

Multi Terrain Quadruped

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Abstract—The quad concept that can easily be changed in walk mode and rover mode is proposed by wheel traversing. Walking mode will be used for non-ideal operations for wheels, such as scaling vertical walls or moving in extremely uneven terrain. Rover mode is used for flat terrain and fast travel. The robot is controlled by a webpage wirelessly that will be fully built for this robot. In addition to our ability to convert, we also intend to add IMU sensors, GPS and lidar for future self-orientation and autonomous performance. All data will be logged by the cloud services and the data can be easily reviewed in the graph for data analysis. The aim of this project is to create a low-cost multi-terrain traversing robot prototype for search and rescue operations.

Keywords— Quadruped Bot, Walking Bot, Transversing Bot, Raspberry Pi, Lidar

I. INTRODUCTION

Many applications, including detection and rescue, surveillance and security, require information from such an unknown region, potentially dangerous to humans. We need mobile autonomous robots with multi-terrain traversing capabilities to explore such places. The robot may be one of several types of wheels, legs, or other types of platforms suitable for these applications. Robots with wheels are very efficient on smooth and continuous surfaces, but there are serious limitations in rough terrain and in different ways. In contrast, legged robots provide high mobility in natural terrain. They are conducive to surface irregularities by using a separate base and contacting the ground at selected points. However, the construction and control mechanism of a foot robot is complicated compared to a wheeled robot. This is the main reason that robots with legs for better control have per actuator and multiple degrees of freedom. In addition to the wheels and foot robots discussed above, there exists a range. These robots have the advantages of both, the warm motion of the legs, as well as the simple control of the wheels robots.

II. MOTIVATION

Taking Note of loss of human life due to search and rescue, surveillance and security operations in hazardous inhumane condition, it is preferable to employ a bot for these purposes. Also due to its mobility to move in multi terrain and small size it would be able to send us much more data than human counterpart. Furthermore, we can also see its application in delivery of products, in space where the terrain is unknown. It can also be equipped with security and surveillance devices for the security personal. An unending line of application can be devised with such a kind of multi terrain bot.

III. MATERIAL AND METHOD

3.1. Proposed methodology:

The Bot uses raspberry pi as its main CPU. Being a Quadruped Bot it transverses on 4 Legs. It can switch from rover mode to wheeled mode upon input by user. It has various integrated sensors and camera to provide the user with sufficient data. The Bot is to be controlled via a web page where the schematics and live camera stream will be available. Data Will be logged on cloud servers. All this will be made possible via Node Js Platform.

3.2. General Block diagram:

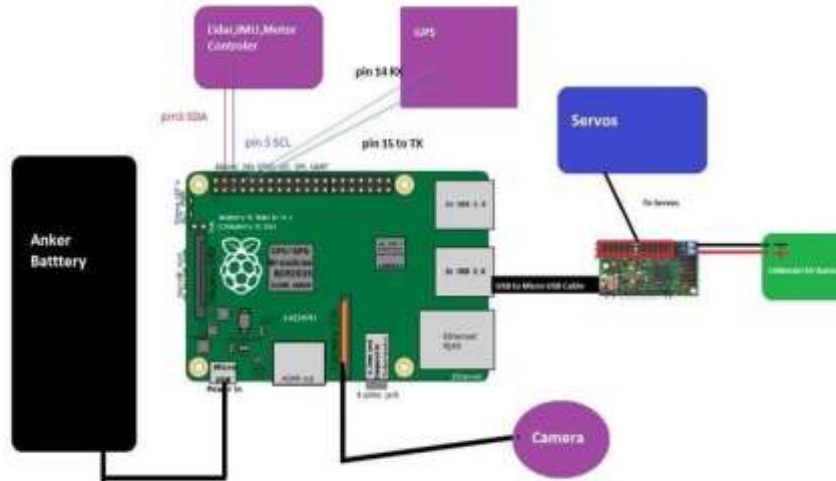


FIGURE 1: Production General Block diagram

Our main motive when designing was to keep it as simple as possible. There are two servo motors connected on each leg, one on femur and one on coxa. There is a micro motor on each of a leg on the tibia for the wheeled movement. The servos are connected to the servo controller. The Raspberry pi is mounted on the top of the chassis. Over it there is a Pi camera mount along with the other sensors connected to Raspberry Pi. The Power is supplied to the raspberry Pi via a rechargeable power bank

a. **Raspberry Pi:** Raspberry pie is a portable, powerful and mini computer. The board length is only 85mm and width is only 56mm. Its size only as big as a credit card but it is a capable little PC. It can be used for many of the things that your desktop PC does, like high-definition video, spreadsheets, word-processing, games and more. Raspberry Pi also has more wide application range, such as music machines, parent detectors to weather stations, tweeting birdhouses with infra-red cameras, lightweight web server, home automation server, etc. It enables people of all ages to explore computing, learn to program and understand how computers work.

b. **Servo Motor:** servo motor is an electrical device which can push or rotate an object with great precision. If you want to rotate and object at some specific angles or distance, then you use servo motor. It is just made up of simple motor which run through servo mechanism.

