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AUTOMATED HAND WHEELCHAIR FOR DISABLED PEOPLE USING MEMS TECHNOLOGY

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ABSTRACT

The interaction between man and machines has become an important topic for the robotic community as it can generalize the use of robots. With the advancement of technology, different devices are being developed in almost each and every field. With these new devices different applications are also being developed and here is one of such latest inventions "Hand Gesture based Robot". Like we know to control any robot, generally we give some command inputs by pressing some keys, etc to control its direction. But here in this project work, we need not to press any keys, instead by moving the hand in one direction automatically the robot will also move in that particular direction. So depending on the movement of the hand, the robot direction is controlled. This is possible using the MEMS technology. MEMS stand for Micro Electro Mechanical System.

As the robot is wireless control, the MEMS is interfaced to the micro controller in the remote and the wireless information is transmitted through the RF transmitter. The control module will be the MEMS interfaced with the controller to generate command codes and the same is transmitted. Depending on these command codes the micro controller present on the robot, gives instructions to the motors to move in specific directions. The MEMS is like a motion sensor. Slight variation in the X, Y, or Z – axes gives us the voltage variation that is fed to the ADC and the digital information is fed to the controller in the remote. This information is encoded and is transmitted through the RF transmitter. The RF receiver on the robot receives this encoded information and will be given to the controller which decodes the data and operates the robot.

INTRODUCTION

IR SENSOR

IR detectors are little microchips with a photocell that are tuned to listen to infrared light. They are almost always used for remote control detection - every TV and DVD player has one of these in the front to listen for the IR signal from the clicker. Inside the remote control is a matching IR LED, which emits IR pulses to tell the TV to turn on, off or change channels. IR light is not visible to the human eye, which means it takes a little more work to test a setup.

There are a few difference between these and say a CdS Photocells ():

- IR detectors are specially filtered for Infrared light, they are not good at detecting visible light. On the other hand, photocells are good at detecting yellow/green visible light, not good at IR light
- IR detectors have a demodulator inside that looks for modulated IR at 38 KHz.Just shining an IR LED won't be detected, it has to be PWM blinking at 38KHz. Photocells do not have any sort of demodulator and can detect any frequency (including DC) within the response speed of the photocell (which is about 1KHz)
- IR detectors are digital out - either they detect 38KHz IR signal and output low (0V) or they do not detect any and output high (5V). Photocells act like resistors depending upon how much light they are exposed to.

Fig 1. IR detector

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LDR

Most home appliances, outdoor lighting, and streetlights are normally operated and maintained manually. This is not only dangerous, but it also wastes energy due to staff negligence or unforeseeable events when turning this electrical equipment ON and OFF Therefore, by using a light sensor, we can automatically shut off the loads based on the intensity of the daylight.

Fig. 2.Typical LDR Sensor

By sensing the radiant energy present in a relatively small range of frequencies often referred to as "light" which runs in frequency from the "infra-red" to "Visible" up to "Ultraviolet" actrum, a light sensor produces an output signal that indicates the intensity of light. The light sensor is a passive component that produces an electrical signal from this "light energy whether it is in the visible or intrared portions of the spectrum Because they transform light energy iphotons) into electricity, light sensors are more generally referred to as "Photoelectric Devices" or "Photo Sensors (electronal).

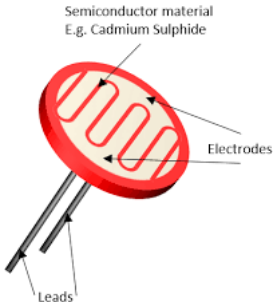

Fig 3. parts of an LDR

It can be divided into two primary categories photovoltaics and photo-emissions and photo-resistors and photo-conductors, which modify their electrical properties

I. DC MOTORS

DC Motors Introduction:-

DC motors are widely used, inexpensive, small and powerful for their size. They are most easy to control. One DC motor requires only two signals for its operation. They are non -polarized, means you can reverse the voltage without any damage to motor. DC motors have + ve and –ve leads. Connecting them to a DC voltage source moves motor in one direction (clockwise) and by reversing the polarity, the DC motor will move in opposite direction (counter clockwise). The maximum speed of DC motor is specified in rpm (rotation per minute). It has two rpms: no load and loaded. The rpm is reduces when moving a load or decreases when load increases. Other specifications of DC motors are voltage and current ratings. Below table shows the specifications of the motor used in the project.

Characteristics	Value
Operating Voltage	12V DC
Operating Current	150MAmps
Speed	30/10 RPM

II. BLOCK DIAGRAM

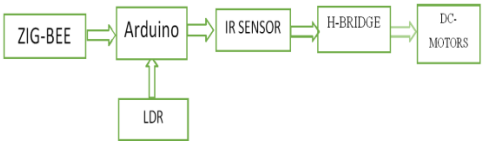

Fig 4:block diagram

Zigbee-Zigbee is a standards-based wireless technology developed to enable low-cost, low-power wireless Machine to machine and jot networks. Zigbee is for low-data rate, low-power applications and is an open standard. This, theoretically, enables the mixing of implementations from different manufacturers, but in practice, Zigbee products have been extended and customized by vendors and, thus, plagued by interoperability issues. In contrast to wi-fi networks used to connect endpoints to high-speed networks, Zigbee supports much lower data rates and use a mesh networking protocol to avoid hub devices and create a self-healing architecture

