specifications

High-level abstract statements about the functions or services of the proposed system are broken down like this:

A. Functional Requirements

- 1) Objects that are in front of the blind are automatically found.

- 2) The pool of water around the water pole is discovered automatically.
- 3) The blinds are automatically adjusted to their proper position.
- 4) Make it simple for people to get help as soon as possible.
 - a. The system should send a text message to the blind family when there's an alert.
 - b. The system should send the location of the blind that is experiencing difficulties.
- 5) should be clear to the blind what kind of problem they're having so they can get help (obstacles, puddles).

B. Nonfunctional Requirement

Three types of nonfunctional requirements are considered: quality, platform, and methodology requirements.

1) Quality Requirements

- a. Response time: One of the most important quality standards is response time. If the system is to work quickly in any situation, it should be made so that it can respond quickly.
- b. Reliability: The system should always give the same results in the same way.
- c. Availability: the system must be able to be used in order to achieve its goals.
- d. If you want to make your system more efficient, you should be able to add hardware or software to make it easier to do so.

2) Platform Requirements

This type of requirement takes into account the environment and technology of the system:

a) Platform for computing: The system runs on Windows 10 with 4GB of RAM and a 1.80GHz processor. It has an Arduino Mega microcontroller, an ultrasonic sensor, a water sensor, GSM, GPS neo 6m, mi, a breadboard, resistance, jumper wires, a PM3 module, a PC, a power supply, and a power cord.

b) Technology used: GSM, TinyGPS++, SoftwareSerial, and SPI are some of the other tools and libraries that are used in the system (StarUML application).

c) METHODOLOGY REQUIREMENTS

Unified modeling Language is used to design and build the system in an object-oriented way (UML).

1.2 Use Case Modeling

A UML use case diagram is a visual tool that helps developers, the people who use

the system, and people who know about the field all understand each other. In this section, we discuss what software products require and how they operate. Each actor in the use case diagram is a person who does one or more use cases. The use case diagram is made up of use cases and actors. In Fig. 1, the general use case model of the system looks. It has three actors and six basic use cases with (association, generalization, and inclusion) relationships.

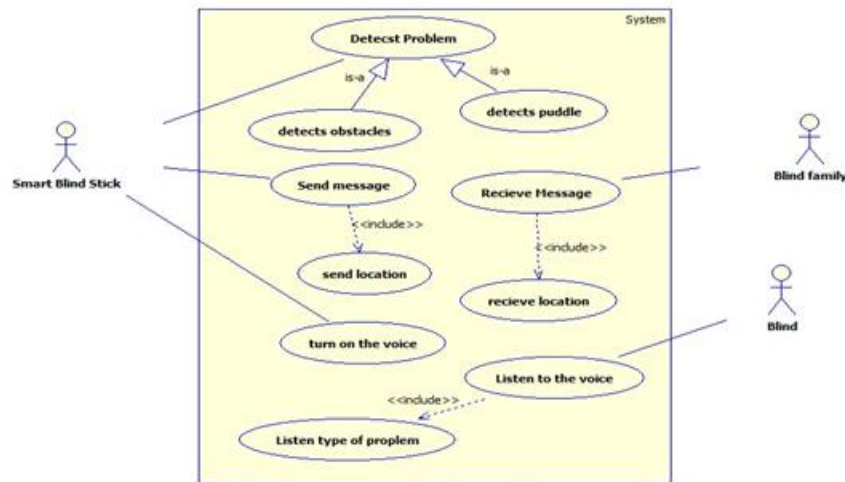


Fig. 1. The use case diagram of the system

3 Proposed System

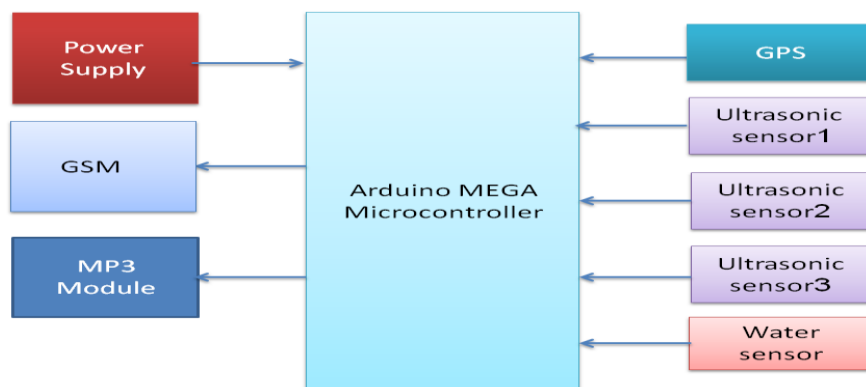


Fig. 2. The block diagram of the system

Most blind people have a hard time in their daily lives, they have to deal with a lot of problems. By using this stick for the blind, they can save time, become more independent, and lessen the number of accidents that happen to them. Fig. 2 shows a block diagram of the system's parts. They are all connected to the Arduino microcontroller, which is the system's "heart." The mp3 module is the output component which re-

ceives a signal from the Arduino to make a sound. Also, the system needs electricity to work. The system circuit of the proposed system will be shown in Fig. 3.

