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AVR Microcontroller Based Wireless Robot For Uneven Surface

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Abstract— In the present scenario the application of robots are quite common to reduce human efforts in several areas. If we want to save our manpower loss there is need in today's world to place equipment in dangerous areas such as camera and sensors .Robots are the best options in place of manpower to do this task because of which we are able to situation and dangers in that area. For that we require a mobile device that is accessed by the remote. This paper gives the information about how can we design and implement the robot easily. In this robot we are using AVR microcontroller ATmega16 for various functions. This robot is able to climb the stairs and we can operate the robot with the help of RF module.
Keywords— AVR microcontroller, uneven surface, RF module, circuit board, design.

I. INTRODUCTION

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 the development of robot mechanism and reducing body weight and energy consumption is also the important aspect. We introduce some solutions to realise stair climbing machines that we developed each of them has good performance as in a category of their kind, e.g. various numbers of wheeled shapes. The mechanism involves a metal body in which front wheel is a combination of three which facilitate the robot to climb uneven surface and small stairs. Robotics is the area of automation which integrates the technology in variegated fields like mechanisms, sensors and electronic control systems, artificial intelligence and embedded systems. The synthesis of mechanism is the very first stage in any robot design depending upon application.

II. MAIN BLOCKS OF ROBOT

The heart of the system is the microcontroller ATmega16. The entire functions of the robot are controlled by this microcontroller. The figure shows the various blocks involved in different functions. There are two main portions of the robot one from which user can operate robot system (i.e. remote) and other is the main robot body. The data from the remote i.e. switches is given to the microcontroller ATmega16. Microcontroller converts the data from switches into the binary 8-bit form. The microcontroller is provided with the power supply of +5 volt. IC 7805 is used to obtain the required +5 volt. Then the 8-bit data from the microcontroller is transmitted through the transmitter of RF module.

The receiver at the robot circuitry receives the data from transmitter and then gives it to the microcontroller. The code received is then provided to the motor driver IC L293D. This drives the motor in forward, backward, left, right according to the coding provided.

It should be noted that the power given to the motor is +12 volt where as the power given to the ICs is +5 volt. This is because with this much voltage (i.e. +5 volt) it is not possible for the robot to climb the uneven surface. Also the robot system can be provided with a wireless camera. This allows the user to see or observe the places where only robot can reach. This application is very useful for rescue situations and used by fire fighters and military.

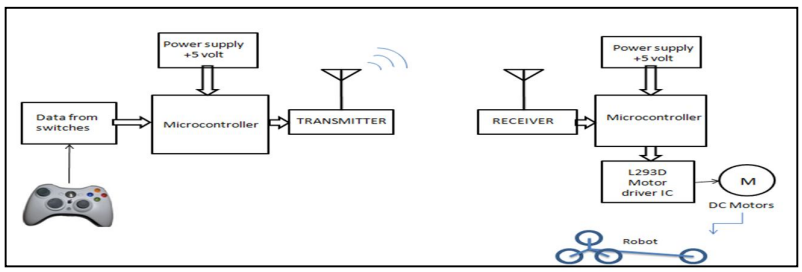

Fig.1: Block diagram showing functioning of robot.

III.MECHANISM OF ROBOT

The robot consist of various parts such as metal frame, DC induction motors, BO motors, wheel structure, transmitter and receiver circuit board, connecting wires, wireless camera. The robot wheel-structure and frame (body) is shown in figure 2.

Fig.2: Wheel Structure and Frame of robot

A. *Description of Parts*

1) *Robot frame and platform:* The robot frame used in this robot is a metal frame; it allows easier fixing of circuit board and battery. The front wheel is the combinations of three wheels separated at an angle of 120 degree from each other.Two 60 RPM DC motors are connected to the front wheels whereas two BO motors are connected to rear wheels. Circuit board is mounted on the upper portion of the robot.

