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**BLUETOOTH CONTROLLED GOODS LIFTER USING RACK AND
PINION MECHANISM**

MICROCONTROLLER AND ITS APPLICATIONS (ECE3003)
L31+L32 SLOT

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To

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J component Project

ECE3003 Microcontrollers and its Applications

It is certified that the project entitled "*Bluetooth controlled Goods lifter using rack and pinion mechanism*" is the Bonafide work for J component of Microcontroller and its applications Project by the following students

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Abstract

- In today's society technology is growing at an exponential rate, where cheap and easy goods lifter is one of the much-needed technologies to be developed.
- Goods lifter is a mechanical system that can move up and down in vertical direction by a mechanical means. In the past they were driven by human themselves using rope and animals to pull it to required altitudes. In today's world, there are far more developed machines to carefully control good lift needs anywhere.
- This project focuses on the robot controlled by Bluetooth which does the lifting of the goods using the Rack and pinion mechanism. The robot helps the rack and pinion mechanism to move to its desired place which is attached to it so that it can be used to lift heavy loads. The objective of this work is to provide an effective application to a real-time problem
- The system will take the voice inputs through the Bluetooth module and will pass on to the Arduino while the rack and pinion mechanism will get its command from the micro-controller. Moreover, this system will be able to bridge the gap between the older techniques and the newer techniques which is easy to control, cheaper & faster.
- Also, the risk factor will be reduced which is a major problem faced while lifting heavy loads. Rack and pinion give access to up and down motion thus helping in construction work to lift the load up or down depending on the requirement

Introduction

- Lift is common and most important device needed for us in Daily life. We use a lift every day to move goods and people in high buildings such as shopping malls, hotels and many more workplaces.
- The goods lifter control system is one of the important aspects of the electronics control module in the automotive application. We use a rack and pinion mechanism fixed to a moving robot which is completely Bluetooth controlled assisted by an android App. So that it becomes easy for the movement of robots
- Rack and pinion Lifter is constituted of two gears and rack and pinion arrangement. A rack and pinion lifter is applied in most of the industries because of its simple setup, easy to handle, and more work efficiency. Moreover, it can be augmented to the desired level of friction to lift heavier weight

Aim

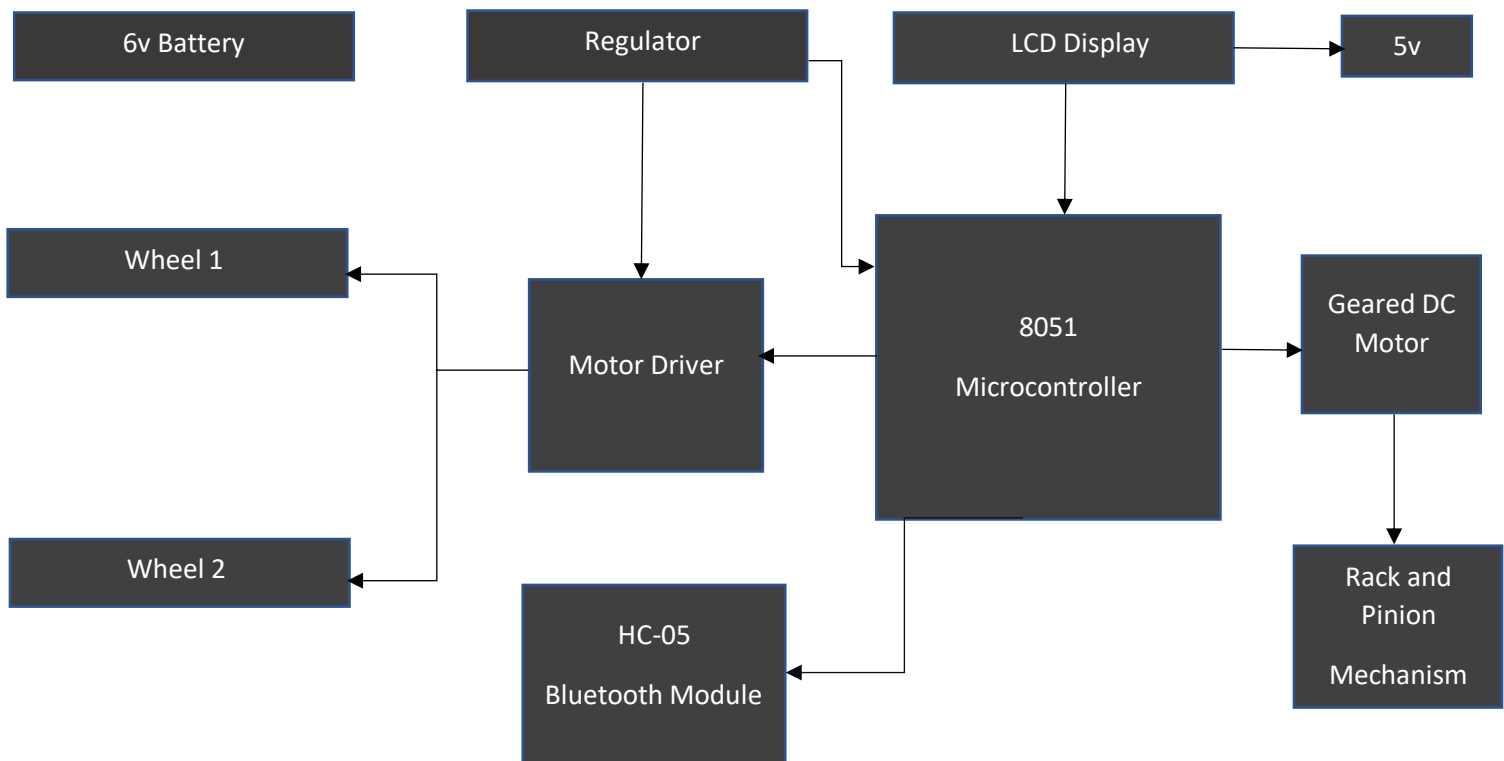
To make a Bluetooth controlled goods lifter which would receive commands from an android app through the HC-05 Bluetooth module and pass it on to the 8051 Microcontroller which in turn make the rack and pinion mechanism to move goods in all egocentric coordinates (i.e. Upwards, Downwards, Forwards, Backwards, Left, Right).

