

ANDROID, BLUETOOTH AND GESTURE BASED WHEELCHAIR CONTROLLER FOR PHYSICALLY HANDICAPPED

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Abstract—Wheelchairs are used by the people who cannot walk due to physical illness, injury or other disability. Now a day's development promises a wide scope in developing smart wheelchair. This paper is to describe an intelligent wheelchair using smart phone is to develop to control the rotation of wheelchair based upon voice and gesture movement for the physically challenged persons. In build voice and gesture function are used to control the wheelchair as well as by using smart phones reading SMS, E-mail, and News. In this system Thermostat is used to monitor the Body temperature and heartbeat. This system that allows the user to robustly interact with the wheelchair at different levels of the control and sensing. The system is divided into 3 main units Voice recognition, gesture recognition and Motor control through signal conditioning. The system is based on grouping an Android phone with Microcontroller.

Keywords—Android phone, Microcontroller PIC16F877A, Gesture recognition, Thermostat, HC-05 Bluetooth module

1. INTRODUCTION

Overall worldwide about 100 million to 130 million need wheelchairs. Wheelchairs are source of mobility for them and essential to their daily lives it feels they are in danger. Some people insist on using manual wheelchairs for the exercise.

Unfortunately day by day the number of handicapped people is increasing due to road accidents and diseases like paralysis. Among all the disabilities the percentage of physically handicapped people is most. If a person is Handicapped is dependent on other person for his day work like transparent, food and Orientation. The aim of this project is to use wheelchair automatically and operate by using voice and gesture control for moving forward, backward, left and right by using Bluetooth and Android. Quadriplegics and multiple sclerosis patients have severe disabilities and cannot drive joystick operating traditional wheelchairs.

A manual wheelchair is propelled by the force of the arms, and it has little difficulty moving back and forth on a flat road, but propulsion up a hill is a great challenge to the wheelchair rider. An electric wheelchair, driven by electric motors and controlled by a joystick, can move anywhere with ease, but it is too heavy and large to be loaded into a regular car. Moreover, it can't perform complicated maneuvers in a narrow or confined space, such as in offices or homes, such that the people around switches driving mode into an electric mode on a hill and turns the with more than the threshold torque.

A wheelchair is fitted with DC motor, GSM, Bluetooth, Thermostat, IR sensor and Smartphone. By just tilting smartphone which is with the wheelchair user wheelchair can be moved in four directions. The approach allows the user to use Human voice, Gesture movement Smartphone

and synchronize with the movement of wheelchair so that they can use it with comfort.

The complexity is reduced by using Smartphone so that the size of the system is very compact.

2. ANDROID

Android is a software stack for mobile devices that includes an operating system, middleware and key applications. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language

3. FEATURES

1. Application framework enabling reuse and replacement of components.
2. David virtual machine optimized for mobile devices.
3. Integrated browser based on the open source Web Kit engine.
4. Optimized graphics powered by a custom 2D graphics library; 3D graphics based on the OpenGL ES 1.0 specification (hardware acceleration optional).
5. SQLite for structured data storage.
6. Media support for common audio, video, and still image formats (MPEG4, H.264, MP3, AAC, AMR, JPG, PNG, GIF).
7. GSM Telephony (hardware dependent).
8. Bluetooth, EDGE, 3G, and Wi-Fi (hardware dependent).
9. Camera, GPS, compass, and accelerometer (hardware dependent).
10. Rich development environment including a device emulator, tools for debugging, memory and performance profiling, and a plug-in for the Eclipse IDE.

4. HARDWARE DESCRIPTION

The components used in this project are Microcontroller PIC 16f877a, DC motor, motor driver, GSM, Thermostat, Bluetooth, Android, smart phone and battery source.

5. BATTERY SOURCE

These are also sometimes called Primary Cells. Inside are two electrodes. One is made of Zinc and the other is made of Manganese Oxide. These make up the positive and negative terminals respectively. The electrodes are surrounded by an alkaline electrolyte, hence their name. Basically what happens inside is the electrolyte causes electrons to move from the zinc electrode to the manganese oxide electrode. This transfer of electrons causes a current to flow. The zinc and Manganese have a resistance, which cause a voltage to develop across them both due to the current passing between them. This voltage is 1.5V. Now, unfortunately this chemical reaction does not go on forever. Eventually, the electrolyte will be weakened and there will be no more voltage at the electrodes. This is when we decide to throw the battery away.

