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A SECURITY RESOURCE FOR DISABLED PEOPLE USING GPS

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Abstract:

This work presents an alternative tool to give support to disabled people for several situations. Based on an embedded microcontroller and using a common GPS antenna, this system allows people to be located at any place by his/her nurse or any people which be responsible of him/her. The system is hidden on the wheelchair in a strategic position. Saving in micro SD card all routes that has traveled, the system sends a message with current location on several operation modes. Coordinates can be sent each second if an alarm button has been activated. If user suffers an epilepsy episode, an alarm tone starts and a message is sent to his/her caretaker. If user got lost, coordinates are sent to his/her caretaker and a message is sent with a legend to ask for support and be located. This system allows disabled people to be more independent and be supervised in long distances, being sure that can receive support if something goes wrong.

Key words: *Microcontroller, GPS, GPRS.*

I. INTRODUCTION

Understanding the needs of disabled people, several systems have been designed to give them support, systems that contribute in some way to adapt and give facilities to this people. During last years, government and some institutions have been working hard to design every time, technologies with adaptive characteristics. It has been shown that disabled people work as hard as possible to come true their goals, even, more than people who have any kind of disability. With technologies that give them some kind of support, they are able to live in a better way, being more independent than disabled people which don't use technologies. This work represents an alternative use of microcontrollers and GPS antenna to give support to disabled people. This work pretends to motivate this people to live in a better way with no dependence on being always with someone else. This system has been thought to supervise several situations that disabled people could experiment, some of these situations can be supervised in long distances, others are critical situations that all people could experiment as abduction or an epilepsy episode, and this system try to prevent or solve in a good way.

As a clear example, there are several systems in the global market to give support to disabled people. One of those examples could be the system called Head Mouse, this system is a computer program that allows people to use the computer without the need for hand use (especially designed for people with physical disabilities in the hands or arms), as it controls the mouse by light and soft nods. For operation is required to install a quality webcam to the computer, no additional hardware required. As another example,

is the system called abc Sound, this one basically is a word processor (such as Word) with the variant that is speaking, so it is ideal for students with visual disabilities. The advantages are that people play the written text by voice synthesizer: by letter, line, or full text. The user can thus detect possible spelling mistakes you have and the correction of their expressions. It has different applications, but the most useful and advisable to use as the word processor only. Another alternative, although the software has not been created for it, is to read stories or lessons to children. Industry has applied one important sector to improve technologies and give this people an alternative to live more comfortable and feel free to trying as much fields as they want.

The idea of design this project, began with a research about technologies that can help disabled people, in specific people that need to use a wheelchair, and making a research about the prices of this kind of technologies. In the global market exist a large field of applications, some of them with a high cost and some other with a reasonable cost to acquire them, and of course, a really important interest to improve these technologies to give support to disabled people. Based on a combination of several projects that have been designed during last years, this project will improve some systems, and will reduce costs besides being a commercial system really easy to acquire.

This work focuses on design a system to give disabled people the opportunity to travel and walk alone, with no directly a supervisor. Based on an embedded microcontroller and using a common GPS antenna, the system is hidden on the wheelchair in a strategic position. The main function is to alarm people who are in charge of them, about several situations, in this way; they will be supervised but not directly. People, who are in charge of disabled people, will receive a specific message depending on what situation is happening with the user. User will be able to select different buttons marked by issue. The system allows people in charge identify specific coordinates, places and times everywhere where disabled people are traveling, and with that main function, to be in contact with each other with greater security. People in charge will be able to meet with disabled people at any place, even if they lost visual contact with him/her.

II. HARDWARE SYSTEM

Micro controller: This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

ARM7TDMI: ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

Liquid-crystal display (**LCD**) is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock.