Problem Statement

The need to ameliorate in the elevator system because, while considering allowance to the extension of production space, installation of each unit on the buildings and exterior structure can be done. In this, we are not necessarily required of machine rooms, hoist ways, and overhead loads

Instead of conventional elevators, the installation of this can be flexibly quick and more cost-cutting while steel support sizes are reduced. Along furthermore, this advanced elevator indulges repeated inspections in order to provide safety in any emergency conditions throughout the evacuation. Moreover, our model is Rack and pinion elevator with voice command moveable via Bluetooth.

Block Diagram



8051 Microcontroller

Intel 8051 microcontroller a very useful part of this project as it is used to control the rack and pinion linear movement. 8051 microcontroller consists of RAM, ROM, Timer, ALU, which helps in storing data and execute them. It consists of 4 ports as shown in figure. 8051 has a crystal frequency of 11.0592MHz which is best suited for serial communication

Rack and Pinion Mechanism

Rack and pinion is a linear actuator which helps in lifting goods. It works on the mechanism similar to the gear system where the rack performs the rotation motion on the pinion which has a linear structure

Hc-05 Bluetooth Module

HC-05 Bluetooth module V2. 0 has an EDR (Enhanced Data Rate) of 3Mbps Modulation with a complete 2.4GHz radio transceiver and baseband. HC-05 work with the help of serial communication has helped in wireless transmission of signals. It works on 4 pins RX (Receiver), TX (Transmitter), VCC (Power Supply), GND (Ground)

Motor Driver

L293D Motor Driver is used to gear the DC motor to give them the direction according to the command. This motor driver has 16 pins among which 4 are input pins and 4 are output pin and 2 Enable pins which makes it possible to control 2 DC motors. This motor driver is designed according to the H-bridge connection which helps in changing the direction of the voltage applied thus making it possible to move the DC motor in a different direction