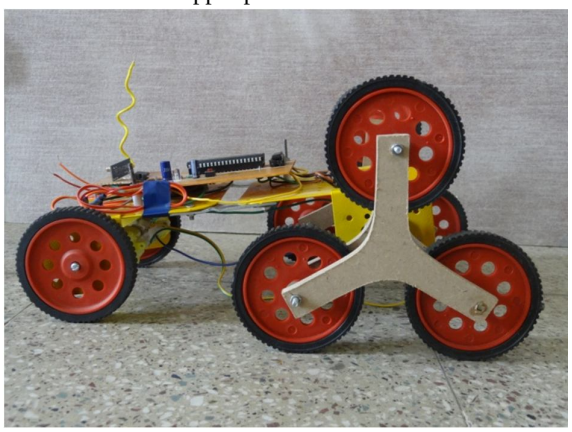

Fig.3: Side view of robot Structure.

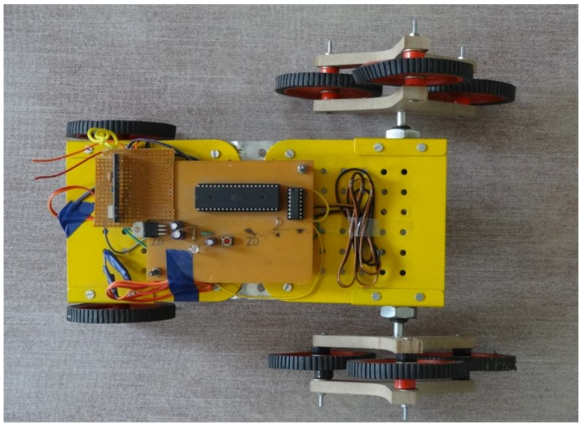

Fig.4: Top view of robot Structure.

It should be noted that we do not use high RPM motors; this is because speed is not the issue for it but torque is. The robot should not fall or slide while passing uneven surface; thus we have used motors with good torque. Motors having good torque help the robot to sustain its weight during climbing uneven surfaces at sharp angles. It becomes very necessary when the robot is loading heavy weight such as battery. The motors are connected to the metal frame with the help of clamps and nuts. Thus providing the grip to the wheels connected.

2) *Circuit Board:* We can move the robot with the help of remote control which have four switches for various movements of robot like left, right, forward and backward. The circuit board is designed for moving the robot which can climb uneven surface. The wireless circuit is designed with help of RF module is shown in following figures.(Transmitter and receiver).

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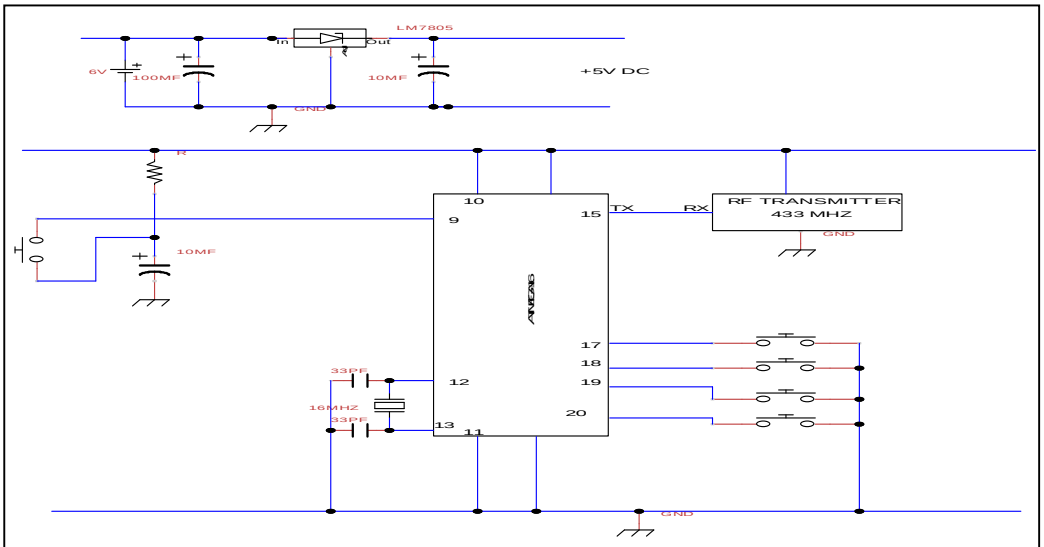

Fig.5: Circuit Diagram for Transmitter.

