INTELLIGENT GESTURE BASED WHEEL CHAIR

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ABSTRACT

We can see in our daily life it is very complicated for the people who are physically disabled. It is very complicated for those who can't walk to do daily activities. They must use wheel chair to do daily activities. Our project is to reduce the complexities for those who don't have strength to move their chair by themselves. With the help of our project can control their wheel chair by moving their hands. We are using mems accelerometer to control wheel chair for user friendly control. With the help of gesture sensor we can easily control the wheel chair. Since we are having three dimensional axis in mems accelerometer we can easily control wheel chair. It is to replace the joystick control wheel chairs. Since they are hard to control and which have less life time. We are using high torque dc gear motors to drive heavy loads. DC gear motors are capable of driving heavy loads then compared to the ordinary motors and the capable of rotating both directions by simply changing polarities.

Keywords: ARM7, DC Gear Motor, MEMS Accelerometer, Motor Driver.

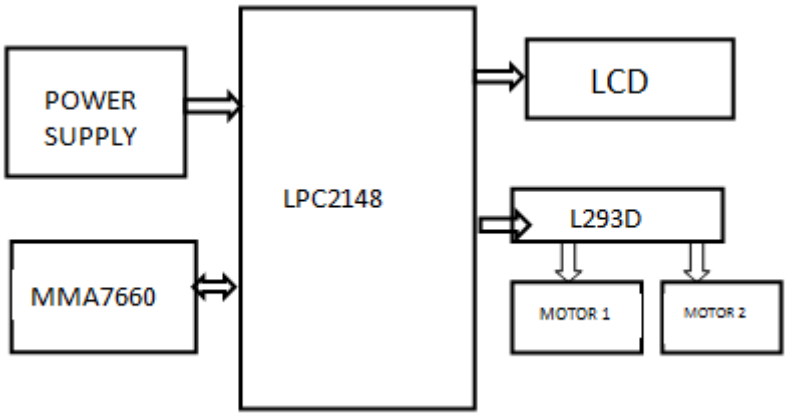
I. INTRODUCTION

We can see that it is very complicated for the old people or physically handicapped people to walk. Most of the cases they need some one's help to do their daily activities. For physically handicapped people they can't even walk properly. They need a wheel chair. Some of them move their chair with themselves, but for others they don't have that much strength to pull their chair themselves. We have to fix motors for their chairs. Controlling is also a complicated issue for them. We are using gesture based wheel chair control in which they can control their wheel chair themselves. We are using MMA7660 mems. It contains three dimensional axis with resolution of 64 on each axis. With resolution we can easily detect the motion. Mems contains the main registers which are x, y, z which are x-axis, y-axis, z-axis respectively. We need to use Inter Integrated Protocol to communicate with the mems ic, which is also known as I2C protocol. I2C protocol is one of the synchronous serial communication protocol. By reading the x, y, z registers we can calculate the small change in the accelerometer which is placed in hands of the person who seated in the wheel chair. With these registers we can calculate the direction in which person wanted to move the wheel chair and we can give the corresponding instructions regarding the direction to the motors. We are using DC gear motor to control the direction of the wheel chair. Switching on/off the corresponding motor we can control the direction and the movement of the wheel chair. We are using gear motors to acquire high torque. We need high torque and at the same time we don't need high speed. In such a case gear motors are used.

II. DESIGN

The main segments that we have to consider in our project are MMA7660, motor drivers and DC gear motors.

2.1 Block Diagram



2.1 LPC2148

LPC2148 is a real time microcontroller which is based on ARM7 micro processer. The features of the LPC2148 are

- Two Universal Asynchronous Receive Transmit ports as UART0 and UART1.
- Two on chip I2C protocols programmed.
- One SPI and SSP each on chip protocols programmed.
- Sixty four I/O programmable pin.
- On chip Real Time Clock.
- One Universal Serial Bus with 512kb ram.
- 512kb on chip flash memory.
- Fourteen individual channel Analogue to digital converters.
- One Digital to Analogue converters.
- Three Timers.
- Pulse Width Modulation and Watch Dog timer one each programmed on chip.

Fig 1: LPC2148 Micro Controller PCB

2.2 MMA7660 (MEMS)

MMA7660 is an I2C based accelerometer. The main purpose of the mems is to measure the small change in motion of mems ic in all the x, y and z dimensions. To communicate with mems mma7660 ic we need to fallow synchronous serial communication. In I2C protocol we have to communicating with mems accelerometer by sending clock in parallel with the data and also we receive an acknowledgement. Since we are using synchronous communication, data loss is very less and we can communicate with high speed. There are mainly three registers in IC which we have to check in interval timings. By comparing the specific values which we are

saved as a predefined we can understand the angle of the mems and also we can estimate the direction which user wants to move. So that we can give commands to the motors.

Fig 2: MMA7660 Accelerometer.

2.3 L293D

To control the high torque motors we need to control high currents. Micro controller can't control high currents directly. The output current of the micro controller is in ma. To control high currents up to 3A and 36v we are going to interface L293D. The main purpose of L293D is control high current with the low currents. L293D can easily switch motors from high to low by micro controller. Each L293D have four channels. To control motor in each direction we need two channels. One L293D is enough to control two motors. L293D can be capable to switch motors with the voltage of 4.5v minimum.