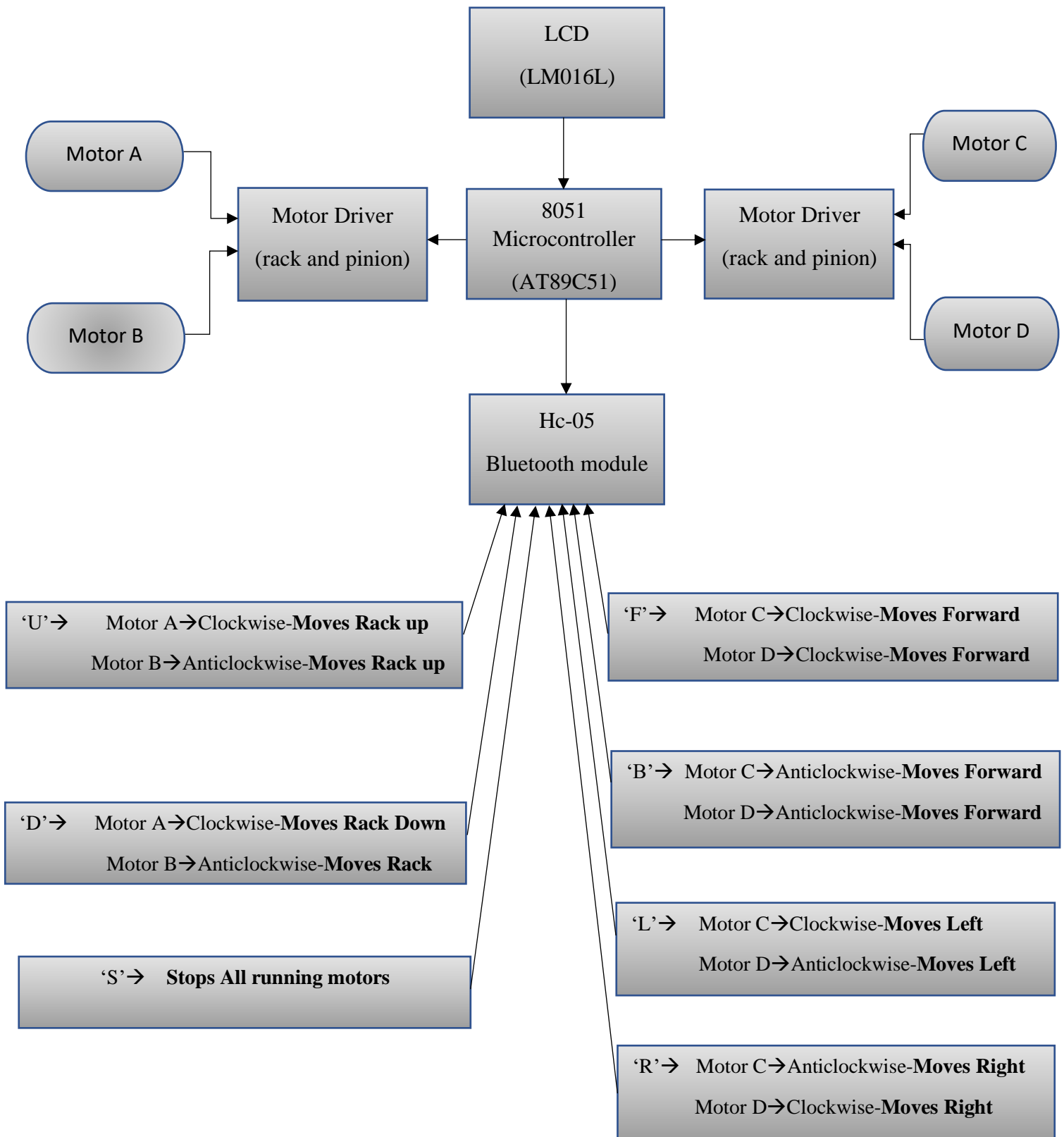
Geared DC Motor

This DC Gear Motor with Shaft is ideal and is designed to easily incorporate the encoder. These motors are inexpensive, small, easy to install, and ideally suited for use in a