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INDOOR GUIDANCE ROBOT FOR VISUALLY IMPAIRED

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Abstract: A location and tracking system becomes very important to our future world of pervasive computing, where information is all around us. Location is one of the most needed information for emerging and future applications. Since the public use of GPS satellite is allowed, several state-of-the-art devices become part of our life, e.g. a car navigator and a mobile phone with a built-in GPS receiver. However, location information for indoor environments is still very limited. Several techniques are proposed to get location information in buildings such as using a radio signal triangulation, a radio signal (beacon) emitter, or signal fingerprinting. Using Radio Frequency Identification (RFID) tags is a new way of giving location information to users. Due to its passive communication circuit, RFID tags can be embedded almost anywhere without an energy source. The tag stores location information and gives it to any reader that is within a proximity range which can be up to 10-15 meters for UHF RFID systems. We propose an RFID-based system for navigation in a building for blind people or visually impaired. The system relies on the location information on the tag, a user's destination, and a routing server where the shortest route from the user's current location to the destination. The navigation device communicates with the routing server using GPRS networks. We build a prototype based on our design and show some results. We found that there are some delay problems in the devices which are the communication delay due to the cold start cycle of a GPRS modem and the voice delay due to the file transfer delay from MMC module.
KEYWORDS- Radio frequency Identification; location; navigation; MMC module;

I. INTRODUCTION

In a pervasive computing world, location information is very precious. Several new emerging applications are based on location information. For example, location information can be used to help users find what they need and where it is from the current location of the users. A tracking system can be used to prevent lost kids in a shopping mall by attaching location devices to them to locate their current location. Similarly, a navigation system is used to guide users to a certain location. For example, a car navigator is used to guide a driver to a destination based on the current location of the vehicle in real-time or turn-by-turn. The location given to the navigator is typically calculated by Global Position System (GPS) receiver that receives reference radio signals from GPS satellites. Thus, the GPS-based navigation does not work for indoor navigation. An indoor navigation is important for some applications. For example, people can utilize an indoor navigation system to locate devices throughout a building, tourists can use it as a tour guide in a museum, or fire fighters can use it to find an emergency exit in the smoky environments where it is difficult to see the way. Several techniques have been proposed for indoor navigation system. For example, a fingerprinting technique is used with Wireless Local Area Network (WLAN) to calculate a current location of a device

II .RELATED WORK

A BLIND NAVIGATION SYSTEM USING RFID FOR INDOOR ENVIRONMENTS

AUTHOR'S NAME: Sakmongkon Chumkamon, Peranitti Tuvaphanthaphiphat

Robots that provide various services in large buildings, or building service robots (BSRs), are becoming increasingly popular. Commercially available robots are fetching and delivering items in hospitals, hotels, greeting and guiding people in large stores or shopping malls .These robots share certain features: they are autonomous, mobile, and at least three feet tall; they know how to find their way to specified locations in their buildings and can navigate through crowded spaces to get there. Given these features and the increasing popularity of BSRs, we wondered whether we could leverage such a technology to address the important open problem of indoor navigation for blind people. Many researchers have attempted to address the challenge of indoor navigation, but no solutions have been widely adopted. Researchers have focused on the technical challenges of localizing the user and routing her down hallways and around obstacles. Most researchers attempted to address these challenges by adding infrastructure to an indoor environment, such as RFID tags or other technologies. It seems unlikely that such techniques will be adopted broadly to solve accessibility problems. Adding infrastructure requires an investment in resources that without legal intervention will probably not be adopted broadly to support a relatively small and marginalized

