ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 10, March 2017

Stair Climbing Low Cost Wheel Chair Robot For Handicapped

Ajay Selva.P[1] Bhuvaneswaran.M[2] Kannathasan.A[3] M.I.Prasanna[4]

bhuwanezh@gmail.com[2] , kannathasan9655@gmail.com[3]

1,2,3-Final Year ECE Students 4-Asst. Professor for ECE department

Dr. G. U. Pope College of Engineering

Abstract

With sharply increasing of elderly and disabled people at present, the work which focuses on making life easier for those people have been paid more attention. So a new stair-climbing wheelchair was designed in this paper which can work in three modes. It helps physically disabled wheelchair mode and manual mode. It helps physically disabled and elderly people to move flexibly and comfortably. This paper presents the design and implementation of a feedback control system for an RF remote-controlled stairclimbing robot. The robot is controlled using PIC 16F877A.The paper presents a complete integrated control architecture and communication strategy for a system of reconfigurable robots that can climb stairs. Its mechanical design is suitable with back wheel to drive the robot over rubble, and large wheels in the front driven by dc motor for climbing stairs.. This design is of low cost and can be easily afforded by the people. This provides locking system which avoids slipping and provides stability. In the growing influence of technology on our lifestyle, we become more obliged to contribute to the welfare of the differently abled and the less privileged. In this regard the mechanism to help the people who are immobile, be it for short term or a long term could be very beneficial.

Keywords—**Stability; Staircases; Locking system; Railing; Electrical wheelchair.**

Introduction

Wheelchair is useful as a mean of ambulation on the flat .However in the real living environment, the accessible facility is not necessarily maintained, so that it seems to be hardest for user of wheelchair such as the aged and the leg handicapped to move in the inaccessible environment like stairs and the few entrance steps. This design overcomes the above disadvantage. This paper describes stair locomotive wheelchair with adjustable wheel base. The main aim of this paper is to design a wheel chair that adjusts to the various dimensions of the stairs for easy and smooth movement of the wheelchair. This paper mainly aims for low cost design. Robots are increasingly being integrated into working tasks to replace humans. They are currently used in many fields of applications including office, military tasks, hospital operations, industrial automation, security systems, dangerous environment and agriculture.Several types of mobile robots with different dimensions are designed [2-8] for various robotic applications. The robot has been designed for the purpose of aiding rescue workers. Common situations that employ the robot are urban disasters, hostage situations, and explosions. The robot is designed to go into slightly destroyed areas to find and help rescue people. The robot is even made to climb stairs and travel through fairly large amounts of rubbles. On the robot there will be a camera which is used to take video. The robot is built to discover areas which people cannot reach. This robot is able to cope with stairs, very rough terrain, and is able to move fast on flat ground. The robot is wirelessly connected to a transmitter/receiver circuit through RF remote control unit ensuring fast and reliable two-way communication.

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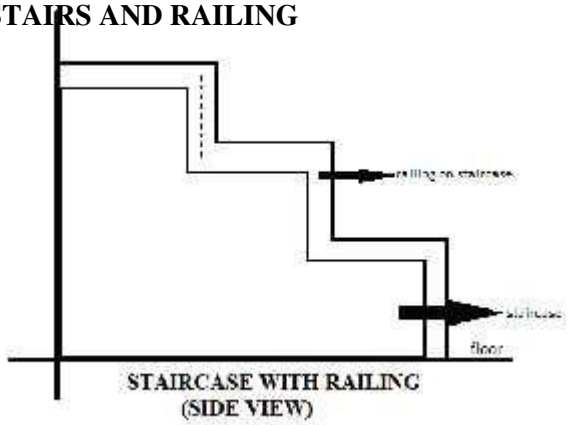
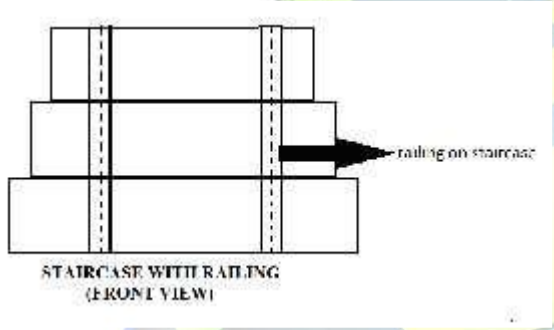
STAIRS AND RAILING



STAIRCASE WITH RAILING
(SIDE VIEW)

Figure1



STAIRCASE WITH RAILING
(FRONT VIEW)

Figure2

In buildings, stairs is a term applied to a complete flight of steps between two floors. A stair flight is a run of stairs or steps between landings. A staircase or stairway is one or more flights of stairs leading from one floor to another, and includes landings, newel posts, handrails, balustrades and additional parts. A stairwell is a compartment extending vertically through a building in which stairs are placed. A stair hall is the stairs, landings, hallways, or other portions of the public hall through which it is necessary to pass when going from the entrance floor to the other floors of a building. Box stairs are stairs built between walls, usually with no support except the wall strings.

The Stair-climbing Robot will be controlled by three different ways:

First, the robot is controlled by using serial joystick, the serial joystick contain pushbuttons and potentiometer. This Pushbuttons control movement of motors (DC motor and stepper motor) and potentiometers control PWM.

Second, the robot is controlled by interfacing stair-climbing robot with PC; in this way serial port was used. This port consists of two wires to transfer data (one for each direction) and a number of signal wires.

Finally, RF module is used to control the robot wireless. 433.92 MHz RF Transmitter and Receiver is wireless data transmit and receive module with VHF/UHF super high frequency. It has strong anti-static protection and high reliability.