mobile robot car. There are several micro-gear ratios available in the market depending upon the use. This geared system is used to have the directional movement of the motor.

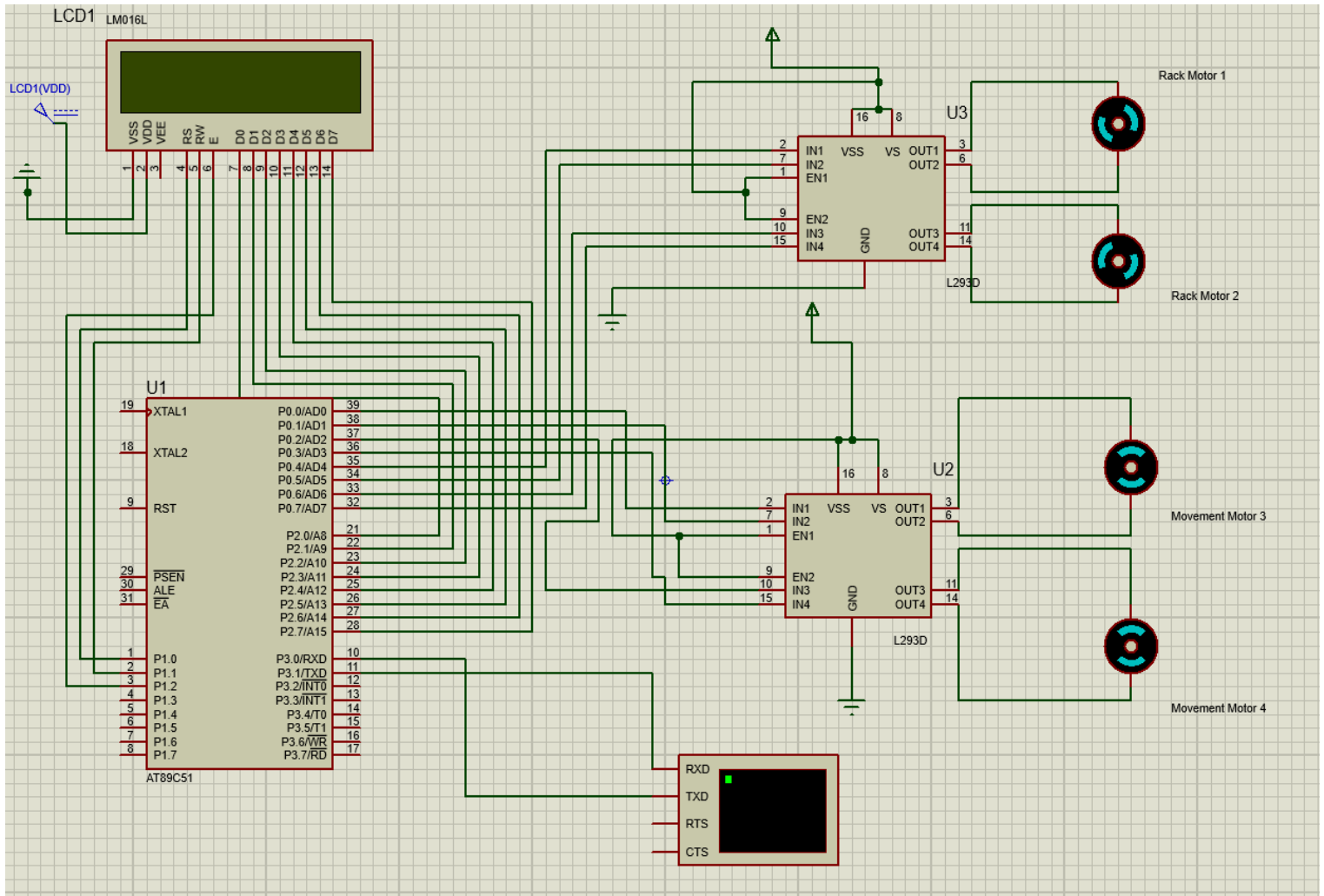
LCD Display (LM016l)

