# Abstract

**Project Title**: QUADRUPED ROBOT

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This project focuses on the design and development of a Quadruped Robot aimed at enhancing mobility and operational capability in challenging environments, particularly for search and rescue applications. Unlike conventional wheeled robots, quadrupeds can navigate complex terrains such as rubble, debris, and uneven surfaces, making them ideal for disaster response scenarios where human access is restricted.

The robot is designed with a combination of Servo motors, IMU, GPS and a camera module, all controlled via a microcontroller and a suitable Computing Interface. Using Robot Operating System as the core framework makes the robot scalable and modular. Different gait mechanisms are implemented to achieve stable and coordinated leg movements, ensuring the robot maintains balance while traversing difficult landscapes.

The project also explores foundational aspects of robotic locomotion, ROS2, Inverse Kinematics, focusing on gait algorithms, sensor integration, and control strategies. By incorporating camera to handle perception and robotic vision makes the robot to know about its environment. The cluster of sensors such as GPS, IMU enables smooth localization of the robot in adverse conditions.

This work lays the groundwork for future advancements in autonomous rescue robotics, offering a modular, scalable platform for further research in mobility systems, real-time perception, and autonomous control. The educational value of the project also extends to hands-on learning in legged robots, Control Systems, and robotic programming.

**Keywords**: Inverse Kinematics, Stability analysis, PID, Control systems, Computer vision, Dynamics, Sensor Fusion

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