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Performance and working of RHex Robot

Malashri Hulgeri, Mayur Gangwal, Harshada Jadhav, Sushma Bhosle
Department of E&TC
Nutan Maharashtra Institute of Engineering and Technology, Talegaon, India.

Abstract— In this work we are discussing the architecture of Rhex and the field definition. RHex is a non-tethered, compliant leg hexapod robot that moves faster than other robots and is inspired by bio-mechanical insights into arthropoden locomotions. Only six actuators of one engine are placed at any point to achieve reliable and robust operating in real-world tasks. The key design issues and limitations influenced by the technological feasibility and the operational efficiency have been taken into account in the design procedure proposed.

I. INTRODUCTION

A hexapod robot, since it is statically stable in three or more legs, is a mechanical vehicle that operates on six legs. The Legged hexapod robots are robots which can be programmed with six legs attached to the robot body. The legs are autonomously controlled so that the robot can travel inside its environments and perform the desired task. If the legs are disabled the robot can still walk.

In reality, the use of wheels or crawlers reduces the obstacle to half the diameter of the wheels. Walking robots in Hexapod also have reduced ground impact and greater mobility. This is particularly important in hazardous conditions such as mine fields or where it is vital for scientific purposes to preserve the landscape largely uninterrupted. [1]

The research robots improved during the 1990s and 2000s during autonomous indoor activity. It provides the sensor, mobility, and computer power required.

Fig.1 Edubot robot [2]

Fig.2 Research robot [3]

The EduBot has a modular structure that integrates a small but efficient distributed architecture consisting of a central CPU, an integrated peripheral actuator/sensor node. [2]. The Structure of Edubot and Research robot:

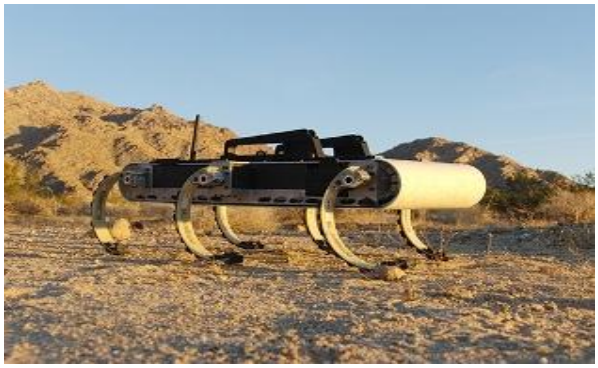

Fig.3. Structure of Rhex robot [3]

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The Rhex project is designed to build 6-legged robot that can perform a wide range of dynamically extrusive tasks, including walking, running escalators with a single autonomous platform. In this view, legged machines which capture a certain degree of animal mobility impose the best hope on the subject in hospitable situations outside the world.

II. PROPOSED WORK

A. DESCRIPTION

Both computer and engine controlling equipment and 12 V-screened lead acid batteries for autonomous power operation are on board. The user feedback is provided by a remote control unit for higher levels of commands, such as forward speed and turning direction. The leg shape resembles that on the research platform, as the half-circle shape has demonstrably helped to shift platforms over obstacles and escalators. The legs have a 1cm diameter and are C-shaped in order to maximise compliance in radial direction [4]. The Rhex robot is divided into two parts:

- Rhex main unit
- Remote control unit

The Fig.4 and fig.5 shows Block Diagram of Rhex robot. Both the units is shown in the Fig.4 and Fig.5.

1. Main unit

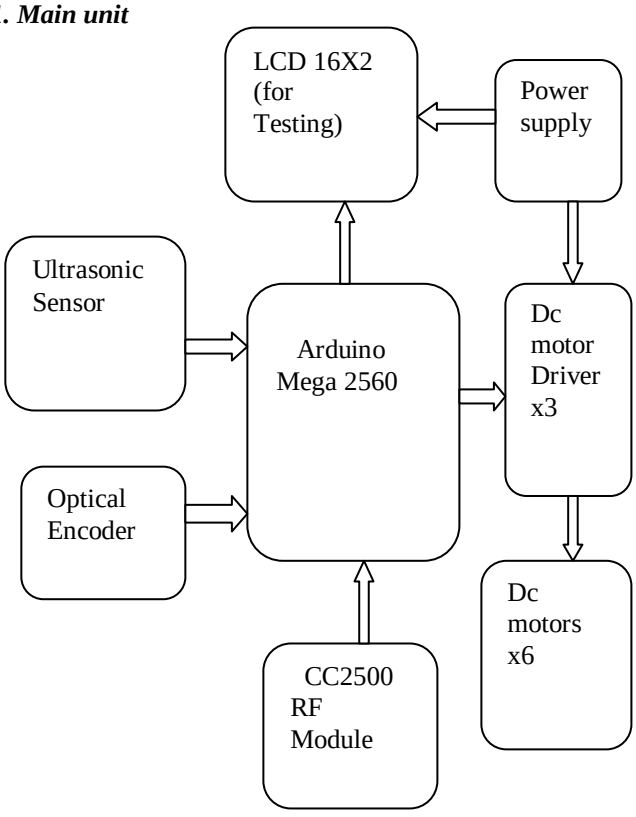

Fig.4. Main unit

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2. Remote unit

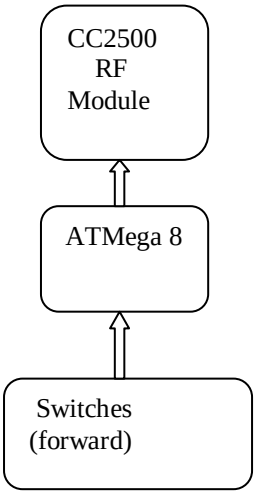

Fig.5. Remote unit

B. HARDWARE DESCRIPTION

Its Hardware is constructed in such a way that it can traverse:

- Forward locomotion
- Obstacle climbing
- Stair Climbing
- Rough Surface

C. SOFTWARES

The software's required for the development of Rhex robot are:

1. ***Express PCB***
   - **S**imple electronics circuit board as design tool
   - Schematic representation is easy.
2. ***Arduino IDE***
   - Easy coding and uploading.
   - It runs on Windows, Mac OS X, and Linux.

D. WORKING PROCESS

1. Start.
2. Initialize LCD.
3. Initialize PWM.
4. Initialize Interrupt.
5. Initialize RF Module.
6. Stop all Motors.
7. If RF data contain Forward instruction then start forward motion else go to next step.
8. If RF data contain backward instruction then start backward motion else go the next step.
9. If RF data contain Left instruction then start left motion else go to the next step.
10. If RF data contain Right instruction then start right motion else go to the next step.
11. Stop.

The fig.6 shows flowchart of proposed work:

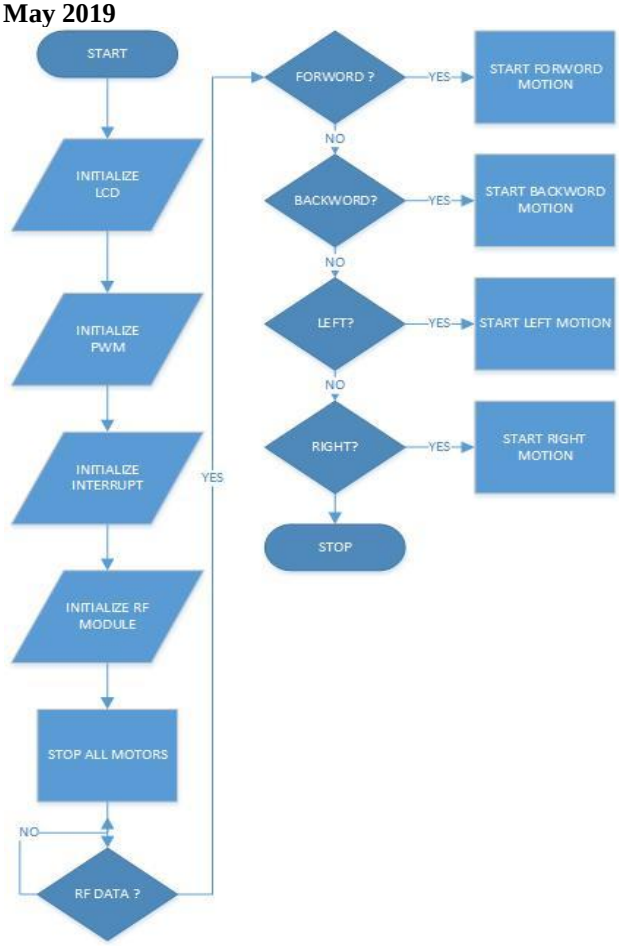

Fig.6 Flowchart

E. PROJECT SPECIFICATION

In terms of capacity, running time, payload size, endurance and land negotiation, RHex is designed to make significant improvements compared to its predecessors in terms of volume and weight.

1. Terrain Specifications

-Transverse rock fields, mud, sand, snow.
-Crosses railroad tracks, curbs, logs and pipes
-Climbing wide range of stairs.

2. Hardware Specifications

- Size**:**
  Weight: 5Kg
  Dimensions: 22x40x10(cm).
- Power**:**
  Battery: 1 SLA battery with 12 Volts.
  Endurance: 1 hour
- Mobility**:**
  Speed: over 62mph on natural terrain.

III. SYSTEM DESIGN

The body has all the autonomous components, such as computational devices, I/O, sensors, power supply and batteries. Unlike other robots with six legs, RHex is made for athletes. RHex has compliant legs. Once again, every leg has only one actuator on the hip and rotates in the sagittal plane. Although the leg design doesn't use a prismatic joint, it's intended, because of its structural, distributed leg

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conformance, to behave more as a radial conformity. Fig.7 displays the Rhex robot's structural architecture. [4]

Fig.7 System Design [4]

IV. ADVANTAGES

a. High mobility.
b. Water Submersible.
c. Simple Mechanical design.
d. Compact size.

V. APPLICATION & FUTURE SCOPE

1. Military Surveillance
2. Remote operation
3. Payload Application
4. Real Time sensing Application
5. Rescue operation
6. Forestry and Agricultural Tasks
7. Civil Project
8. Land, Submarine and Planetary Exploration

VI .CONCLUSION

In the synonym of our target, to cross terrains with appropriate forwards and reverses in human and urban environments. The robot performs versatile motions based on its engine rotation. The test finding reveals that the robot is an electromechanical device that programming the controller moves and performs the job. Robots may operate independently, as well as being controlled directly by an operator, under the supervision of a controller programme. As a search and rescue robots, space robots and discover robots, six-legged robots can be used.

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