RFID IN ROBOT-ASSISTED INDOOR NAVIGATION FORTHE VISUALLY IMPAIRED

AUTHOR'S NAME: Vladimir Kulyukin, Chaitanya Gharpure

For most visually impaired people the main barrier to improving their quality of life is the inability to navigate. This inability denies the visually impaired equal access to buildings, limits their use of public transportation, and makes the visually impaired in the United States a group with one of the highest unemployment rates (74%).Robot-assisted navigation can help the visually impaired overcome the navigation barrier for several reasons. First, the amount of body gear required by wearable navigation is significantly minimized, because most of it is mounted on the robot and powered from on-board batteries. Consequently, the navigation-related physical load is significantly reduced. Second, the user can interact with the robot in ways unimaginable with guide dogs and white canes, i.e., speech, wearable keyboard, audio, etc. These interaction modes make the user feel more at ease and reduce her navigation-related cognitive load. Third, the robot can interact with other people in the environment, e.g., ask them to yield. Fourth, robotic guide scan carry useful payloads e.g., suitcases and grocery bags.

A PROTOTYPE NAVIGATION SYSTEM FOR GUIDING BLIND PEOPLE INDOORS USING NXT MINDSTORMS

AUTHOR'S NAME: Tareq Alhmiedat, Anas Abu Taleb

Mobility is one of the critical problems encountered by visual impaired persons in their daily life. Over decades, these people were using navigational aids like guide dogs, white cane, or electronic travel equipment. Dogs are very capable guidance for orienting the blind people outdoors, and offer impaired persons with the highest degree of mobility and independence. However this method necessitates an extensive training and selective breeding. Furthermore, trained dogs are only useful for about five years. According to fully trained guide dogs cost between RM20000 and RM50000 per year for training, breed and support. Due to the development of modern technology, many different types of navigational aids are now available to assist blind persons. They are frequently known as Electronic Travel Aid (ETA) which has been used widely to help blind people while they are walking from one point to another. ETA systems are efficient navigation systems; however they require hard training due to the complicated sensors which used in such systems. Recently, robotic technology has been involved in guiding and navigating impaired people. The use of robotics is a promising alternative to guide dogs. A well designed navigation robotic system could enhance reliability and reduce high cost required for such complicated systems (i.e. ETA). A project named Eye Blind has started in 2012, which mainly aims to build a robotic system which should be able to guide blind people to reach their destinations with the least cost