The most commonly used character-based LED which can be interface with various microcontrollers and can be programmed in 8bit/4bit programming. Most LCDs with 1 controller has 14 Pins and LCDs with 2 controller has 16 Pins (two pins are extra in both for back-light LED connections)

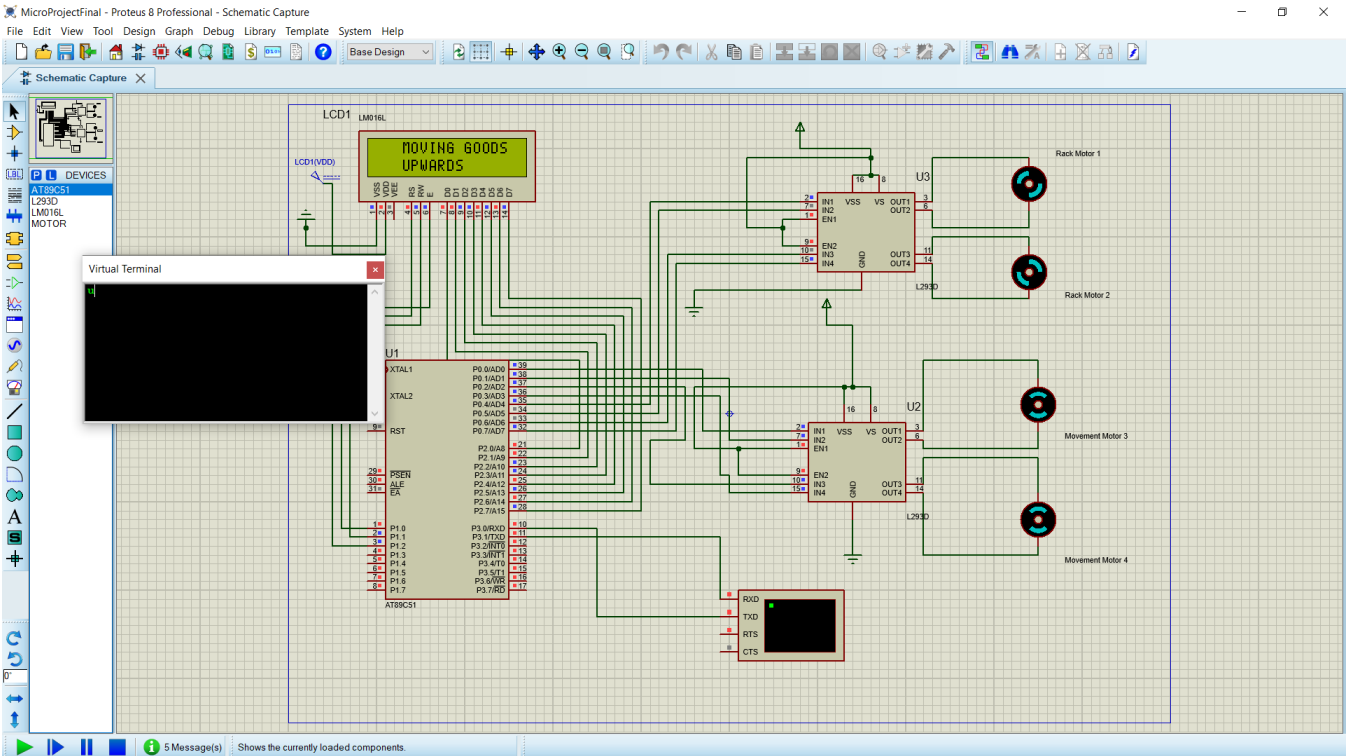
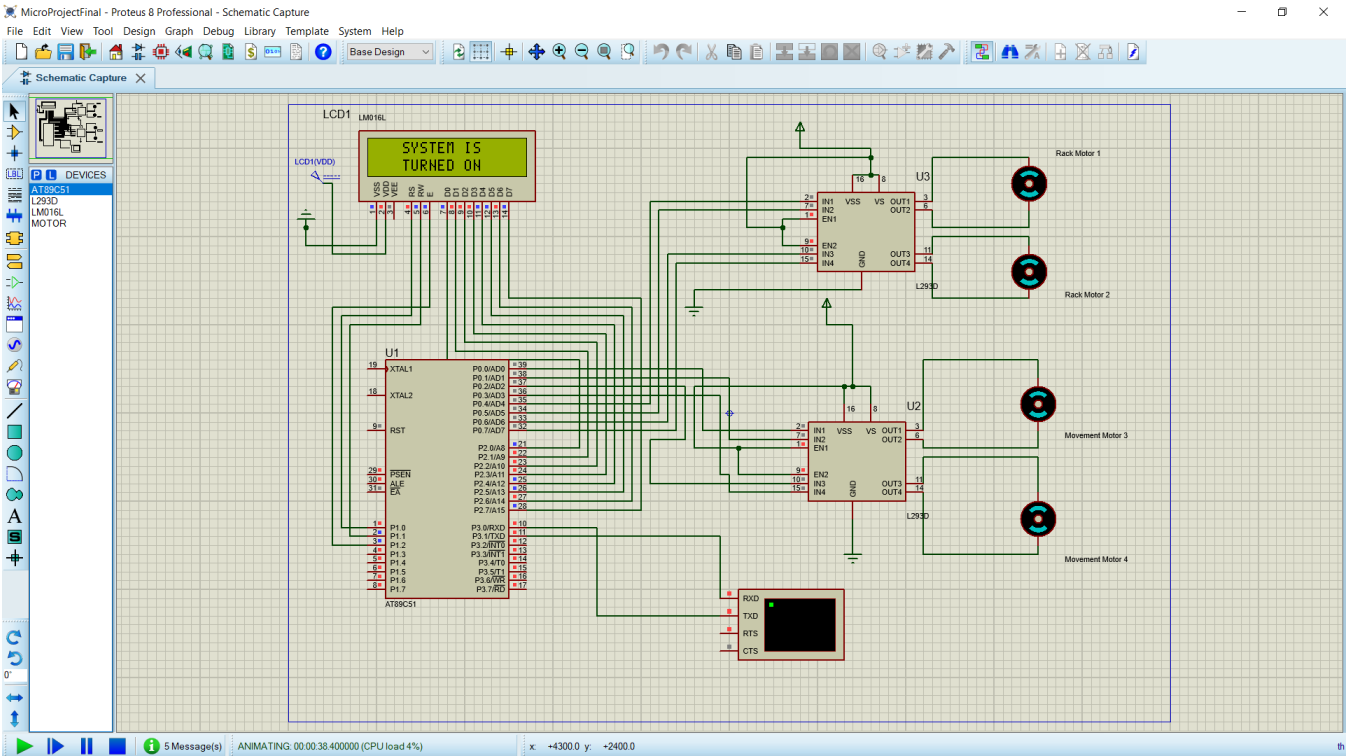
Algorithm Flowchart