3.3. Leg Design:

The Leg design is divided into three parts for better stability and mobility. In fig.2 we can see that the parts are Coxa, Femur and Tibia. Their alignment is made such that it can transverse easily from legged mode to wheeled mode easily.

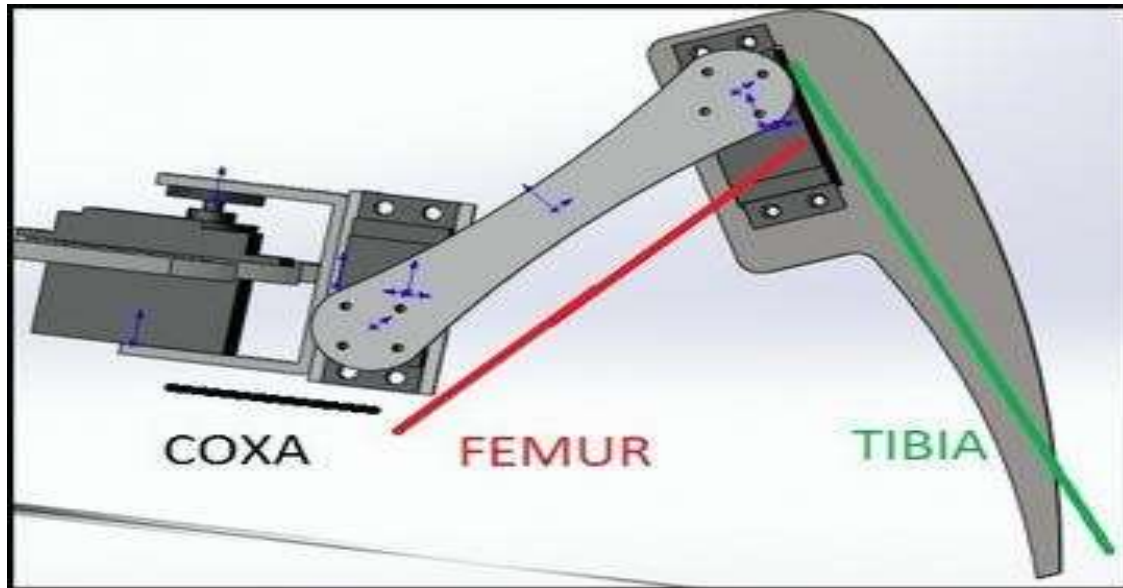


FIGURE 2: Leg Design Diagram

3.4. Web Layout Diagram:

The layout is designed as such to give the operator complete control over the bot along with the interactive operating switches with almost all of the information displayed on the screen.

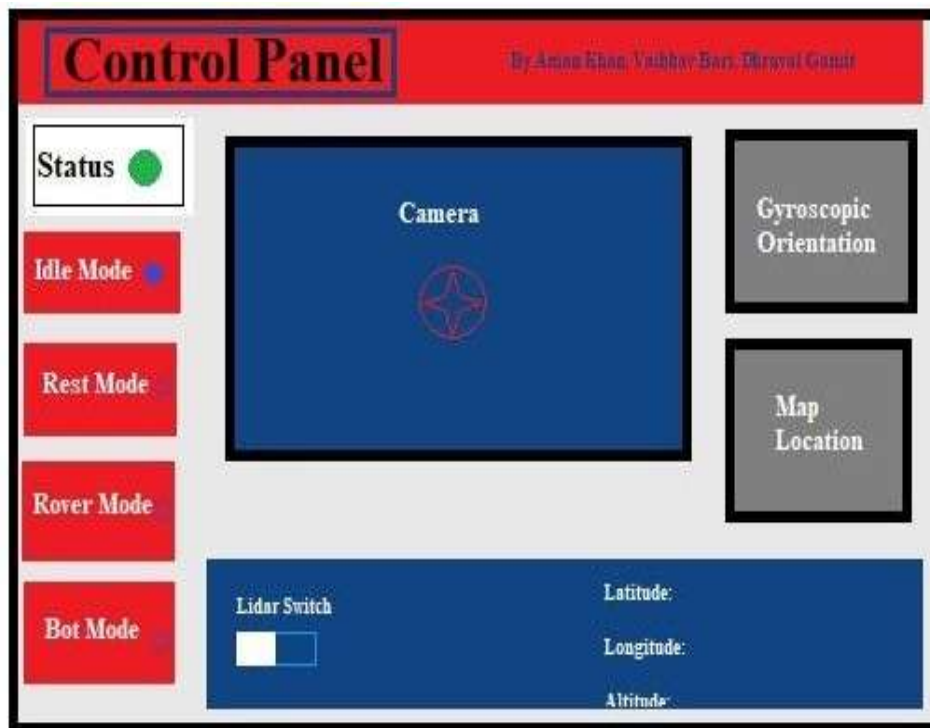


FIGURE 2: Layout Diagram

IV. EXPECTED RESULT

We expect to complete this bot with maximum sensors to provide a much accurate data. Also we intend to keep working on a better leg movement algorithm to provide the bot a much more stable walking pattern.

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