III. METHODOLOGY

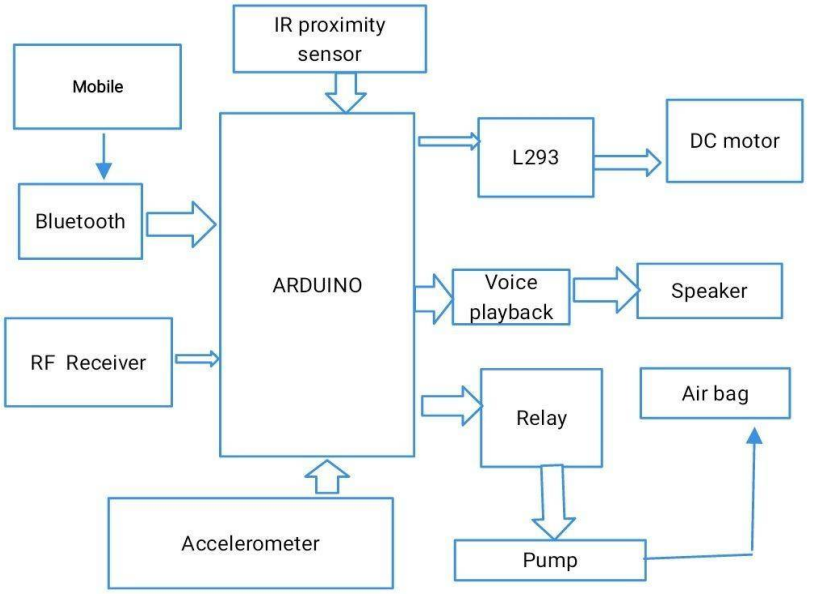
BLOCK DIAGRAM DESCRIPTION

The Android mobile system is connected to the Bluetooth, it is for transferring information and RFID Reader, it is a device used to gather information from an RFID tag, which is used to track individual object both are connected to Arduino In DC motor four main types, they are permanent magnet DC motor, series DC motor, shunt DC motor, compound DC motor and also voice playback connected to speaker and to Arduin For safety measures water bag used and then working of water bag pump and relay is used and there are all connected to Arduino.IR sensor is electronic device that emits in order to sense some aspects of the surrounding. It can measures the heat of the object as well as detect the motion. Accelerometers are device that measure acceleration which is rate of change of the velocity of an object. In the present proposed system Ardunio is single board microcontroller to make use in electronic multi disciplinary project more accessible .The system used for guidance and a safety measure to blind people .The principle is based on obstacle detection

The block diagram consists of hardware components:

- Arduino
- Accelerometer
- RFID
- Speaker driver
- Relay
- DC motor

3.1 BLOCK DIAGRAM



3.2ARDUINO

Arduino is a single-board microcontroller to make using electronics in multidisciplinary board designed around an 8-bit Atmel AVR projects more accessible. The hardware consists of an open-source hardware microcontroller, or a 32-bit Atmel. The software consists of a standard programming language compiler and a boot loader that executes on the microcontroller Arduino boards can be purchased pre-assembled Unlike most earlier programmable circuit boards, the Arduino does not require a separate part of hardware in order to program a new code onto the board you can just use a USB cable. As well, the Arduino IDE uses a basic version of C++, making it simpler to learn the program. At last, Arduino board offers a typical form factor that breaks out the functions of the microcontroller into a more available package.

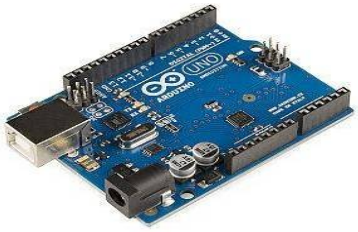


Fig 3.2 Arduino Board

The power pins are as follows:

1) Vin : The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin
2) 5V: The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply
3) 3.3V: A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
4) GND: Ground pins.

3.3 ACCELEROMETERS

Accelerometers have multiple applications in industry and science. Highly sensitive accelerometers are components of inertial navigation systems for aircraft and missiles. Accelerometers are used to detect and monitor vibration in rotating machinery.

Accelerometers are used in tablet computers and digital cameras so that images on screens are always displayed upright. An accelerometer is a device that measures proper acceleration. The proper acceleration measured by an accelerometer is not necessarily the coordinate acceleration (rate of change of velocity). For example, an accelerometer the surface of the earth will measure an acceleration g= 9.81 m/s^2 straight upwards, due to its weight.

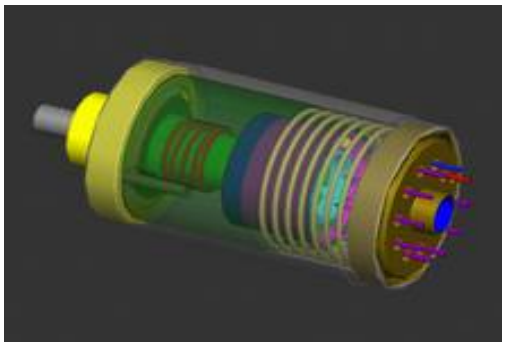


Fig 3.3 Accelerometer

By contrast, accelerometers in free fall or at rest in outer space will measure zero. Another term for the type of acceleration that accelerometers can measure is g-force acceleration. Accelerometers have multiple applications in industry and science. Highly sensitive accelerometers are components of inertial navigation systems for aircraft and missiles. Accelerometers are used to detect and monitor vibration in rotating machinery. Accelerometers are used in tablet computers and digital cameras so that images on screens are always displayed upright. Single- and multi-axis models of accelerometer are available to detect magnitude and direction of the proper acceleration (or g-force), as a vector quantity, and can be used to sense orientation (because direction of weight changes), coordinate acceleration (so long as it produces g-force or a change in g-force), vibration, shock, and falling in a resistive medium (a case where the proper acceleration changes, since it starts at zero, then increases). Micro machined accelerometers are increasingly present in portable electronic devices and video game controllers, to detect the position of the device or provide for game input.