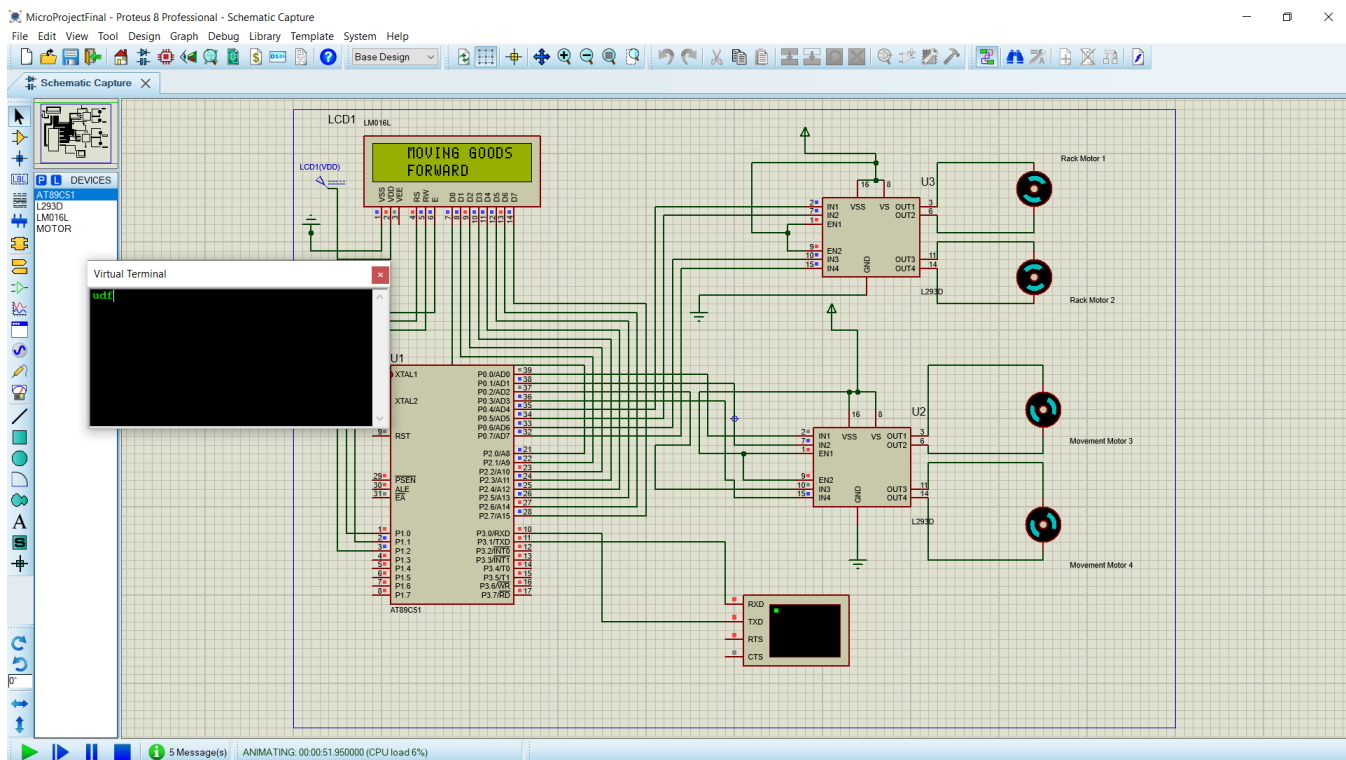
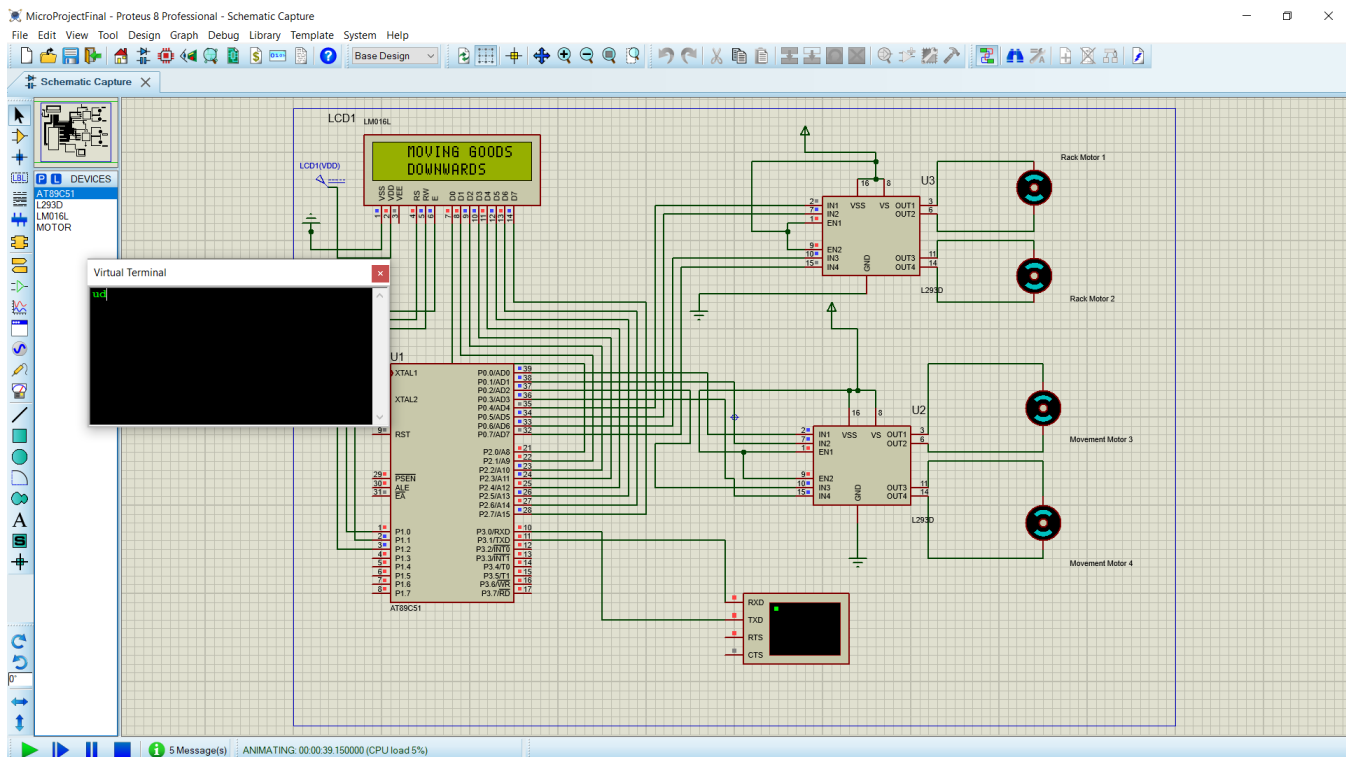


