Voice based Wheel Chair for the Paralysed

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Abstract— With the advancement of science and Technology an innovative mechanism is adopted to provide the assistance for physically challenged personalities. Spinal card injury persons and physically challenged persons required human assistance to move from one point to another point. The spinal card injury makes the people toparalysed, by this they need to depend on others for their movement. Electronics interfaced Wheel chair had designed to move without any assistance. Micro Electro Mechanical Systems (MEMS) based accelerometer sensor is used to direct the movement of the device. The wheel chair may move forward, backward, left and right directions based on the output signal of the MEMS device. And also wheelchair is controlled by voice commands through google assistant. The developed wheel chair is best suited to meet the challenges of the physically challenge personalities and also provide them an easy control of wheel chair..

Keywords— Wheel Chair, Google Assisted Wheel Chair, Mems Accelerometer, Micro-controller

I. INTRODUCTION

It's a widespread nature of a human being to walk independently as a by-born nature. But sometimes, some reason causes the interruption of this character. Superior stage of spiral cord damage, accident and brain as well as nervous system anarchy are such types of cases which causes inhabitants to loss control of arms or legs or together arms. In addition, physical disorder at the time of born also makes people immobilize. However, wheelchair is the way to make this group to being able to move. But, in the occasion of upper limb injury, it restricts some to the use of manual wheelchair, which is operated by arm's muscular strength. So, they have to depend on others to give the manual force to move the wheelchair. To remove this enslavement and progress the feature of their life, present science made a progression on wheelchair history, which eliminates some of the mobility problems. Electric Powered Wheelchair is the solution, which is commonly branded as Automatic Wheelchair. The wheelchair where an electric motor moves the chair in spite of labour -intensive power as known as motorized wheelchair, electric wheelchair power chair, or electric-powered wheelchair. Old citizens or disabled persons become dependent on other members of the family to navigate through their habitat or within residence. A smart wheel chair can be a useful assistant for them. Recent development in the field of robotics, automation ,embedded system, artificial intelligence etc. can be combinedly utilised to design such a wheel chair. It can be controlled wirelessly adopting proper communication system. The chair can be controlled by head gesture as well as hand gesture method with directions as needed. The previous development of this kind of wheel chair is using a laptop or PC on the wheel chair.

By this development the recent wheel chairs are gesture controlled or voice controlled.

II. TYPES OF WHEEL CHAIR

A. All-Terrain Wheel Chair

One of the most unusual types of power wheelchairs, these are niche products,but well worth a mention. They feature large inflated tires (and sometimes tank tracks!) with deep treads that enable them to go over just about any terrain

B. Manual Wheel Chair

These are what most people think about when you mention the phrase. Mostcommonly seen in hospitals and nursing homes, they are the most economical choicefor most people..

C. Electrical Wheel Chair

Electric wheelchars are far and away the most popular variety because they allow those who use them greater freedom of mobility without having to rely on anurse or other assistant, except perhaps for getting into the chair.

D. Beach Wheelchair:

Another highly specialized design, these are almost always made from PVC or hollow aluminum tubes, with almost cartooishly large wheels to make it easier totraverse the sand. Just because you have mobility issues doesn't mean you have to belimited in the things you can do or enjoy.

E. Bariatric Wheelchair:

This is another highly-specialized type of chair, expressly designed with obese patients in mind. Constructed on a sturdier frame with a wider seat, these chairs provide the full range of mobility options to people who suffer from extreme weight issues.

III. SYSTEM DESIGN

In existing system the wheel chair is operated using Bluetooth module HC 05 which is interfaced with the controller. The main disadvantage is it can lose connection in certain conditions. It has low bandwidth as compared to other WSN networks. It allows only short range communication between devices. This is considered as the main disadvantage of the existing method.