3.4 RFID READER

Radio Frequency Identification (RFID) is a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object or person wirelessly, using radio waves. It's grouped under the broad category of automatic identification technologies .Auto-ID technologies include bar codes, optical character readers and some biometric technologies, such as retinal scans. The auto-ID technologies have been used to reduce the amount of time and labor needed to input data manually and to improve data accuracy. The auto-ID technologies, such as bar code systems, often require a person to manually scan a label or tag to capture the data. RFID is designed to enable readers to capture data on tags and transmit it to a computer system without needing a person to be involved. RFID, the technology of tomorrow, is here today. In fact, over a billion tags are in use worldwide, yielding benefits from livestock tracking to vehicle immobilization. This is such a huge number that it makes one question calling RFID an emerging technology. In the most basic level, it identifies unique objects, processes, transactions or events. RFID does this by using a burst of radio waves to move information, much like carrier pigeons were used to move information from point to point centuries ago. It is possible to explain RFID using only two basic building blocks - A Tag and a Reader. Of course, they may be configured in sophisticated ways to create large networks capable of staggering data flows

3.5 SPEAKER DRIVER

A speaker driver mainly consists of a speaker and driver. It is generally called as a speaker, as this is the part that produces sound.

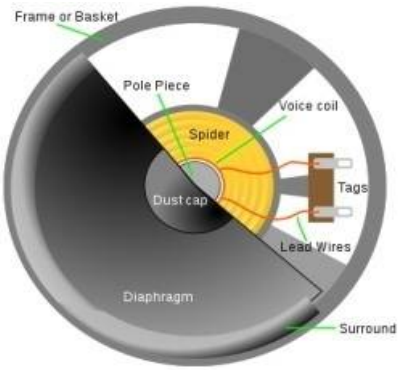


Fig3.5 Cross section of speaker

The driver is actually a transducer that uses an electronically induced reciprocating motion to make pressure waves, which are used to create the original sound. The motion is created with the help of a diaphragm. The diaphragm is a flexible cone or also a dome which is usually made of paper or plastic. It also has two magnets out of which one is mounted to the diaphragm and is made up of tightly wound electrical wire. It is used to receive the electrical signals from the amplifier so as to move the voice coil. The voice coil then interacts with the second magnet which is a permanent magnet. The permanent magnet is usually larger than the moving magnet. The drivers produce lower frequencies when they are larger in size. The suspension is designed in such a manner that it is attached to the driver's metal frame called the basket. The suspension also helps in moving the cone, whose narrow end is connected to the voice coil. The connection between the basket and coil is made with the help of a ring of flexible material called spider. The spider helps the coil to move back and forth.

3.6 RELAY DRIVER

A relay is an electro-magnetic switch which is useful if you want to use a low voltage circuit to switch on and off a light bulb (or anything else) connected to the 220v mains supply. The diagram below shows a typical relay (with "normally-open" contacts)