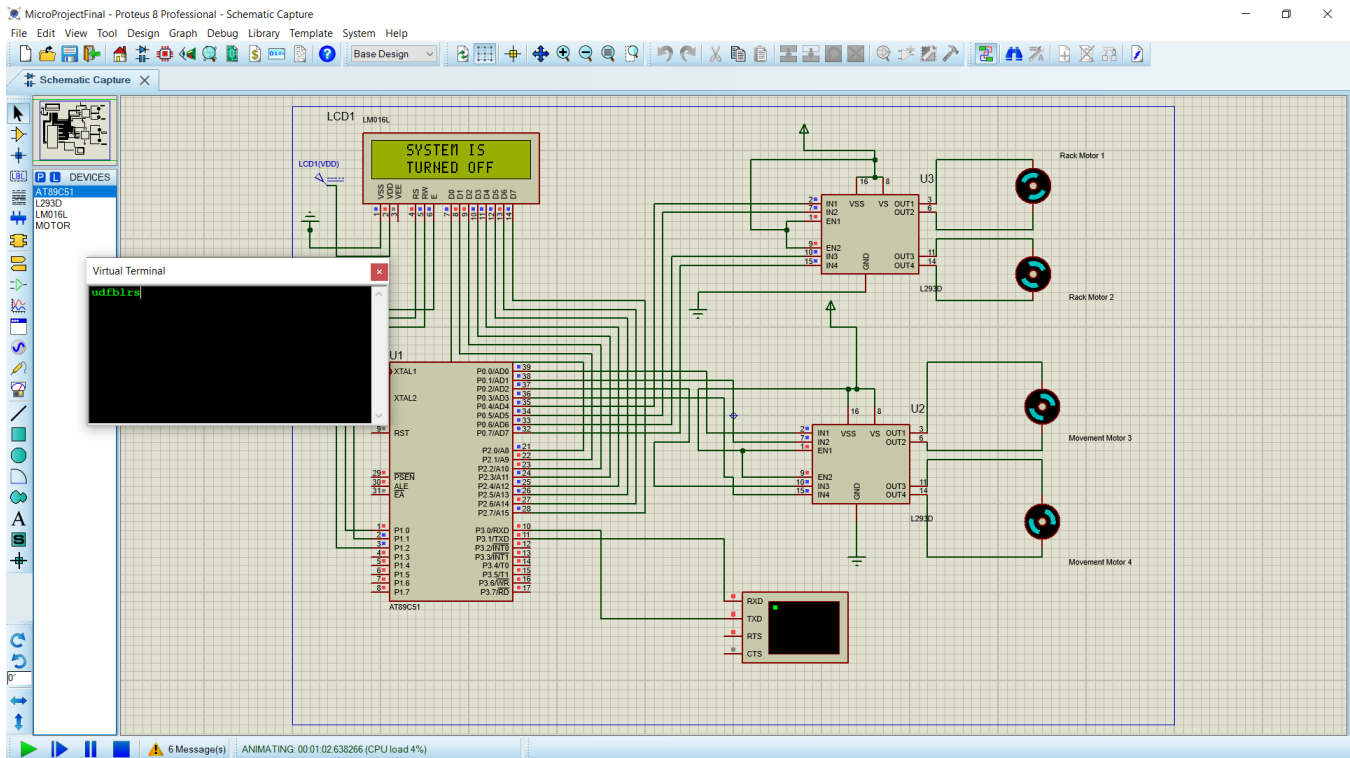
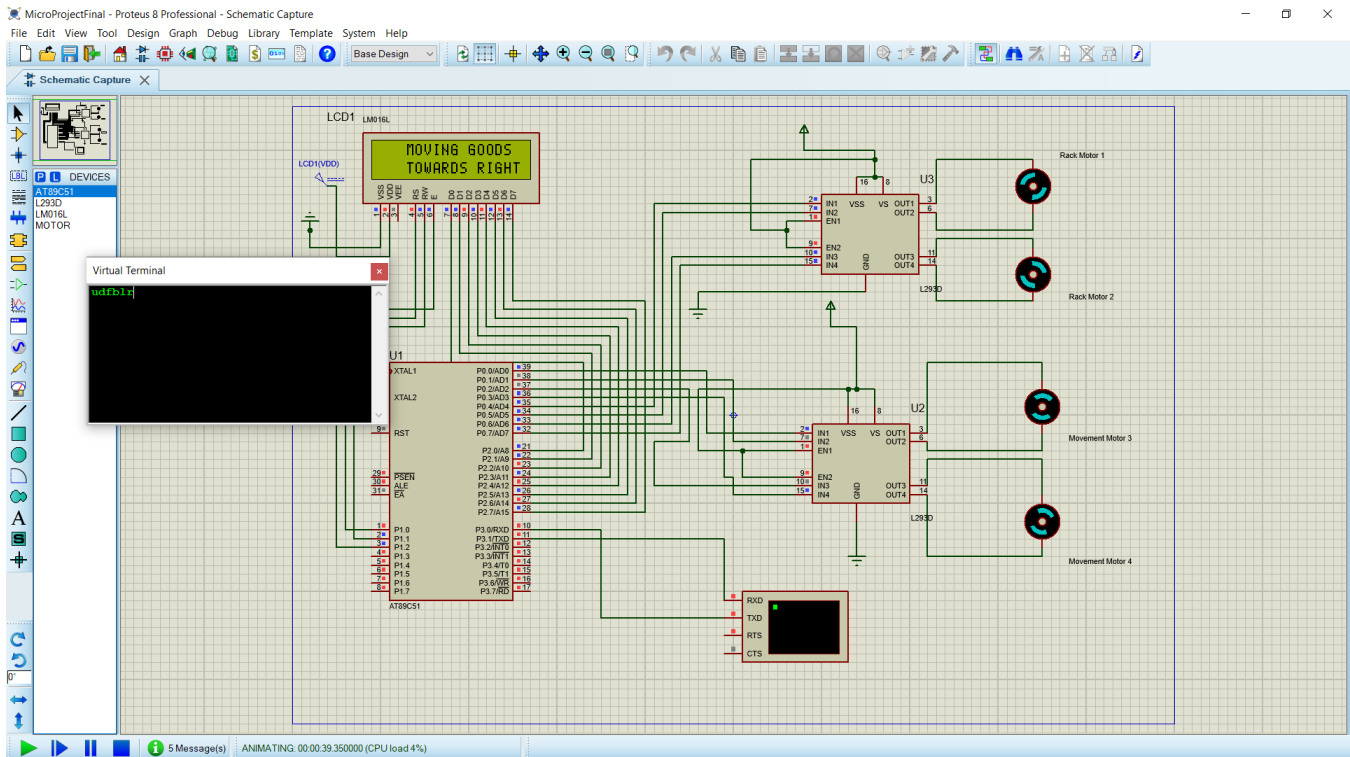
Proteus Circuit



