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Wirelessly Controlled Wheeled Robotic Arm

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Abstract: **Our project relates to the world of robotics. The word 'robotics' means the study of robots. A Robotic arm is designed as an agent used for automatic gesture recognition of human arm and performs the same action as delivered by the human arm. For this purpose triple-axis accelerometer and LDR sensor are used which is present at transmitter side and they are responsible to recognize the movement of human arm. This Robotic Arm is capable of rotating on three separate axis; rotation about its base, rotation at shoulder position, and rotation at the base of the wrist for grapping. A central microcontroller will instruct the servo motors of robotic arm to perform the same action and perform the same movement as done by the human arm. In addition to robotic arm the toy car on which this arm is fixed can also be controlled by arm gestures. The summary of the project is that the robotic arm as well as toy car can be controlled simultaneously with the casual human arm gesture with modern wireless wearable remote control system made up of one accelerometer and LDR sensors only.**

Keyword: Microcontrollers, Motors, Sensors, Communication channel

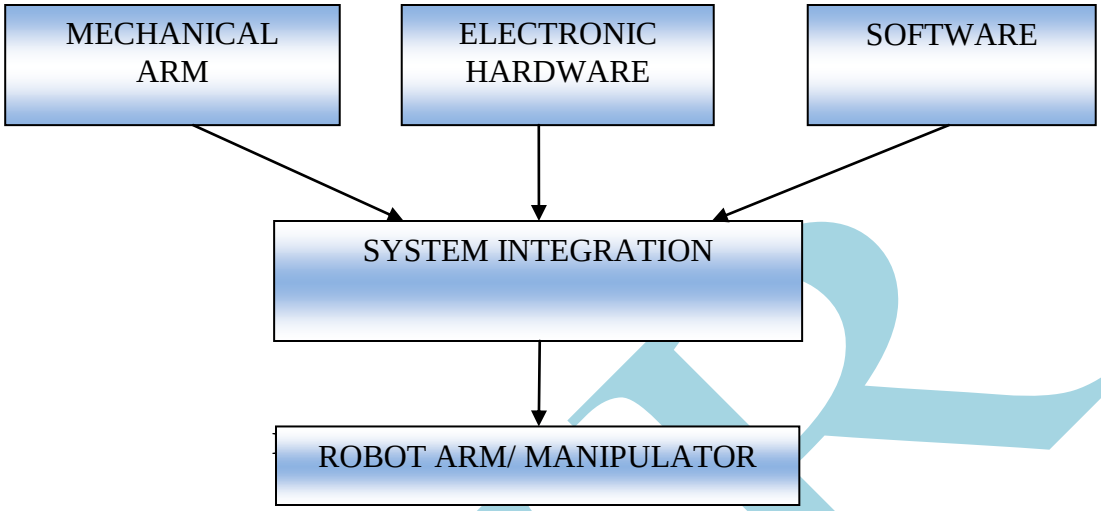
1. Introduction

A human arm gesture control system for a manipulator arm is designed as an agent used for automatic gesture recognition of human arm and performs the same action as delivered by the human arm.It is capable of rotating on three separate axis; rotation about its base, rotation at shoulder position, and rotation at the base of the wrist for grapping.For this purpose a wearable remote control system made up triple-axis accelerometer and LDR sensors are used which will recognizes the position, angle and movement of human arm at the transmitter site.A decision block will generate the appropriate command and send it to the transmitting antenna which will transmit the data to the receiving antenna.A central microcontroller will instruct the servo motors of robotic arm to perform the same action and perform the same movement as done by the human arm.Thus a robotic arm can be processed and controlled by human arm gesture.

