

CS 225/226 - Mini Project

Part 2

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Exploration Bot

Objective:

The objective of this mini project was to design and fabricate an exploration bot which moves on any terrain and explores the region using a camera attached to it.

Project Description:

What is it?

The project is a robot which moves on any terrain in a region and explores the region. It uses the camera on it to live feed the information to a user.

Why this project idea and what was the inspiration?

The project is inspired by rovers and exploring machines used in locations which are difficult to access physically, for humans. Eg: Curiosity and Opportunity Mars exploration rovers, Fire exploration and rescue bots, Earth terrain exploration bots, etc. This project was made as this idea of exploration is extremely interesting and with advancements it has a great scope of development and a tremendous market potential.

What are the concepts and components used?

Various concepts and components were used in making of the project. The components of highlight utilized are as follows:

- 1) Raspberry Pi
- 2) Pi camera module
- 3) Arduino Mega board
- 4) L293D motor driver IC
- 5) HC-SR04 Ultrasonic Sensor
- 6) DC motors x2
- 7) Raspberry Pi-Arduino Interface

The concepts of highlight used are as follows:

1) Motion Planning of the robot:

The robot moves around using DC motors with front wheel control. The motors are controlled using an Arduino Mega and an L293D motor driver acting as an interface. The robot detects obstacles using an ultrasonic sensor and safely avoids them during the exploration.

2) Live feed of Terrain using Pi camera module:

The robot uses a Pi camera module to give a live feed to the Raspberry Pi which streams it over the network using RSTP protocol on VLC. The camera also records the video feed if required.

What will the robot do?

The robot will move around the terrain using DC motors with front wheel control, controlled by the Arduino in a specific manner safely avoiding obstacles, if any, sensed by the ultrasonic sensor. It will give the live feed of the region to the user or record the data if asked by the user.

What will be the final obtained result and project's ultimate goal?

The project's ultimate goal is to develop a robot to explore a region, irrespective of the terrain and the conditions. The final result obtained helps us record the data of a region explored by the robot in the form of live feed or a video.

What are the possible improvements and advancements?

There is an extreme scope of improvement for this robot and some additions are possible as well. Some of them are as follows:

- 1) Obstacle avoidance can be improved to moving or sudden obstacles by reducing the reaction time and by using Q-learning to analyse the situation.
- 2) The area can be mapped using a Kinect which can be useful in cartography.
- 3) Underground exploration is also possible if appropriate adjustments and additions are made.
- 4) If this is applied to UAVs, Aerial exploration is given a scope, which can be used for exploring volcanic areas.
- 5) If applied to robots mobile in water, submarine exploration is given a scope.
- 6) Exploration is the primitive step for rescue. Hence after advance improvements, a rescue bot can be modelled using this technology as a base.