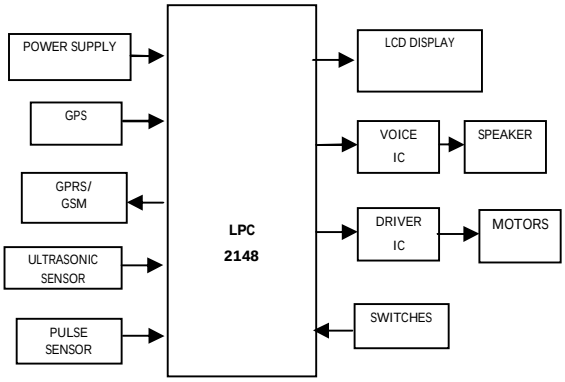

Fig: Block diagram

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III. Board hardware system features

GPS:

Global Positioning System (GPS) technology is changing the way we work and play. You can use GPS technology when you are driving, flying, fishing, sailing, hiking, running, biking, working, or exploring. With a GPS receiver, you have an amazing amount of information at your fingertips. Here are just a few examples of how you can use GPS technology.

GPS technology requires the following three segments.

- Space segment.
- Control segment.
- User segment

Space Segment

At least 24 GPS satellites orbit the earth twice a day in a specific pattern. They travel at approximately 7,000 miles per hour about 12,000 miles above the earth's surface. These satellites are spaced so that a GPS receiver anywhere in the world can receive signals from at least four of them.

Control Segment

The control segment is responsible for constantly monitoring satellite health, signal integrity, and orbital configuration from the ground control segment includes the following sections: Master control station, Monitor stations, and Ground antennas.

User Segment

The GPS user segment consists of your GPS receiver. Your receiver collects and processes signals from the GPS satellites that are in view and then uses that information to determine and display your location, speed, time, and so forth. Your GPS receiver does not transmit any information back to the satellites.

The following points provide a summary of the technology at work:

- The control segment constantly monitors the GPS constellation and uploads information

to satellites to provide maximum user accuracy

- Your GPS receiver collects information from the GPS satellites that are in view.
- Your GPS receiver accounts for errors. For more information, refer to the Sources of Errors.
- Your GPS receiver determines your current location, velocity, and time.
- Your GPS receiver can calculate other information, such as bearing, track, trip distance, and distance to destination, sunrise and sunset time so forth.
- Your GPS receiver displays the applicable information on the screen.

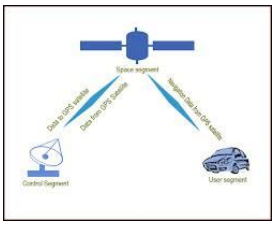

Fig: GPS Working

GPRS:

GPRS (general packet radio service) is a packet-based data bearer service for wireless communication services that is delivered as a network overlay for GSM, CDMA and TDMA (ANSI-I36) networks. GPRS applies a packet radio principle to transfer user data packets in an efficient way between GSM mobile stations and external packet data networks. Packet switching is where data is split into packets that are transmitted separately and then reassembled at the receiving end. GPRS supports the world's leading packet-based Internet communication protocols, Internet protocol (IP) and X.25, a protocol that is used mainly in Europe. GPRS enables any existing IP or X.25 application to operate over a GSM cellular connection. Cellular networks with GPRS capabilities are wireless extensions of the Internet and X.25 networks.

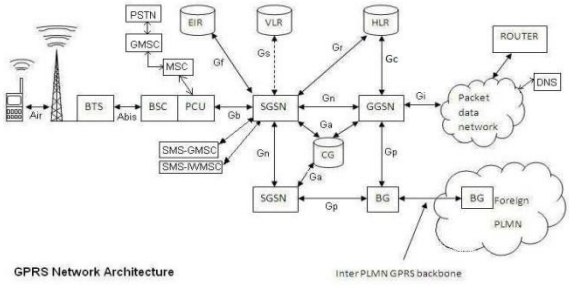

Fig: GPRS Architecture

Ultrasonic sensor:

The sensor is primarily intended to be used in security systems for detection of moving objects, but can be effectively involved in intelligent children's toys, automatic door opening devices, and sports training and contact-less-speed measurement equipment. Infrared sensors are characterized by high sensitivity, low cost and are widely used. But, these sensors can generate false alarm signals if heating systems are active or temperature change speed exceeds some threshold level. Moreover, infrared sensors appreciably lose sensitivity if small insects penetrate the sensor lens. Ultrasound motion detection sensors are characterized by small power consumption, suitable cost and high sensitivity. That it why this kind of sensor is commonly used in home, office and car security systems. Existing ultrasound sensors consist of multiple passive and active components and are relatively complicated for production and testing. Sensors often times require a laborious tuning process.