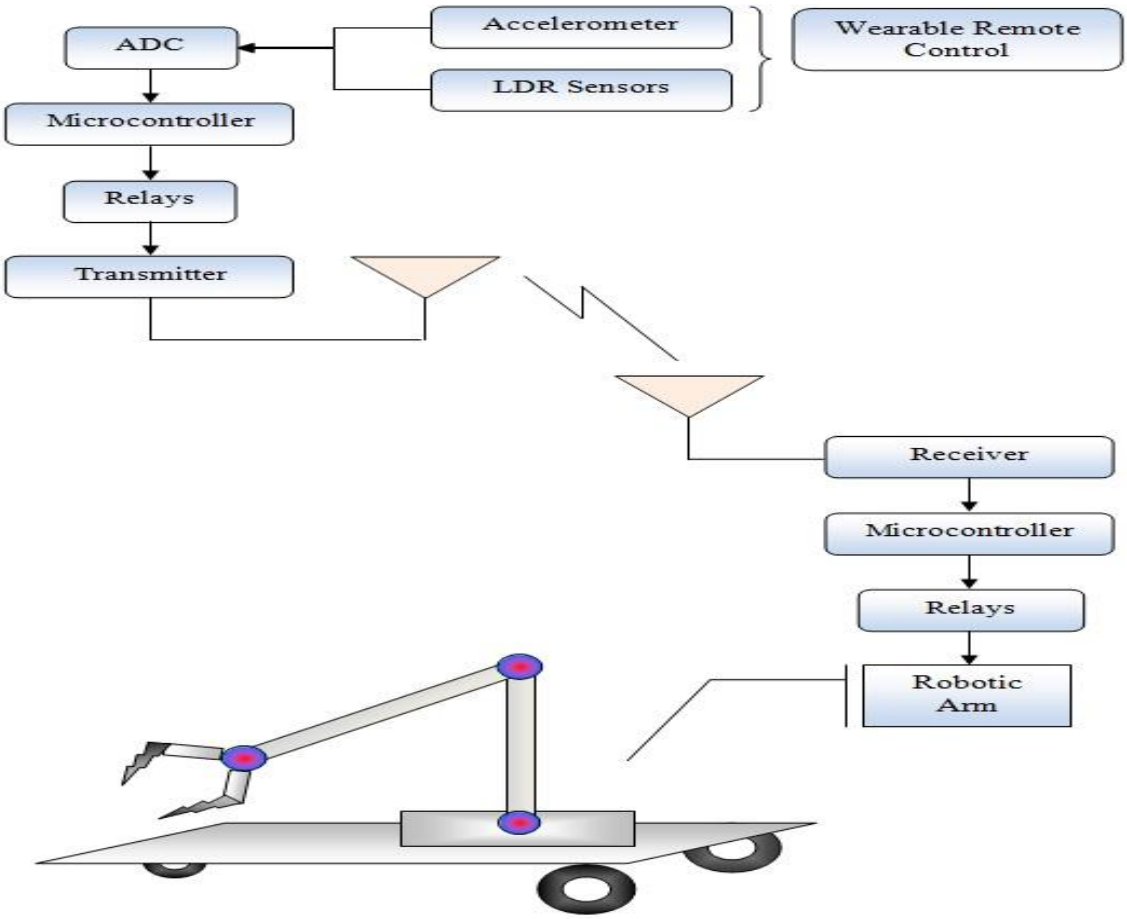
In addition to robotic arm, the same sensors can also be used for movement of toy car engine on which the robotic arm is fixed, that is, the car be moved in any direction as instructed by the gesture of same human arm which is previous used for the movement of robotic arm. User motions are sensed by the same 3-axis accelerometer and processed by same microcontroller, and the motion is replicated by two DC motors in the toy car engine. Thus the same human arm can be used for controlling of both the robotic arm and the toy car engine simultaneously wirelessly.

2. Methodology:

Initially the project was divided in three sections, the mechanical structure, Electronic Hardware section and Software coding The work done will be elaborated in the above-mentioned three main streams as mechanical structure, hardware and software, separately because all these things are different fields of work. So the software section deals with the choice of programming language, so the language chosen by us for the programming is assembly language because of low level language and easy to use.The working phenomenon is that the human arm gestures are sensed by accelerometer and LDR sensors which are fixed at transmitter side. That data is given to program microcontroller through Analog to digital converter. Microcontroller then transmit this data towards receiving end of circuit. At receiving end this received data is being processed by microcontroller and Robotic arm or toy car is instructed to perform the given said task.