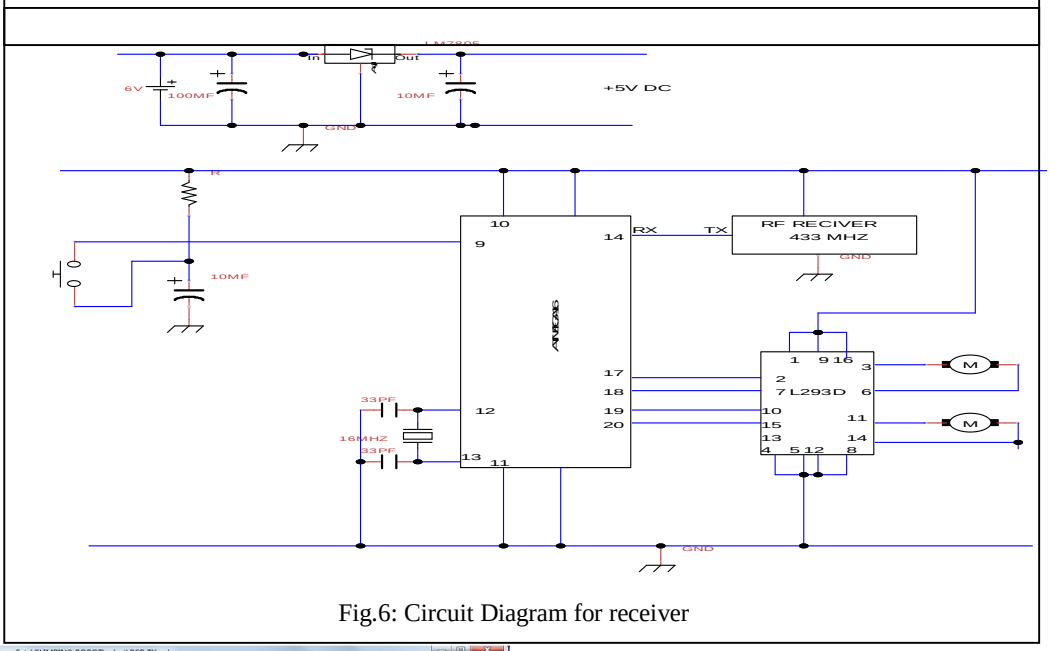

Fig.6: Circuit Diagram for receiver

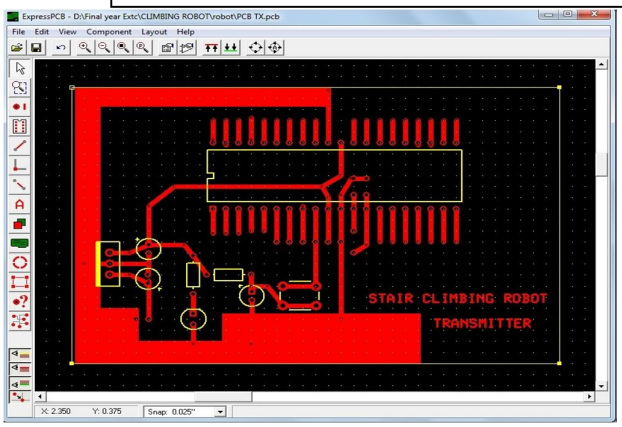

Fig.7: PCB Layout for Transmitter.

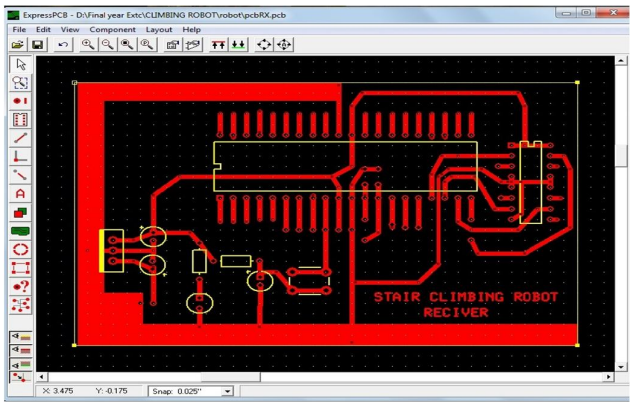

Fig.8: PCB Layout for Receiver.

For designing of the PCB layout we have used ExpressPCB software. Using different symbols and representation the circuit (PCB layout) is designed for both transmitter and receiver circuit.
The fabricated PCB for transmitter and receiver is shown below.

