OVERVIEW OF STAIRS CLIMBING ROBOT USING MEMS TECHNOLOGY

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ABSTRACT

A method of developing a real time mechanism of Stair Climbing Robot. It is one of the major task in the field of Mechatronics require a mechanical arrangement and electronics based control of the actuators using wireless technology. The mechanism is fully developed using Aluminum, Iron and MDF (Medium Density Fiber) sheet for providing the strength to the robot, whereas AVR Microcontroller is used to control all the mechanism of the robot manually using wireless trans receiver module CC2500.

They are not dynamic enough to conform even to the most commonplace terrain such as stairs. To overcome this, we are proposing a stair climbing robot that looks a lot like the human leg and can adjust itself according to the height of the step. The stair climbing robots are used to climb the stairs for different applications up to now, but the main disadvantage of the rugged terrain robots is not adjustable according to the structure of the stairs. To overcome this, we have developed an adjustable stair climbing robot to climb the stairs up and down according to the dimensions of the staircase by using adjustable frame. The main features of the robot include the platform which is attached to the adjustable frame to carry the materials up and down as per the motor capacity

Keyword *: - ADXL335sensor 1, ATMega16 2, Accelerometer(MEMS)3*

1. INTRODUCTION

Now a day, the robotics development is increasing day by day and the scenario is changing as per the technological development where robots is playing an important role for developing the product, Carrying Goods, Defense, Home Application etc. The most challenging job for the robot in this development is to climbing into stairs, where various parameters is to be studied to climbing on stairs smoothly. Taking in action all these parameters the developed stair climbing robot is developed which will climbing easily into stairs. The technologies used for developing this robot is advanced as compare to the other technologies. The remote control is based on touch screen, whereas for establishing the wireless communication HC-05 transcreceiver is used, working on 2.4GHz bandwidth.

2. LITERATURE SURVEY

1. Design of Low Cost Stair Climbing Robot Using Arduino

Jeyabalaji C et al. Int. Journal of Engineering Research and Applications ISSN : 2248-9622, Vol. 4, Issue 10(Part - 3), October 2014, pp.15-18 locomotion.

We are proposing a stair climbing robot that looks a lot like the human leg and can adjust itself according to the height of the step. But, we are currently developing a unit to carry payload of about 4 Kg. The automatic adjustment in the robot according to the height of the stair is done by connecting an Android device that has an application programmed in OpenCV with an Arduino in Host mode.

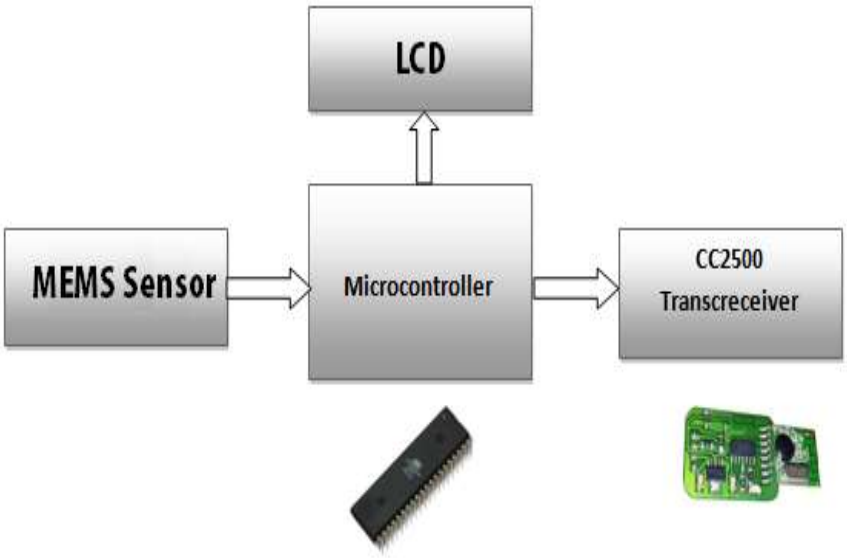
2. Design and development of adjustable stair climbing robot

K. Narendra Kumar1, A. Gopichand2, M. Gopala Anjaneyulu3, B. Gopi Krishna4 Apr-2013
Developments have been made on various kinds of stair climbers, considering how to make its climbing ability higher and its mechanical complexity reasonable and practical. The research includes realizing a large step negotiating. Reducing body weight and energy consumption is also the important matter of developing. We introduce some solutions to realize stair climbing machines that we developed. Each of them has good performance as in a category of their kind