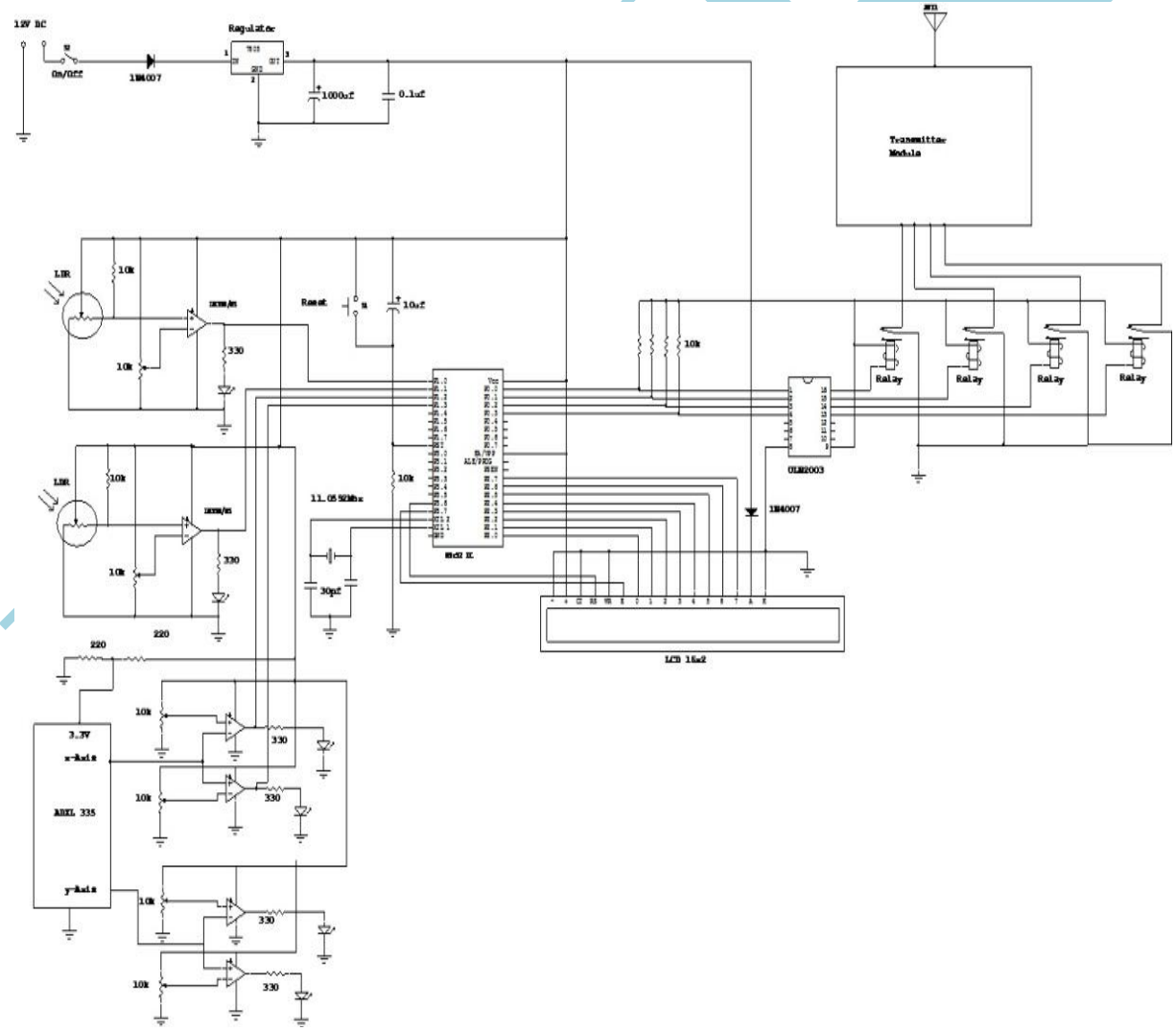
3. Basic Block Diagram



4. Circuit Design:

The electronic hardware design consists of the following modules:

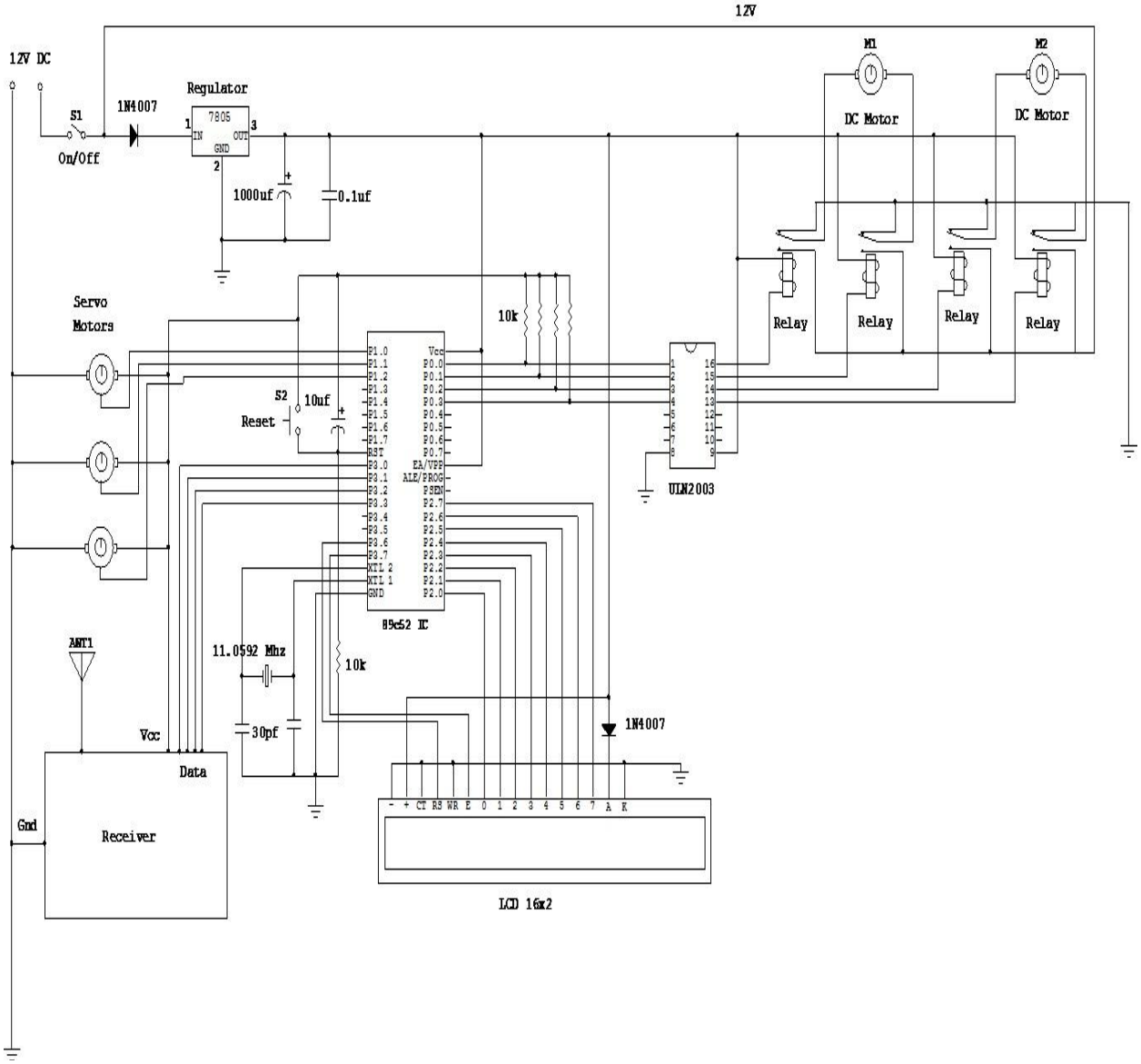
- The Power Supply Unit.
- The Transmitter side circuit unit.
- The Receiver side circuit unit.
- The Motor Controller.
- Wireless communication module
- The Transmitter side circuit unit
- The transmitter side circuit unit consists of:
- A microcontroller (AT89S52).
- A voltage regulator (7805).
- LM358 ICs.
- ULN2003 IC.
- Transmitter module.
- LEDs, transistors.
- Variable resisters.
- Capacitors.
- Relays.
- Diodes.
- LCD.
- Wire connectors and buttons.
- Diodes.
- 11.0592 MHz crystal.
- Resistors.
- And wearable remote control which consists of light dependent resisters (LDRs) and ADXL 335 Accelerometer



4.1. Receiver side circuit unit

The receiver side circuit unit consists of:

- Robotic arm.
- 3 Servo motors.
- Toy car.
- 2 DC motors.
- A microcontroller (AT89S52).
- A voltage regulator (7805).
- ULN2003 IC.
- Wireless receiver module
- Capacitors.
- Relays.
- 12 Battery.
- Diodes.
- Wire connectors and buttons.
- Diodes.
- 11.0592 MHz crystal.
- Resistors



5. Applications:

Some of the useful applications of robotic arm are as follow

- This robotic arm having artificial intelligence can perform many industrial duties.
- This Robotic arm is designed to help humans.
- Used for pick and place work. For example, among the elderly or people with disabilities, who need help for everyday things can use this robotic arm for lifting small household objects in their homes.

- It can accomplish complex tasks in diverse environments and replace scientists in difficult possibly dangerous extravehicular activities and can be supervised by our own hand gesture without usage of any type remote control to make it more user friendly.
- For business and industry, these small robotic arms are another technology that helps companies to compete in the global marketplace and help to establish themselves as leaders in their fields

6. Conclusion And Future Work

The summary of the project is that the robotic arm as well as toy car can be controlled simultaneously with the casual human arm gesture with modern wireless wearable remote control system made up of one accelerometer and LDR sensors only.

- The robotic arm can be made for more degree of freedom.
- High power transmitter and receiver can be used.

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