GROUP – 58

TELEOPERATED ROBOT USING ROS

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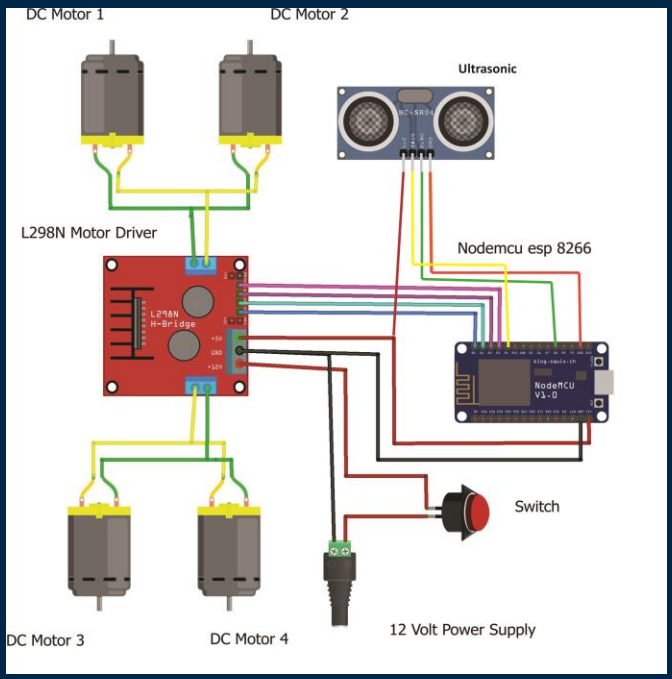
1. SUMMARY:

Our teleoperated robot is based on ROS (robot operating system) technology. Ros is an open-source framework and set of libraries and tools that help us build robot applications. A teleoperated robot using robot operating system (ROS) is a type of robot that can be remotely controlled by a human operator using a computer or other input device. The main components of these types of robots include a controlling device and a communication system. This report presents a summary of the key aspects of a teleoperated robot using ROS, including its design, uses of each component, working principle, and potential applications. Our robot is equipped with sensors and motors that allow it to move and interact with its environment. The robot we have created will be teleoperated through the computer. We have put a 4-wheel differential drive system in our project i.e., all four wheels will be working on their own, they can be rotated at different speeds creating an ease for robot to turn in any direction. We have also added a camera so that robot can navigate through different places.

2. SCHEMATIC:

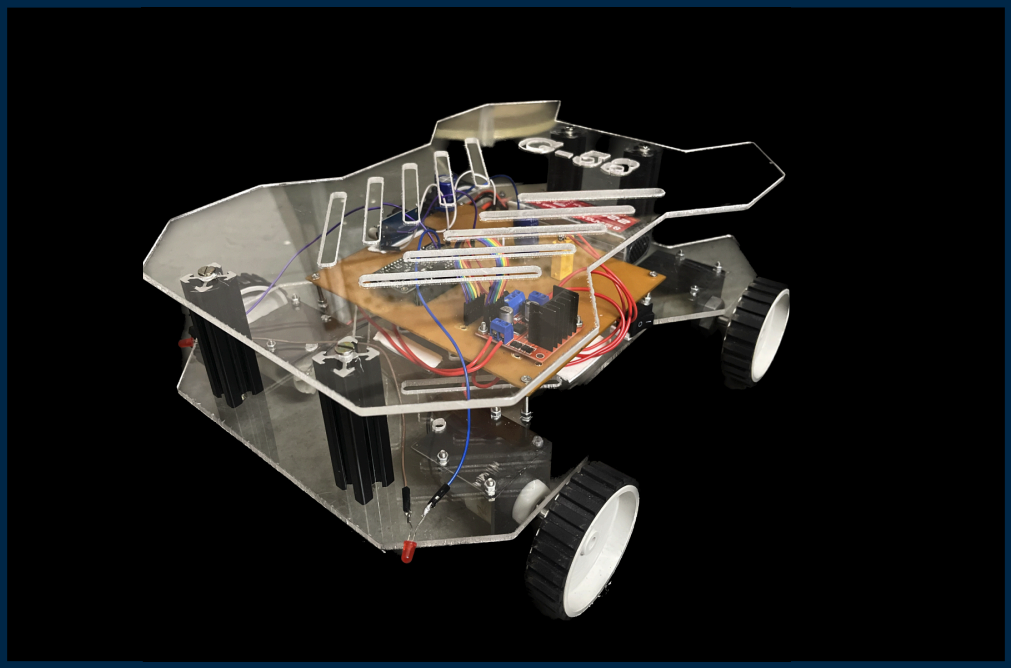


3. PARTS USED:

- NODE MCU (ESP8266)
- ACRYLIC SHEET
- 6-12 V GEARED-ENCODER MOTOR OF 60 RPM
- 75 MM RUBBER WHEELS
- JUMPER WIRES (M-M, F-F, M-F)
- MOTOR DRIVER
- 12V LIPO BATTERIES
- BUCK CONVERTER
- ALUMINIUM PROFILES
- ALLEN BOLT/SCREWS

- XT 60 M-F CONNECTOR
- M2, M4 NUT & BOLT

4. METHODOLOGY OF DESIGN:



We have put each component in this way so that weight of the robot is uniformly distributed so when robot start or stop moving, it does not topple. Using 4-wheel drive will help the robot to move fast and turn left or right easily. We have given such a design to give it a realistic look. We kept it very compact so that it can move fast. In the final prototype we might make some changes in the design in order to put camera.

5. USAGE OF COMPONENTS:

• We have used node MCU in our project as a sensor or actuator node due to its ability to connect to a Wi-Fi network and send and receive data wirelessly. As a sensor node it will collect data from various sensors such as ultrasonic sensor, it will transmit this data to the ROS master over wi-fi and as an actuator node it will control various devices such as motors, LEDs, it will receive commands from ROS master over wi-fi and use these commands to control the device. For using node MCU with ROS, we have flashed node MCU with appropriate firmware and installed necessary ROS packages.

• The use of motor driver in our project is that it will provide high power to the motors using a small voltage signal from a node MCU and the buck converter is to derive the required input voltage from higher voltage source.

• The ultrasonic sensor in our project detects the object and stops at that moment i.e. While robot is moving if any wall or object comes in between it will immediately stop there.

• LIPO batteries are providing power supply node MCU and other components like ultrasonic sensor and LEDs are taking their power from node MCU and buck converter. Geared motors are taking their supply from motor driver.

6. APPLICATION:

The prototype that we have developed has potential applications in various fields including increased safety, reduced costs, and improved efficiency. It can be used in mapping of area like if we can plot the navigation of place. It can be used to gather data from remote places. Since our prototype is equipped with a sensor and camera it can be used for surveillance and security purposes. it can navigate through narrow passages. It can be used for inspection and maintenance purposes in industrial settings. It can navigate through hazardous areas and gather data about the condition of machinery and equipment. one of the good uses of this robot is in agriculture field for crop monitoring, it can navigate through filed and gather the data about crop health and soil conditions.

7. LIMITATIONS:

- Since our prototype consists of heavy motors, aluminum profiles and acrylic sheets, it has become heavy and by this factor it has slowed down.
- The functioning of the prototype mainly depends on the nature of the surface on which it is moving (not very effective on rough surfaces).
- Since our prototype is connected through wi-fi, it can only be operated inside a particular range of networks. If we want it to operate in a large range, it will require a wide range of same network.