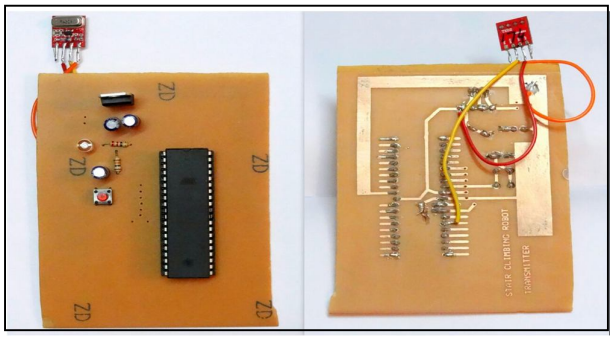

Fig.9: Designed Transmitter PCB.

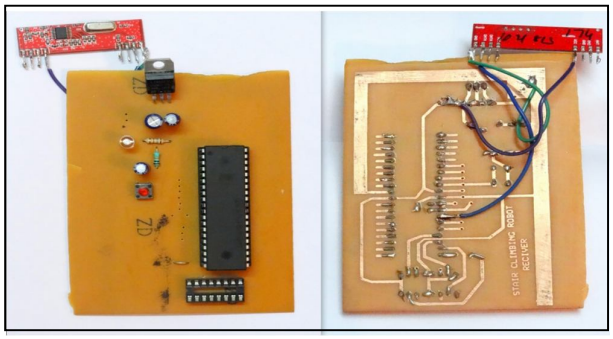

Fig.10: Designed Receiver PCB.

3) *Parts Specifications:* The various parts and components required for the robot are listed below. Also we have used software like ExpressPCB for PCB layout, AVRstudio4 for coding and Tinycad for circuit designing.

TABLE I PART SPECIFICATIONS

Sr. NO.	Robot parts Specifications		
	Part	**Specification**	**Quantity**
1	DC gear motor (front)	60 RPM	2
2	BO motor(rear)	60 RPM	2
3	Wheels	10.5cmx 4.2cm	8
4	Battery(dry)	6 volt	2
5	Circuit board	Transmitter and receiver	1
6	Metal frame	-	1
7	IC ATmega16	microcontroller	2
8	RF module	433 MHz	1
9	L293D	Motor driver IC	1
10	IC 7805	Voltage regulator IC	2

4) *Steps For Making The Robot:*
a) First adjust the clamps of the metal frame in order to fix the motors.
b) Fix the three wheels with cardboard, 120 degrees apart from each other to make one complete front wheel.
c) The structure of the robot should be rigid.
d) Two DC 60 RPM motors are attached to front wheels whereas two BO motors are attached to rear wheels.
e) The receiver circuit board id mounted in the platform and power supply is provided
f) These connections are linked to circuit board for robot motion.
g) The robot can be controlled by the remote that is provided with controlling switches.
h) Also the robot can be equipped with wireless camera in order to watch the location in rescue operations.

5) *Working of the Robot:* Working of the robot takes place stepwise. The robot comes to rest momentarily after each step. The steps for climbing the stairs or uneven surface are as follows.
a) Robot wheel touches the step.
b) Lifting the front part.
c) Lifting the back part of the robot.

d) Following the above steps the robot proceeds.

1) *Robot Wheel Touches the Step:* Initially the robot is in horizontal position and when the robot touches the first step; the upper wheel is ready to move upward to lift the front part of the robot. This makes the condition for the robot to climb upstairs.
2) *Lifting The Front Part:* By switching on the circuit and pressing the keys; the motor starts starts rotating the upper wheel which lifts the front part of the robot to a certain height. The front wheels will move forward through the step and also helps the robot to climb the uneven surface,
3) *Lifting The Back Part of The Robot:* After lifting the front portion of the robot; the rear wheels touches the step and moves forward. After climbing the stair; it will return to its initial position.

IV. CONCLUSIONS

In this paper we have developed wireless robot for uneven surface providing the service to replace the human in many fields like military tasks, industrial automation, security systems, fire fighters, hospital operations, offices and dangerous environment. The developed model has completed the task successfully.