A. Proposed System

Assistive technology for physically challenged personalities had wide scope in present research era. The major concept of our project is to provide an assistive wheel chair working based on MEMS sensor which is connected to controller. The MEMS sensors may be positioned to sense the head movement or to sense the gestures of the hand. The motor driver which is connected with the controller is used to control the movement of the wheel chair based on the MEMS sensor. And also it is controlled by Google assistant.
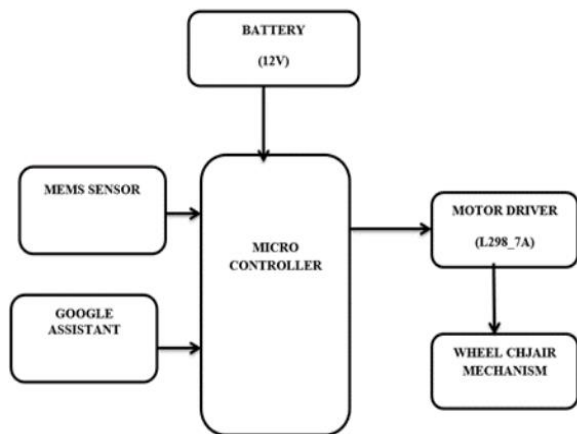
Figure 1 Block Diagram of the Proposed System

B. Methodology

This developed structure of wheelchair is so designed that a physically unable person can do their habitat and move around their house without any help of others. Our proposed wheelchair is so designed that it can be easily controlled by the head gesture command. The most attractive feature of this wheelchair is that it can be wirelessly controlled as we have done in this module using the RF receiver transmitter module. The controlling technique of this device is performed by microcontroller (Arduino Open Source Prototyping Platform).

C. Hardware Requirements

Arduino is a great platform for beginners into the World of Microcontrollers and Embedded Systems. With a lot of cheap sensors and modules, you can make several projects either as a hobby or even commercial.

As technology advanced, new project ideas and implementations came into play and one particular concept is the Internet of Things or IoT. It is a connected platform, where several "things" or devices are connected over internet for exchange of information.

In DIY community, the IOT projects are mainly focused on Home Automation and Smart Home applications but commercial and industrial IoT projects have far complex implementations like Machine Learning, Artificial Intelligence, Wireless Sensor Networks etc.

If you want to add Wi-Fi connectivity to your projects, then ESP8266 is a great option. But if you want build a complete system with Wi-Fi connectivity, Bluetooth connectivity, high resolution ADCs, DAC, Serial Connectivity and many other features, then ESP32 is the ultimate choice.
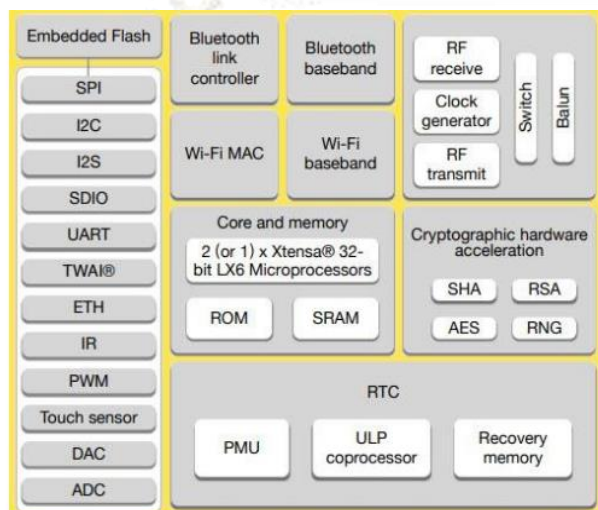
C Architecture of ESP32

Figure 2 Architure Of ESP32

ESP32 is a low-cost System on Chip (SoC) Microcontroller from Espress if Systems, the developers of the famous ESP8266 SoC. It is a successor to ESP8266 SoC and comes in both single-core and dual-core variations of the Tensilica's 32-bit Xtensa LX6 Microprocessor with integrated Wi-Fi and Bluetooth.

The good thing about ESP32, like ESP8266 is its integrated RF components like Power Amplifier, Low-Noise Receive Amplifier, Antenna Switch, Filters and RF Balun. This makes designing hardware around ESP32 very easy as you require very few external components.

Specifications of ESP32:
- Single or Dual-Core 32-bit LX6 Microprocessor with clock frequency up to 240 MHz.
- 520 KB of SRAM, 448 KB of ROM and 16 KB of RTC SRAM.
- Supports 802.11 b/g/n Wi-Fi connectivity with speeds up to 150 Mbps.