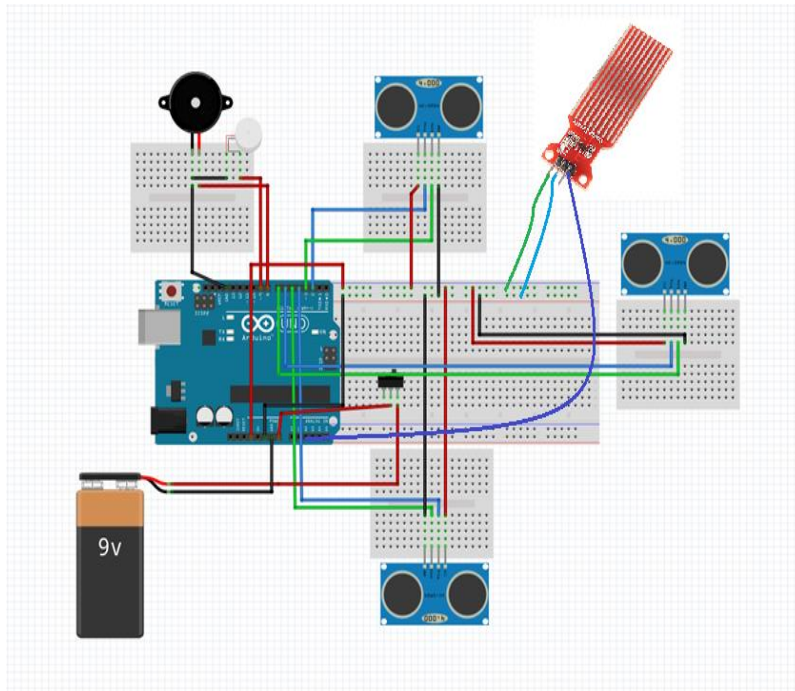


Fig. 3. The circuit of the system.

The system has three ultrasonic sensors distributed along the cane which are used to detect any obstacle in front of the blind. Also, the water sensor is used to detect if there is a puddle found. The system informs the family of the blind by sending an alarm message with its location if some problem occurs. GPS is used to get location in form of latitude and longitude, GSM is used to send the alarm message via its network.

4 System Testing

In order to make sure the implementation system works well. The system tests in case of something in front of the blind and in case of pond found. If the distance between the stick and the object is 30 cm or less, the ultrasonic sensor will tell the microcontroller that there is an object in the way.

It sends and gets ultrasound waves when it hits something. The Arduino then calculates the distance between the sensor and the object based on the time it takes for waves to be sent and received. It does this by figuring out the speed of sound in the air and doing some math. The MP3 module gives a sound alarm to inform the blind about the problem. When one of the ultrasonic sensors activates, the MP3 module makes obstacles sound. When the water sensor is activated, the MP3 module makes water

sound. Fig. 4 shows the final shapes of the system. The system sends an alarm message contains the location of the blind to his family(see Fig. 5).



Fig. 4. Smart stick for blind people

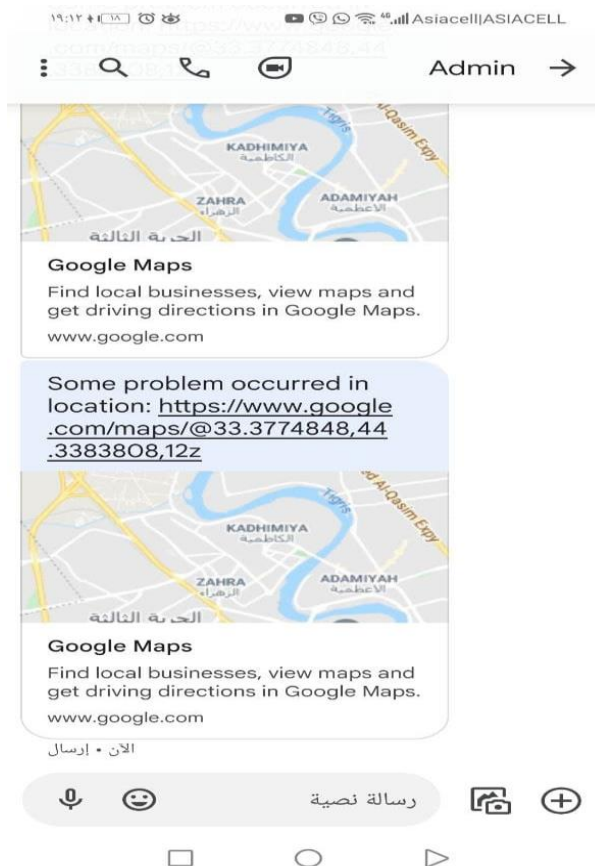


Fig. 5. Alarm message system.

5 Conclusion and Future work

A prototype for a smart stick can help the blind get where they want to go. Because blind people usually use their sense of hearing to get around, this app tries to help them. The system also takes the steps to make sure they are safe. With this system, blind people all over the world will be able to walk better. To help blind people move forward. The MP3 module can help the blind understand what the problem is occurred. a GPS module can be used to give the location of the blind and send it over GSM module to family blind. The system can developed by adding a some sensors like a gas , a fire , and other biosensors sensors.

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