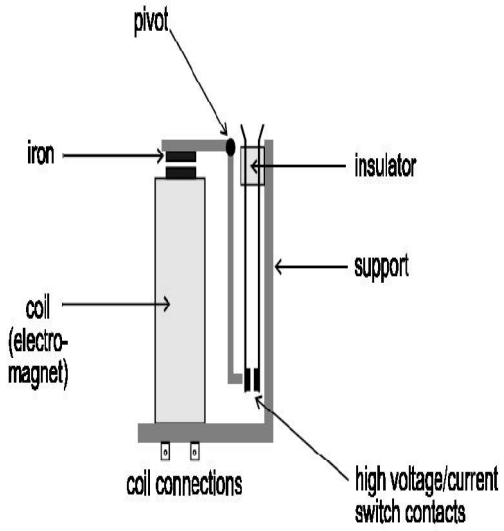


Fig 3.6 Relay Driver

RELAY DRIVER WITH FLIP FLOP

In many situations in which you use a relay, you will also need a bitable flip-flop. One useful integrated circuit flip-flop is the 4013. (This is actually contains two flip-flops.) With the connections as shown in the circuit below, when the voltage on pin 3 changes (rapidly) from 0v to the positive supply voltage, the flip-flop changes state (it "flips"). The next time the same thing happens, the flip-flop changes back to its original state again (it "flops").

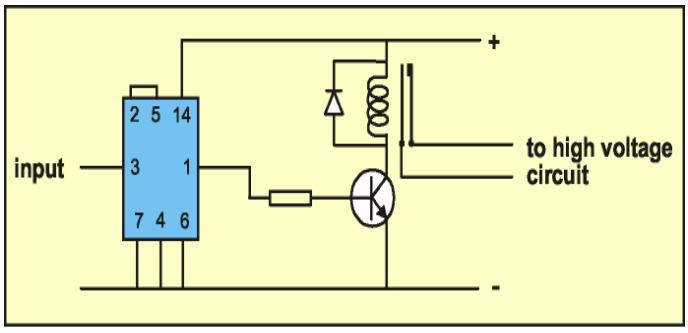


Fig.3.6 RELAY DRIVER WITH FLIP FLOP

3.7 DC Motor

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. Every DC motor has six basic parts axle, rotor, stator, commutator, field magnet and brushes. A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil.

The direction and magnitude of the magnetic field produced by the coil can be changed with the direction and magnitude of the current flowing through it. A simple DC motor has a stationary set of magnets in the stator and an armature with one or more windings of insulated wire wrapped around a soft iron core that concentrates the magnetic field. The windings usually have multiple turns around the core, and in large motors there can be several parallel current paths. The ends of the wire winding are connected to a commutator. The commutator allows each armature coil to be energized in turn and connects the rotating coils with the external power supply through rushes.

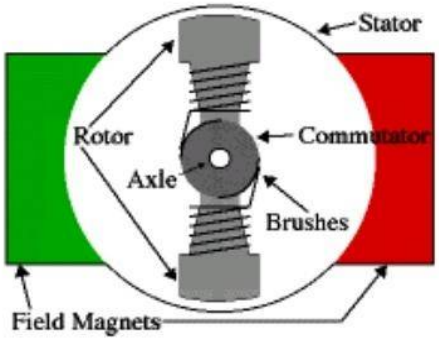


Fig 3.7 DC Motor

(Brushless DC motors have electronics that switch the DC current to each coil on and off and have no brushes.)The total amount of current sent to the coil, the coil's size and what it's wrapped around dictate the strength of the electromagnetic field created.

IV.RESULT

The input will be given as an command to reach the destination place. The output will be obtained through voice playback when the destination place is reached

V.CONCLUSION

In this paper, we have explored one approach for solving the challenge of indoor navigation for blind people: using build service robots (BSRs) as guides. We used a novel participatory design process to elicit design recommendations from a group of designers and target users who had a range of visual abilities. In the future, we will develop a prototype robot guide with a commercially available BSR. We will conduct a formal evaluation of the prototype to measure its effectiveness for finding a destination, teaching the user about her environment, and supporting feelings of independence and social acceptance. We hope our work will inform and inspire robotics researchers and developers to develop BSRs that can also solve accessibility challenges. We showed how Radio Frequency Identification (RFID) can be used in robot-assisted indoor navigation for the visually impaired. We presented a robotic guide for the visually impaired that was deployed and tested both with and without visually impaired participants in two indoor environments. The experiments illustrate that passive RFID tags can act as reliable stimuli that trigger local navigation behaviors to achieve global navigation objectives.

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