VILNIUS UNIVERSITY
FACULTY OF MATHEMATICS AND INFORMATICS
INSTITUTE OF COMPUTER SCIENCE
INFORMATION TECHNOLOGIES STUDY PROGRAM

Problem-based Project

Rover

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1. Introduction

1.1. Purpose of this Document

This is a Requirements Specification document for an autonomous robot companion. This document describes the scope, objectives, and goal of this project. In addition to describing non-functional requirements, this document models the functional requirements with use cases and diagrams. This document is intended to direct the design and implementation of the robot.

1.2. Scope of this Document

The scope of this document is to:

- Provide a high-level overview of the project.
- Specify the functional requirements.
- Specify the non-functional requirements.
- Outline the most important quality attributes of this project.
- Outline an implementation plan.

2. Functional Requirements

2.1. High priority

- The robot will be able to move around the room freely, which includes moving forward, backward, and turning left and right.
- The robot will be able to detect obstacles that are in front of it and behind it.
- The robot will be able to move around the detected obstacles.
- The robot will be able to detect objects.

2.2. Medium priority

- The robot will be able to inform the user about errors with sound signals.

2.3. Low Priority

- The robot will be able to recognise and follow the objects.

3. Non-Functional Requirements

3.1. Reliability

- The robot will be operational until turned off unless it runs out of power.
- The robot will have an expected battery life of 2 hours.

3.2. Usability

- The robot will be easy to operate – it will be turned on with a button.

4. Use Case

The robot will be turned on with a push of a button located on the robot, then it will start to move around the room, scanning the environment using its sensors and cameras. It will detect obstacles, avoid them, and will remember the layout of the room. If stuck, it will alert the user with a sound signal using a beeper.

5. Implementation Plan

5.1 Version Plan

Version	Features
Version 1	Robot can move around room freely – forwards, backwards, and can turn.
Version 2	Robot can detect surroundings using cameras and sensors.
Version 3	Robot can avoid obstacles it detects.
Version 4	Robot can produce sound signals.
Version 5	Robot can map and remember its surroundings.
Version 6	Robot can follow objects and/or people.

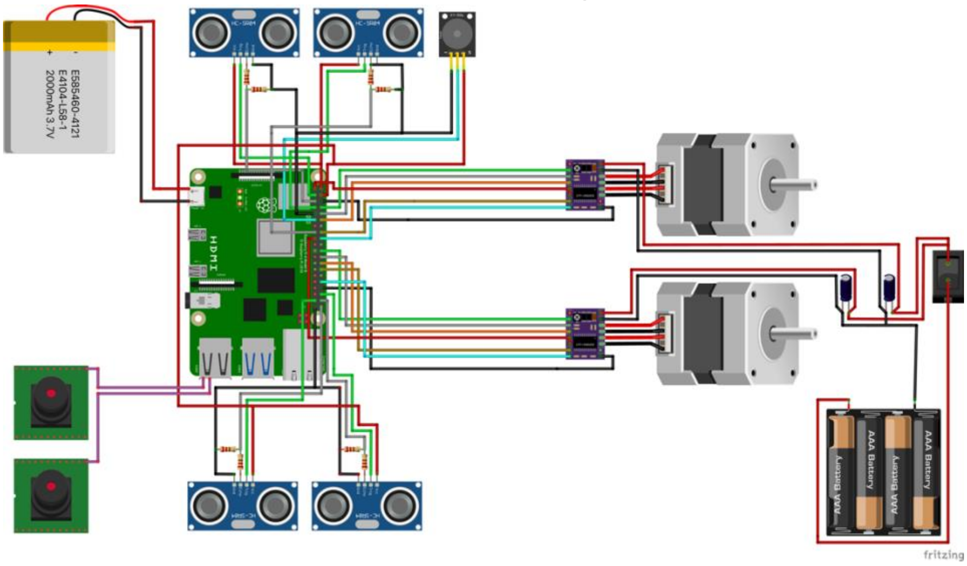
5.2 Tools used

The following technologies will be used to build the robot:

- Python
- OpenCV
- Git
- Linux

5.3 Hardware Diagram

The robot’s hardware will follow this diagram:



5.4 Hardware components

1. Raspberry Pi 4 Model B (4GB RAM version)
2. (4) HC-SR04 ultrasound distance sensors.
3. (2) USB cameras.
4. (2) NEMA 17 stepper motors.
5. (2) DRV8825 stepper motor controllers.
6. Power switch.
7. Power bank.
8. (4) 18650 batteries.
9. 18650 battery holders.
10. (4) 1kΩ resistors.
11. (4) 2kΩ resistors.
12. (2) 100 μF capacitors.
13. Beeper.
14. 32GB MicroSD card.