The robot can be further modified in better version that is having higher caliber and specification and can be useful in carrying heavy load and baggage. Thus reduce the human effort. Another aspect involves that these robots are developed to rescue the people in disastrous and hostage situation by fire fighters and military. The robots have the capacity to move over the irregular or uneven terrain of collapsed or destroyed buildings. Another feature involves that on the robot a camera can be installed to take a video of the affected areas which can further help in rescuing people.

By this way, an attempt has been made to fabricate an AVR microcontroller based wireless robot for uneven surface with available indigenous material.

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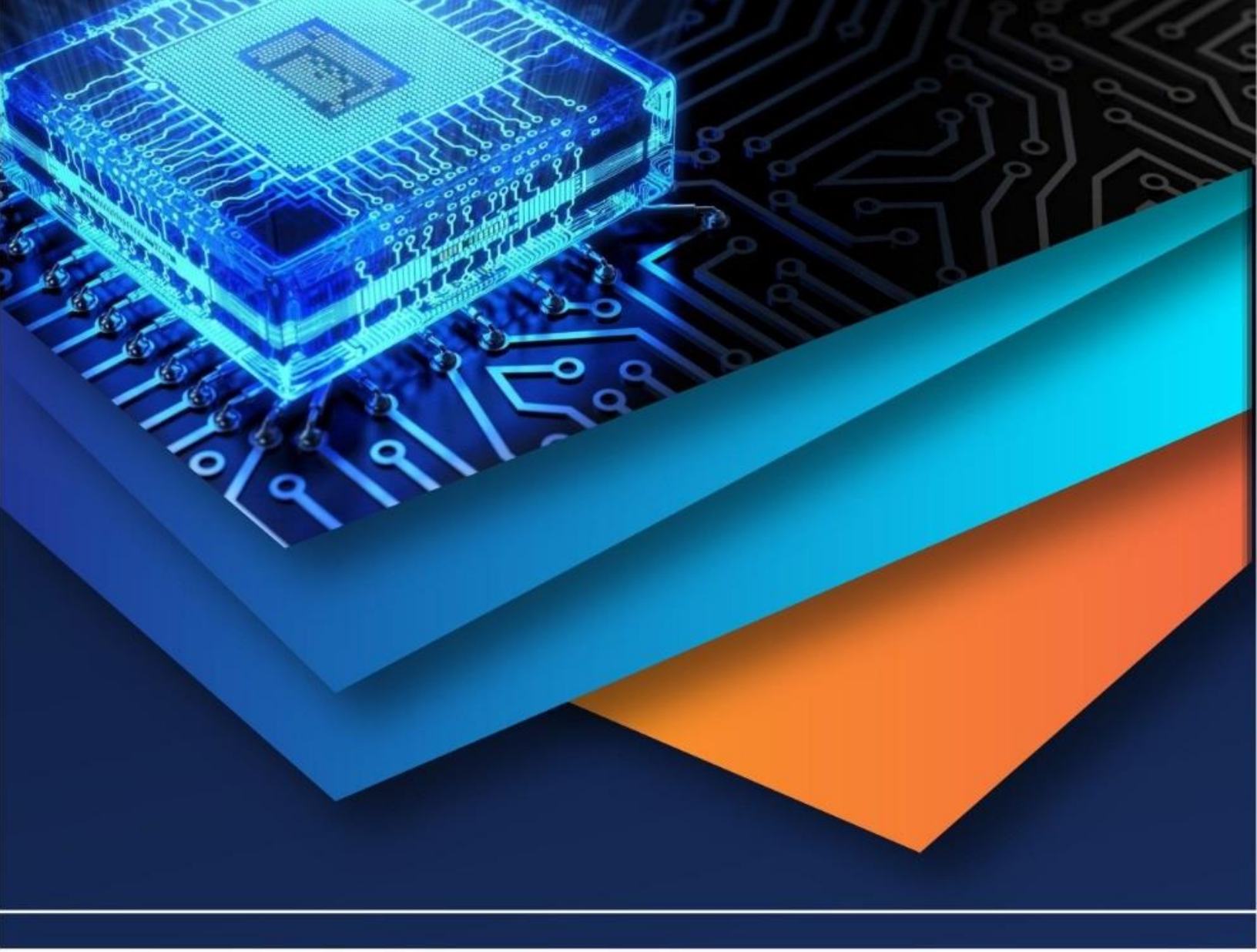

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