

# Agnirva Project Report

**Project Report Topic: Differences Between Space Robotics and  
Earth-based Robotics**

**Internship Organisation : The Agnirva Space Internship program**

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## Introduction

- Definition of Robotics  
Define robotics and its relevance to various fields, particularly space exploration and terrestrial applications.
- Importance of Robotics in Space and Earth Applications  
Discuss the role of robotics in advancing technology and achieving mission objectives in both environments.
- Objectives of the Report  
Outline the aims of the report, focusing on comparing space and Earth robotics.

## Environmental Conditions

- Challenges in Space Environments  
Explain the extreme conditions of space, including vacuum, temperature fluctuations, and radiation levels.
- Construction Materials for Space Robots  
Discuss the materials used in space robotics, such as radiation-resistant composites and thermal control systems.
- Comparison with Earth Environments  
Contrast these conditions with the more stable environments on Earth.

## Power Management Systems

- Energy Sources for Space Robots  
Detail the power sources used by space robots, such as solar panels and nuclear power.
- Efficiency and Storage Considerations  
Highlight the need for efficient energy management in the absence of traditional power supplies.
- Traditional Power Systems for Earth Robots  
Discuss how Earth robots typically rely on batteries and direct electrical connections.

## Levels of Autonomy

- Need for Autonomy in Space Robotics  
Explain the necessity for high autonomy in space due to communication delays.
- AI and Machine Learning in Space  
Describe the advanced AI technologies that enable autonomous operation.
- Real-time Control in Earth Robotics  
Discuss how Earth-based robots often have real-time human oversight.

## Mobility Systems

- Specialized Mobility for Space Robots  
Explain how space robots are designed to navigate unique terrains and gravity conditions.
- Terrain Navigation on Other Celestial Bodies  
Discuss examples, such as the advanced mobility systems in Mars rovers.
- Mobility Requirements for Earth Robots  
Describe the more predictable mobility systems used in Earth environments.

## Durability and Reliability

- Importance of Reliability in Space Missions  
Discuss the critical nature of durability given the costs of repairs in space.
- Redundancy and Testing Protocols for Space Robots  
Explain the rigorous testing and design protocols to ensure reliability.
- Maintenance Capabilities for Earth Robots  
Contrast this with the ability to perform regular maintenance on Earth-based robots.

## Communication Systems

- Communication Challenges in Space  
Detail the difficulties faced by space robots in transmitting data over

- vast distances.
- Data Transmission Over Long Distances  
Discuss the technologies used for reliable long-distance communication.
- Terrestrial Communication Networks for Earth Robots  
Highlight the advantages of existing communication infrastructure on Earth.

## Mission Objectives

- Goals of Space Robotics  
Discuss the primary focus areas for space robots, including exploration and research.
- Applications of Earth-based Robotics  
Outline the diverse applications of Earth-based robots across various sectors.
- Comparison of Mission Objectives  
Compare and contrast the objectives of space and Earth robotics.

## Conclusion

- Summary of Key Differences  
Recap the significant differences discussed in the report.
- Implications for Future Robotics Development  
Discuss how these differences impact the design and development of future robots.
- The Importance of Specialized Designs  
Emphasize the necessity for tailored solutions in both domains.

## Future Directions

- Emerging Trends in Robotics  
Discuss upcoming technologies and innovations in both space and Earth robotics.
- Potential for Cross-Domain Innovations  
Explore opportunities for integrating technologies from both fields.
- Challenges Ahead  
Identify ongoing challenges that need to be addressed in both areas of robotics.