Proteus Simulation







Advantages

- This can be useful for the survival of academic activities as in lifting goods like books or files from one floor to another.
- This tool can lift goods up to 2kg and all items that are lifted can be placed in the designated place at the top of the robot.
- Control of smartphone via Bluetooth can move the robot so no need of any physical work
- Compared to other controllers such as using a remote control, this Android-based robot controller is better because it can be controlled over a longer distance
- Bluetooth module consumes less power than a Wi-Fi module and can be easily used on a small-scale usage

Disadvantages

- The rack and pinion only lift the weight properly with certain levels of friction. If the friction is too high, the mechanism will be subject to more wear than usual and will require more force to operate
- The range of Bluetooth is quite less i.e. 10m
- The 8051 microcontrollers can only perform a limited number of operations simultaneously making it difficult to implement this on a larger scale.

Conclusions

- Our project deals with the mechanism based on the motion of the robot-controlled using Bluetooth commands, and the linear motion using rack and pinion to lift the goods using microcontroller 8051
- Robots and smartphones are a perfect match, especially mobile robots, as phones and mobile devices are each time more powerful, using them as robot for building robot with advanced feature such as voice recognition. Android Bluetooth-enable phones and Bluetooth module via HC-05 and communication among Bluetooth devices.

Future Scope

- The range of the robot can be increased by using other technologies or the linear motion used in rack and pinion can be switched to a robotic arm (both rotational and linear movements of the joints to overcome the load and reduce the friction)
- Microcontroller can be replaced with a programmable logic controller
- Present work is carried out using C coding in future and this can be done using other programming languages

References

<https://iopscience.iop.org/article/10.1088/1742-6596/1255/1/012042>

http://www.iaeme.com/MasterAdmin/Journal_uploads/ijeet/VOLUME_11_ISSUE_7/IJEET_11_07_003.pdf

<https://circuitdigest.com/microcontroller-projects/bluetoothcontrolled-robot-using-8051>

<https://www.ijltemas.in/DigitalLibrary/Vol.6Issue4/160-162.pdf>