Fig: Ultrasonic sensor

DC Motor:

A DC motor relies on the fact that like magnet poles repels and unlike magnetic poles attracts each other. A coil of wire with a current running through it generates an electromagnetic field aligned with the center of the coil. By switching the current on or off in a coil its magnetic field can be switched on or off or by switching the direction of the current in the coil the direction of the generated magnetic field can be switched 180°.

Fig: DC Motor

Motor driver:

DC motors are typically controlled by using a transistor configuration called an "H-bridge". This consists of a minimum of four mechanical or solid-state switches, such as two NPN and two PNP transistors. One NPN and one PNP transistor are activated at a time. Both NPN and PNP transistors can be activated to cause a short across the motor terminals, which can be useful for slowing down the motor from the back EMF it creates. H-bridge. Sometimes called a "full bridge" the H-bridge is so named because it has four switching elements at the "corners" of the H and the motor forms the cross bar. The switches are turned on in pairs, either high left and lower right, or lower left and high right, but never both switches on the same "side" of the bridge. If both switches on one side of a bridge are turned on it creates a short circuit between the battery plus and battery minus terminals. If the bridge is sufficiently powerful it will absorb that load and your batteries will simply drain quickly. Usually however the switches in question melt.

High Side Left	**High Side Right**	**Low Side Left**	**Low Side Right**	**Quadrant Description**
On	Off	Off	On	Forward Running
Off	On	On	Off	Backward Running
On	On	Off	Off	Braking
Off	Off	On	On	Braking

Table: operation of H-Bridge

Voice IC:

The APR9600 device offers true single-chip voice recording, non-volatile storage, and playback capability for 40 to 60 seconds. The device supports both random and sequential access of multiple messages. Sample rates are user- selectable, allowing designers to customize their design for unique quality and storage time needs. Integrated output amplifier, microphone amplifier, and AGC circuits greatly

simplify system design. the device is ideal for use in portable voice recorders, toys, and many other consumer and industrial applications.

• Single-chip, high-quality voice recording & playback solution

- No external ICs required

- Minimum external components

• Non-volatile Flash memory technology

- No battery backup required

• User-Selectable messaging options

- Random access of multiple fixed-duration messages

- Sequential access of multiple variable-duration messages

• User-friendly, easy-to-use operation

- Programming & development systems not required

- Level-activated recording & edge-activated play back switches

• Low power consumption

- Operating current: 25 mA typical

- Standby current: 1 uA typical

- Automatic power-down

• Chip Enable pin for simple message expansion

Fig: Voice IC module

Max 232:

MAX232 converts from RS232 voltage levels to TTL voltage levels, and vice versa. One advantage of the MAX232 chip is that it uses a +5V power source which, is the same as the source voltage for the 8051. In the other words, with a single +5V power supply we can power both the 8051 and MAX232, with no need for the power supplies. The MAX232 has two sets of line drivers for transferring and receiving data. The line drivers used for TXD are called T1 and T2, while the line drivers for RXD are designated as R1 and R2. In many applications only one of each is used.

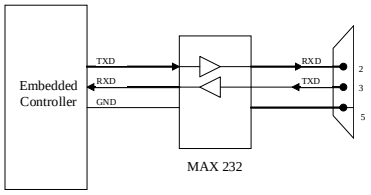

Fig: Communication via Max 232

Pulse sensor:

Attach to finger and get Analog out from the sensor based on heart beat pulse. You can read the analog output with microcontroller ADC and then plot it or calculate readings like heart beat per minute. It is simple to use and accurate results.

Fig: Pulse sensor

IV. CONCLUSION

This system has shown good efficiency, fast response, and has worked with high accuracy using commercial modules. Until this stage of the project all issues have been working according to the established goals. For future works, will be working on the compatibility of the system with smartphones to create a free app using this system, and thus contribute the community with some design for disabled people. Even the system is under design; it has shown good results at this stage.

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