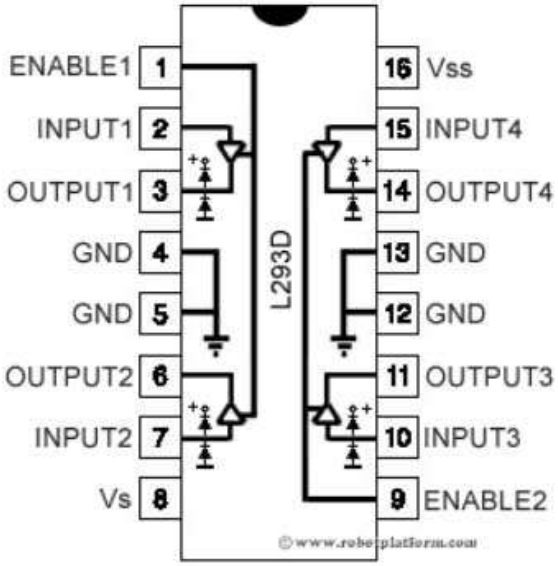


Fig 3: L293D Pin Description

2.4 DC GEAR MOTOR

Motor is well known as the converter of electrical energy to mechanical energy. The principle of the motor is when electrical energy is transferred through the electromagnetic coil magnetic field is generated. The generated magnetic field is enough to pull or push the magnet which is near by or which is fixed to shaft. DC motor is capable of rotating in both directions. When we reverse the polarities of the AC motor the motor rotates in the same direction unlike that when we reverse the polarities of the DC motor it rotates in reverse direction.

To control the direction of the robot or wheel chair we are switching on one and switching off other. To turn the wheel chair in left direction we will switch on the right motor and switch off the left robot. So that wheel chair rotates left direction. This is also known as round cut. To rotate the wheel chair in other direction we will switch on left one and switch off the right one. To move robot in reverse direction or in back ward movement we will reverse the polarities of both motors.

The gears are mostly used to multiply the torque of the motor. As larger the gear connected the output shaft and as smaller the gear connected to the motor shaft the torque is multiplied and at the same time the speed is divided. We need high torque and low Rotations Per Minute we will use large gear for the output shaft. So that we get our required output torque and output RPM at the same time.

III. FLOW CHART

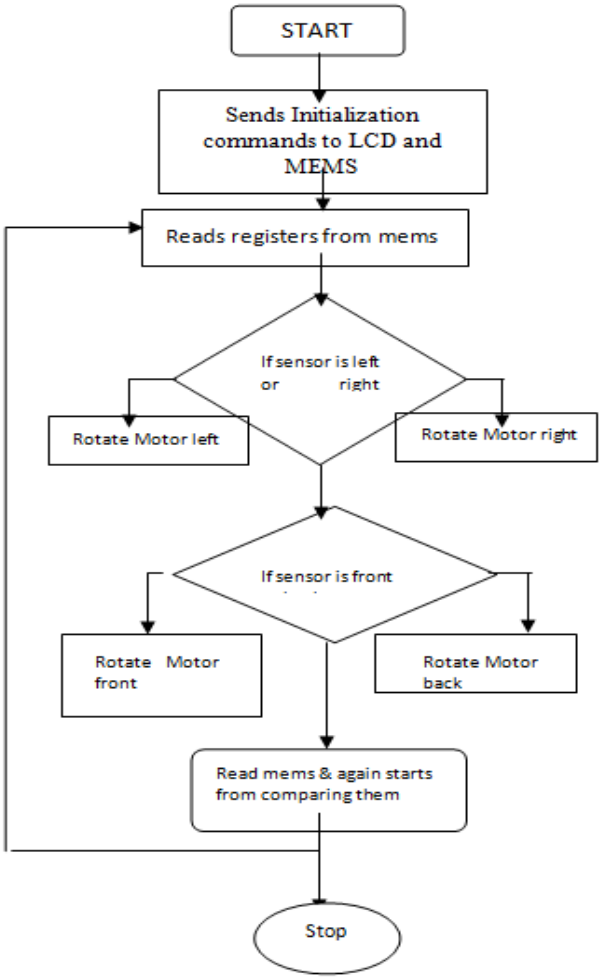


Fig 4: Flow Chart of Project Design Model

IV. WORKING PRINCIPLE

1. Sends initialization commands to LCD and MEMS.
2. Reads motion values from mems sensor using I2C protocol
3. Compares the values with the predefined values and checks the direction user wants
4. Give instructions to motors according to the user desertions
5. If mems readings out of range then go to step 2.

V. CONCLUSION

With the help of the project gesture based wheel chair can be very help full for physically handicapped people. Since we using accelerometer instead of traditionally used buttons or joysticks. Mems is the high sensitive motion sensor. With the help of this sensor we can easily control the motor directions and user can easily give instructions to the micro controller.

VI. RESULT

When we switched on our project micro controller send initialization commands to the LCD and MEMS. After sending commands to the mems controller started reading the three axis registers and compared them with the readings that we stored them as defaults. If the received readings are of the direction left, right, front, back and stop the wheel chair is moved in such direction and when micro controller read other directions it started the same process again from the reading the registers.

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