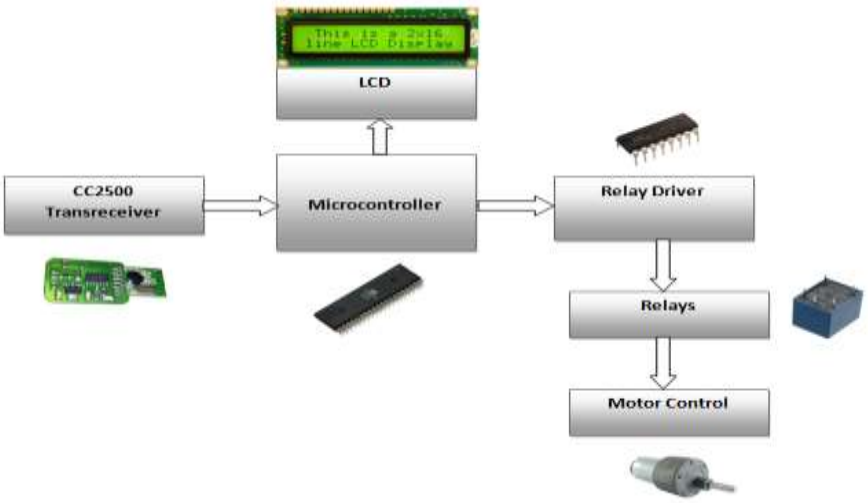
3. Design and Implementation of Stair-Climbing Robot for Rescue Applications "Basil Hamed"
International Journal of Computer and Electrical Engineering, Vol. 3, No. 3, June 2011
This paper presents the design and implementation of a feedback control system for an RF remote-controlled stair climbing robot. 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 stair.

3. BLOCK DIAGRAM

3.1 Transmitter Section:



3.2 Receiver Section



4. WORKING

Block diagram that it consisting of transmitter and receiver section. Consisting of LCD, Microcontroller, [7] CC2500, Accelerometer (MEMS) and other supporting accessories.

Above figure shows complete block diagram of the working of controlling unit using MESM module interfaced with microcontroller and data will be transmitted using CC2500 Transreceiver module. Whereas Fig.4 shows the receiver end which is consisting of a CC2500 Transreceiver module connected to the microcontroller ATMega16 for serial receiving of data. The microcontroller will process the signal and control the mechanism of the robot as per the [3] algorithm embedded on it.

5. METHODOLOGY

In order to design a stairs climbing robot, one of the aspects that need to concern about is the movement method of the robot. There are many methods that can be attached to a robot so that it be able to move through stairs such as robot legs, rubber wheels, chain-wheels, blocks or else. All this depends on the condition of the stairs, the cost of the materials, movement style of the robot and the speed movement of the robot. In the other hand, in order to modify a circuit for the controller and for the robot so that the controller be able to send command by RF signal and for the robot to receive command from the [4] RF signal, the method on how to modify the circuit with the transmitter and receiver of RF signal attach to it, will be need to studied. Besides,
type RF transmitter and receiver and power supply use in the circuit will put in consideration depends on the circuit system, cost of the equipment's, and the robot needs itself. Furthermore, suitable types and quantity of motors to be used for the robot such as power widow motor, servo motor, or stepper motor, will depend on the design of the robot, speed movement of the robot, the power and torque of motors the robot need and the cost of the motors.
In developing and fabricating the robot, it will consider the materials use depend on the size of the robot, the shape or design of the robot, the cost of materials, and the ability to fabricate with the materials in order to developing the robot. Other than aspects mentioned above, there are particular parts and aspects that need to learned and studied in developing the robot such as types of gears to be used, types of wheels to be used, materials to be used for the robot structure, chains, wireless remote control system, and mechanical system of the robot.

6. COMPONENTS USED

6.1 Hardware components

The major components are given below.

1. ATMega16 Microcontroller
2. CC2500 Transreceiver Module
3. ELCD-16x2 Display
4. GLCD Motor Driver L293D
5. DC Motor -10RPM
6. Metallic Chassis
7. Track belts
8. DC Battery
9. Accelerometer

6.2 Software components

1. AVR Studio
2. PCB Artist
3. Win AVR

7. LANGUAGE USED

1. Embedded C

8. CONCLUSION

There is a lot of scope for improvement and this mechanism can be further modified and used in various other applications such as carrying heavy loads and thus further reducing human effort. Another scenario where this mechanism can be employed is during disaster management.

This mechanism can be further modified and used in various other applications. It can be useful in carrying heavy baggage or load and thus reducing human effort. Another common situation that employs the use of this mechanism is in the case of urban disasters or hostage situations wherein these robots are designed to rescue workers.

The benefits of rescue robots to these operations include personnel requirements, reduced fatigue as well as access to unreachable areas. These robots have the ability to move over irregular terrain of collapsed or destroyed buildings. On the robot, a camera can be placed to take a video of the affected areas which can further help in rescuing operations.

9.REFERENCES

[1]. Jeyabalaji C Design of Low Cost Stair Climbing Robot Using Arduino et al. Int. Journal of Engineering Research and Applications ISSN : 2248-9622, Vol. 4, Issue 10(Part - 3), October 2014, pp.15-18 locomotion

[2]. K. Narendra Kumar1,A. Gopichand2, M. Gopala Anjaneyulu3, B. Gopi Krishna Design and development of adjustable stair climbing robot Apr-2013

[3]. "Basil Hamed" Design and Implementation of Stair-Climbing Robot for Rescue Applications International Journal of Electrical Vol. 3, No. 3, June 2011

[4]. Junzhi Yu, Min Tan, Shuo Wang, "Development of a Biomimetic Robots and Its Control Algorithm," in *IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS,* VOL. 34, NO. 4, AUGUST 2004.