

Rocker-Bogie Robotic Vehicle with LiDAR and Toy Gun

iTechBuilders Project Report

Introduction

The Rocker-Bogie robotic vehicle is a rugged, all-terrain rover designed to traverse uneven surfaces. In this project, the vehicle is enhanced with LiDAR for autonomous navigation and a toy gun mechanism for defense and experimental applications. The design replicates real-world planetary rovers used by NASA, making it ideal for research, defense, and robotics learning.

Objectives

- To design a stable and efficient rocker-bogie robotic vehicle.
- To integrate LiDAR for obstacle detection and mapping.
- To mount and control a toy gun mechanism for demonstration.
- To showcase IoT/remote-controlled operation via wireless communication.

System Overview

The system consists of a rocker-bogie mechanical chassis driven by DC motors and motor drivers, controlled by a microcontroller (Arduino/Raspberry Pi). A LiDAR sensor is mounted on the vehicle to detect obstacles and map the environment. A toy gun mechanism is attached, which can be controlled remotely for firing demonstrations.

Hardware Components

- Rocker-Bogie Chassis
- DC Motors and Motor Driver
- Microcontroller (Arduino/Raspberry Pi)
- LiDAR Sensor
- Toy Gun with Actuation Mechanism
- Power Supply (Battery Pack)
- Wireless Communication Module
- Supporting Frame and Mounts

Working Principle

The rocker-bogie mechanism distributes weight evenly across six wheels, allowing smooth navigation on rough terrain. The microcontroller receives LiDAR data to detect obstacles and adjust the vehicle's path. The toy gun mechanism is triggered remotely via wireless communication, demonstrating integration of mobility and action systems.

Features

- All-terrain navigation with rocker-bogie suspension
- Autonomous/remote operation

- Real-time obstacle detection using LiDAR
- Toy gun demonstration for defense/entertainment
- Modular design for upgrades

Applications

- Robotics research and training
- Defense and security demonstrations
- Search and rescue operations
- Educational projects for engineering students
- Planetary exploration model

Future Scope

- Integration of AI for autonomous navigation
- Use of high-power laser modules or advanced payloads
- Solar power for long-duration missions
- Swarm coordination with multiple robotic vehicles

Conclusion

The Rocker-Bogie robotic vehicle with LiDAR and a toy gun demonstrates the combination of mechanical design, electronics, and automation in robotics. Developed under iTechBuilders, this project is a strong foundation for advanced research and real-world applications in defense, exploration, and learning.