ELECTRICAL WHEELCHAIR

A electric-powered wheelchair (EPW) is a wheelchair that is propelled by means of an electric motor rather than manual power. Motorized wheelchairs are useful for those unable to propel a manual wheelchair or who may need to use a wheelchair for distances or over terrain which would be fatiguing in a manual wheelchair. They may also be used not just by people with 'traditional' mobility impairments, but also by people with cardiovascular and fatigue-based conditions.

Powerchairs may be designed for indoor, outdoor or indoor/outdoor use. A typical indoor powerchair will be narrow and short, to enable

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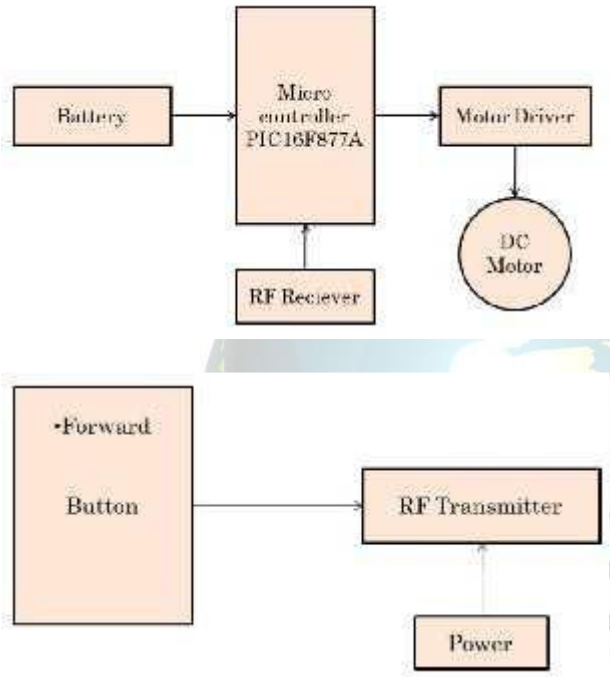
better maneuvering around tight environments. Controls are usually simple, and due to the smaller design, the chair would be less stable outdoors.

BLOCK DIAGRAM

Block diagram represents the working of the electric wheel chair design by us. We are using PIC16F877A, which is the brain of the device. We are also using a Joystick/Remote for the Command.



HARDWARE DESIGN

MOTOR DRIVER

Motor Driver ICs are primarily used in autonomous robotics only. Also most microprocessors operate at low voltages and require a small amount of current to operate while the motors require a relatively higher voltages and current. Thus current cannot be supplied to the motors from the microprocessor. This is the primary need for the motor driver IC

MICRO CONTROLLER

The PIC16F877A CMOS FLASH-based 8-bit microcontroller is upward compatible with the PIC16C5x, PIC12Cxxx and PIC16C7x devices. It features 200 ns instruction execution, 256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 8 channels of 10-bit Analog-to-Digital (A/D) converter, 2 capture/compare/PWM functions, a synchronous serial port that can be configured as either 3-wire SPI or 2-wire I2C bus, a USART, and a Parallel Slave Port.

RF MODULE

RF module is used to transmit or receive radio waves. The transmitter/receiver (Tx/Rx) pair operates at a frequency of 434 MHz. An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps - 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter. The RF module is often used along with a pair of encoder/decoder. The encoder is used for encoding parallel data for transmission feed while reception is decoded by a decoder. HT12E-HT12D, HT640-HT648, etc. are some commonly used encoder/decoder pair ICs

BATTERY

An electric battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices such as flashlights, smart phones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode.

DC MOTOR

A motor is an electrical machine which converts electrical energy into mechanical energy. The principle of working of a DC motor is that "*whenever a current carrying conductor is placed in a magnetic field, it experiences a mechanical force*". The direction of this force is given by Fleming's left hand rule and it's magnitude is given by

$F = BIL$

Where,

B = magnetic flux density,

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I = current
L = length of the conductor within the magnetic field.

ADVANTAGES

1. Travelling steep is not so fast, passive wheel base mechanism is useful for reduction of fear of user.
2. For user comfort, this design achieves ascending and descending the staircase with fixed support.
3. The designed wheelchair is not affected by the size of the stairs that a wheelchair can climb.

FLOWCHART

CONCLUSION

Stair climbing wheel chair simulates the easiest and cheapest mechanism, where The person concerned can easily get. Where the chair facilitates his movement and reach to any place he wants. We searched for treatment of this problem at least equipment, efforts and costs. And we hope that this project can be implemented on the ground successfully. To provide humanitarian service, for special needs people.

REFERENCE

[1] R.Rajshekhar, K P Pranavkarthik.IEEE research "Design and fabrication of staircase climbing wheelchair." ISSN 2278-0149 vol.2, no.2, April 2013.

[2] Motoki shino, nobuyasu tomokuni ."Wheeled inverted pendulum type robotic wheelchair with integratedcontrol of seat slider."

[3] Jayaraj Sajjanar, Darshan Deshpande, Sachin S M, Rakesh Gulaganji, Pavan Mahendrakar "A Novel, Cost-Effective and Scalable Helping Aid for the Specially Abled" International Journal of Scientific & Engineering Research,Volume 5, Issue 2, February-2014ISSN 2229-5518.

[4] "Wheeled Inverted Pendulum Type Robotic Wheelchair with Integrated Control of Seat Slider and Rotary Link between Wheels for Climbing Stairs*"Genki Murata, and Masaya Segawa

[5] "Development of Stair Locomotive Wheelchair with Adjustable Wheelbase" Tsuyoshi Yamamoto1 , Fumiaki Takemori1 and Ryuta Itakura2 1Graduate school of Eng., Tottori University, Japan

2014 IEEE workshop on advance robotic and its social impact (ARSO) Sept 11- sept13 2014 Evanston, Illinois, USA