D. Wipers Motors

The car wiper motor is the component that powers the windshield wipers. As it spins, a mechanism built to it rotates a worm gear, arm and, finally, the windshield or windscreen wiper blades. The wiper blades then rid the windscreen of water, snow, dust, or any other debris that may affect visibility when driving. Car wiper motors form part of the wiper system. Because they help clear the windshield, they are usually viewed as one of the car safety components. Other parts of the wiper system include wiper linkage, wiper washer pump, and wiper switch.

Features:
- Supply voltage: 24 vdc.
- Long Lifetime, Low Noise, Smooth Motion.
- Equipped with high efficiency.

E . Driver Circuit BTS7960

The BTS7960 is a fully integrated high current H bridge module for motor drive applications. Interfacing to a microcontroller is made easy by the integrated driver IC which features logic level inputs, diagnosis with current sense, slew rate adjustment, dead time generation and protection against overtemperature, overvoltage, undervoltage, overcurrent and short circuit. The BTS7960 provides a cost optimized solution for protected high current PWM motor drives with very low board space consumption.

Specifications:
- Input Voltage: 6 ~ 27Vdc.
- Driver: Dual BTS7960 H Bridge Configuration. Peak current: 43-Amp.
- PWM capability of up to 25 kHz.

F. MEMS Accelerometer:

The accelerometer is a low power, low profile capacitive micro machined Accelerometer featuring signal conditioning, a 1-pole low pass filter, temperature Compensation, self test, 0g-Detect which detects linear freefall, and g-Select which Allows for the selection between 2 sensitivities Zero-g offset and sensitivity is Factory set and requires no external devices. This includes a Sleep Mode that makes it ideal for handheld battery powered electronics.

Features:
- Low Current Consumption: 400 µA
- Sleep Mode: 3µA
- Low Voltage Operation: 2.2 V – 3.6 V
- High Sensitivity (800 mV/g @ 1.5g)
- Selectable Sensitivity (±1.5g, ±6g)☐ Fast Turn on Time (0.5 ms Enable Response Time)

- Self-Test for Freefall Detect Diagnosis

G. Software Requirement
Google Assistant

Google Assistant is Google's voice assistant. When it launched, Google Assistant was an extension of Google Now, designed to be personal while expanding on Google's existing "OK Google" voice controls.

Originally, Google Now smartly pulled out relevant information for you. It knew where you worked, your meetings and travel plans, the sports teams you liked, and what interested you so that it could present you with information that mattered to you. Google has long killed Google Now, but Assistant lives in the same space, fusing these personalized elements with a wide-range of voice control. Google Assistant supports both text or voice entry and it will follow the conversation whichever entry method you.

Google Assistant on Phone:

Google expanded its Google Assistant service in 2017 so that it would be available on more mobile devices. That saw the roll-out of Assistant to most Android phones, with all recent launches offering the AI system. Even devices that offer another AI system, like Samsung's Bixby, also offer Google Assistant. Essentially, if your phone has Android, your phone has Google Assistant, so the user base for Google Assistant is huge.

It's possible to have Assistant respond to you even when your Android phone is locked too, if you opt-in through your settings and you can also opt in to see answers to personal queries too.

Features:

- Ease to Check-in Flights
- Opportunity to Book a Hotel
- See Traffic on Locked Device
- Make Phone Calls for Appointments

Figure 3 Hardware Model of the Wheel Chair

Figure 4 Control Unit of the Wheel Chair

IV. CONCLUSION AND FUTURE SCOPE

A major challenge in the design of the smart wheelchair is to rapidly, accurately, and sufficiently produce control commands. The cost of the system is less and it gives the reliable output as compared to another system which useful for society. To have safe and it is mainly implemented on a long scale for the better results and problem free solutions in the future.

Due this fast growing world due accident and other reason some may lost the movement and need to depend on others for their movement. Other than accidents due to improper cell division and malnutrition due to the food habits of now a days children may lack limbs. For their movement wheelchair is needed. This voice controlled and head movement controlled wheelchair will be affordable for those disabled peoples. With further development to this system advancement can be done more features can be added.

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