Arduino-The Arduino UNO is a standard board of Ardaino Here UNO means 'one' m Italian. It was named as UNO to label the first release of Arduno Software. It was also the first USB board released by Arduino It is considered as the powerful board used in various projects Arduino.cc developed the Arduino UNO board Arduino UNO is based on an ATmega1ZEP microcontroller. It is easy to use compared to other boards, mach as the Arduino Mega board, etc. The board coasts of digital and analog Input Output pins (1/0), childs, and other circuits. The Arduino UNO includes 6 analog pin inputs, 14 digital pins, USB sector, a power jack, and an ICSP (In-Circuit Serial Programming) header 1 programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms.The IDE is common to all available boards of Arduino

IR sensor-An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. Infrared radiation was accidentally discovered by an astronomer named William Herchel in 1800. While measuring the temperature of each color of light (separated by a prism), he noticed that the temperature just beyond the red light was highest. IR is invisible to the human eye, as its wavelength is longer than that of visible light (though it is still on the same electromagnetic spectrum). Anything that emits heat (everything that has a temperature around 500 degree kelvin) gives off infrared radiation.

H-Bridge-H-bridge is an electronic circuit that switches the polarity of a voltage applied to a load. These circuits are often used in robotics and other applications to allow DC motors to run forwards or backwards. The name is derived from its common schematic diagram representation, with four switching elements configured as the branches of a letter "H" and the load connected as the cross-bar. Most DC-to-AC converters most AC/AC converters, the DC-to-DC push-pull converter, isolated DC- DC converter most motor controllers, and many other kinds of power electronics use H bridges. In particular, a bipolar stepper motor is almost always driven by a motor controller containing two H bridges

DC-motors-A DC motor is any of a class of rotary electrical motors that converts direct current (DC) electrical energy into mechanical energy. The most common types rely on the forces produced by induced magnetic fields due to flowing current in the coil. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.

LDR-Photoresistors, also known as light dependent resistors (LDR), are light sensitive devices most often used to indicate the presence or absence of light, or to measure the light intensity. In the dark, their resistance is very high, sometimes up to 1 M2, but when the LDR sensor is exposed to light, the resistance drops dramatically, even down to a few olums, depending on the light intensity. LDR have a sensitivity that varies with the wavelength of the light applied and are nonlinear devices. They are used in many applications, but this light sensing function is often performed by other devices such as photodiodes and phototransistors. Some countries have banned LDRs made of lead or cadmium over environmental safety concerns.

Explanation-This is our receiver part of the project.it starts with zigbee receiving signals from the transmitter part. The communication between both our zigbee's is of simplex type after that arduino in the receiver part controls both DC-motors and H-bridge. DC motor is used to get the movement of the wheel chair and H-bridge is used to change the direction of the wheel chair.IR sensor is used to detect any obstacle in the way of the wheel chair,it detects them and stops the wheel chair our project also consists of LDR which can be helpful in situations where there is no sufficient light.

ARDUINO UNO

The Arduino UNO is a standard board of Arduino. Here UNO means 'one' in Italian. It was named as UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino. It is considered as the powerful board used in various projects. Arduino.cc developed the Arduino UNO board. The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc and initially released in 2010.

The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.

Arduino UNO is based on an ATmega328P microcontroller. It is easy to use compared to other boards, such as the Arduino Mega board, etc. The board consists of digital and analog Input/Output pins (I/O), shields, and other circuits.

Figure 5 Arduino UNO Board

It has 14 digital input/output pins (of which 6 can be used as PWMoutputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection.power jack, an ICSP header, and a reset button. It contains everything needed tosupport the microcontroller.

BRIEF DESCRIPTION ABOUT RF COMMUNICATIONS

Radio Frequency (RF) and wireless have been around for over a century with Alexander Popov and Sir Oliver Lodge laying the groundwork for Guglielmo Marconi's wireless radio developments in the early 20th century. In December 1901, Marconi performed his most prominent experiment, where he successfully transmitted Morse code from Cornwall, England, to St John's, Canada.

General physics of radio signals RF communication works by creating electromagnetic waves at a source and being able to pick up those electromagnetic waves at a particular destination. These electromagnetic waves travel through the air at near the speed of light. The wavelength of an electromagnetic signal is inversely proportional to the frequency; the higher the frequency, the shorter the wavelength.

Frequency is measured in Hertz (cycles per second) and radio frequencies are measured in kilohertz (KHz or thousands of cycles per second), megahertz (MHz or millions of cycles per second) and gigahertz (GHz or billions of cycles per second). Higher frequencies result in shorter wavelengths. The wavelength for a 900 MHz device is longer than that of a 2.4 GHz device.

In general, signals with longer wavelengths travel a greater distance and penetrate through, and around objects better than signals with shorter wavelengths.

III. ADVANTAGES AND DISADVANTAGES ADVANTAGES

ADVANTAGES

• Wireless makes ease of operation

• It is easy to design and manufacture as all the components are easily available

• Arduino can be reprogrammed , if any modification is required

Disadvantages

• If power supply fails ,system won't work

• Failure of device/components may have dire consequences , fatal accidents can occur

Applications

• Industrial application for trolley control , lift control

• Military application to control robotics

• Construction applications

• Gaming

IV. Result

Fig 6: Result

V. Conclusion

• Automated wheel chair can be used to help handicapped people , especially those who are not able to move

• This system was successfully implemented and the results were found to be satisfactory

Our major project stage-II has been completed sucessfully and the results were found to be satisfactory.

REFERENCES:

While designing and fabrication of this project work, we gathered information from websites & consulted experts in various fields. The information is gathered from yahoo.com search Engine. Regarding micro controllers plenty of books are available, the following are the references made during design, development and fabrication of the project work.

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