6. THERMISTORS

Thermostats are temperature sensitive resistors. All resistors vary with temperature, but thermostats are constructed of semiconductor material with resistivity that is especially sensitive temperature. However unlike most other resistive devices the resistance of a thermostat decreases with increasing temperature. That is due to properties of the semiconductor that the resistor is made from. Thermostats are expensive, easily-obtainable temperature sensor. In this system the thermostat is fitted to detect and monitor the body temperature of handicapped persons. They are easy to use and adaptable

7. BLUETOOTH

Bluetooth is wireless technology standard for exchanging data over short distances using short – wavelength UHF radio waves in the ISM band from 2.4 to 2.485 GHz from fixed and mobile devices and building personal area networks (PANs). A Bluetooth device uses radio waves instead of wires or cables to connect to a phone or computer. A Bluetooth product like a headset or a watch contains a tiny computer chip with a Bluetooth radio and software that makes it easy to connect. Bluetooth is managed by the (SIG) which has more than 30,000 member companies in the areas of telecommunication, computing, networking, and consumer electronics. The IEEE standardized Bluetooth as IEEE 802.15.1, but no longer maintains the standard. The Bluetooth SIG oversees development of the specification, manages the qualification program, and protects the trademarks. A manufacturer must meet Bluetooth SIG standards to market it as a Bluetooth device. Networks of patents apply to the technology, which are licensed to individual qualifying devices. Invented by telecom vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables. It can connect up to seven devices,

overcoming problems that older technologies had when attempting to connect.

8. GSM (GLOBAL SYSTEM FOR MOBILE COMMUNICATION)

A GSM modem exposes an interface that allows applications such as SMS to send and receive over the modem interface. The mobile operator charges for this message sending and receiving as if it was performed directly on a mobile phone. To perform these tasks a GSM modem must support an “Extended AT command set for sending/receiving SMS messages. GSM (Global System for Mobile Communications, originally Grouped Special Mobile) is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile phones, first deployed in Finland in July 1991. As of 2014 it has become the de facto global standard for mobile communications – with over 90% market share, operating in over 219 countries and territories. 2G networks developed as a replacement for first generation (1G) analog cellular networks, and the GSM standard originally described as a digital, circuit-switched network optimized for full duplex voice telephony. This expanded over time to include data communications, first by circuit-switched transport, then by packet data transport via GPRS (General Packet Radio Services) and EDGE (Enhanced Data rates for GSM Evolution or EGPRS).

9. DC MOTOR

A DC motor in simple words is a device that converts direct current into mechanical energy. It is of vital importance for the Industry today and it is equally important for engineers to look into the Working principle of DC motor. The very basic construction of DC contains a current carrying armature which is connected to the supply end through commutator segments and brushes it is placed within the north south poles of a permanent or an electromagnet. DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

10. MICROCONTROLLER PIC 16F877A

A microcontroller (or MCU for microcontroller unit) is a small computer on a single integrated circuit. In modern terminology, it is a System on a chip or SoC. A microcontroller contains one or more CPUs (processor cores) along with memory and input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR

flash or OTP ROM is also often included on chip, as well as a small amount of RAM.

Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips. Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices, remote controls, office machines, appliances, power tools, toys and other embedded systems. Or microwatts). Some microcontrollers may use four-bit words and operate at frequencies as low as 4 kHz, for low power consumption (single-digit milliwatts or microwatts). They will generally have the ability to retain functionality while waiting for an event such as a button press or other interrupt; power consumption while sleeping (CPU clock and most peripherals off) may be just nanowatts, making many of them well suited for long lasting battery applications. Other microcontrollers may serve performance-critical roles, where they may need to act more like a digital signal processor (DSP), with higher clock speeds and power consumption.

11. IR SENSOR

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detect the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations.

12. BLOCK DIAGRAM FOR RECEIVER

Smartphone is a mobile phone also known as cell phone with an advanced mobile operating system that combines features of a personal computer operating system with other features useful for mobile. It can access the internet and can run a variety of software components the display is almost always a touch screen and sometimes additionally a touch enable keyboard like passport blackberrys which enables the user to use virtual keyboard to type words and numbers and press on screen icons to activate app features.

13. CONCLUSION

By using this system physically handicapped people easy way to navigate within the house using wheelchair without the external help. This provides is of operation as the system uses smart phones that accuracy is increased.

The reading of SMS, E-mail, and News can be possible. The IR Sensor describes the parameter like heart beat and Thermostat monitors body temperature. The IR sensor is used for obstacle avoidance. If any emergency then the Panic button is there it blows buzzer.

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