Quadrapod

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***Abstract*— This paper shows the complete design and functioning of four leg quadruped robot. Four-legged robots also called a quadruped or a Quadra pod, can have very complicated moving patterns and it provides the ways of moving on terrain where wheeled robots might not be able to move. This paper shows the usage of different moving parts to accomplish the synchronized development of the quadruped robot. The goal of this project is to develop a reliable platform that permits the implementation of fast and stable static/dynamic walking on terrain. This also consisting of a camera embedded on it for detecting a real-time status of the environment for surveillance and controlled by Bluetooth based android application.**

Keywords: Four-legged robots, synchronized development, locomotion patterns, Bluetooth android application.

I. INTRODUCTION

In many circumstances, there is a necessity for mobile platforms that can move in regions with difficult landscape conditions where wheeled vehicles can't travel. Samples of such conditions can be found in the search and salvage task, and also in carrying payloads. Not like wheeled robots, walking robots are characterized by great portability in unpleasant region. Wheeled robots are fast, but not suitable for the rough area. Tracked robots are slower but more suitable to the rough area. Legged robots are slow, much difficult to control but extremely potent in rough areas. Legged robots are capable to cross large holes and may operate even after losing a leg. Many researches were performed in this field in the past few years, because of its large potential. Today's era is of robotics. One of the foremost important parts of a robot is its chassis. Wheeled robots are fast, but not suitable for the rough area. Tracked robots are slower but more suitable to the rugged area. Legged robots are slow, much difficult to control but extremely powerful in rough areas. Legged robots are capable to pass large holes and can function even after losing a leg. Many researches were performed in this field in the past few years, because of its large potential. Legged chassis is especially ideal for space missions. There are also several projects in military research. Legs have unmistakable points of interest over wheels. The biggest advantage is in transverse ability and proficiency.

II. OBJECTIVE

The main purpose of this paper is to show an innovative, modular and reasonable design of a four-legged robot for environmental study purposes. The goal is to create a cheap legged platform, which allows research and experimentation of walking chassis and monitoring environmental conditions. The robot should be driven from a remote location. The biggest advantage is in transverse ability and proficiency. Legged robot has a unique capability to - Separate their body from territory abnormalities, Avoid undesirable foothold, Regulate their stability, Achieve energy efficiency.

III. LITERATURE

A. DOMAIN EXPLANATION

Robotics is an interdisciplinary branch of engineering and science that includes mechanical engineering, electronic engineering, information engineering, computer science, and others. Robotics deals with the design, construction, operation, and use of robots, as well as computer systems for their control, sensory feedback, and information processing.[1]

These technologies are used to develop machines that can substitute for humans and replicate human actions. Robots can be used in many situations and for lots of purposes, but today many are used in dangerous environments (including bomb detection and deactivation), manufacturing processes, or where humans cannot survive (e.g. in space, under water, in high heat, and clean up and containment of hazardous materials and radiation).[3] Robots can take on any form but some are made to resemble humans in appearance. This is said to help in the acceptance of a robot in certain replicative behaviors usually performed by people. Such robots attempt to replicate walking, lifting, speech, cognition, or any other human activity. Many of today's robots are inspired by nature, contributing to the field of bio-inspired robotics.

The concept of creating machines that can operate autonomously dates back to classical times, but research into the functionality and potential uses of robots did not grow substantially until the 20th century.[5] Throughout history, it has been frequently assumed by various scholars,

inventors, engineers, and technicians that robots will one day be able to mimic human behavior and manage tasks in a human-like fashion. Today, robotics is a rapidly growing field, as technological advances continue; researching, designing, and building new robots serve various practical purposes, whether domestically, commercially, or militarily. Many robots are built to do jobs that are hazardous to people, such as defusing bombs, finding survivors in unstable ruins, and exploring mines and shipwrecks. Robotics is also used in STEM (science, technology, engineering, and mathematics) as a teaching aid.[4] The advent of nanorobots, microscopic robots that can be injected into the human body, could revolutionize medicine and human health.

B. EXISTING SYSTEM

Wheeled robots are robots that operate around the ground using motor-driven wheels to drive themselves.[2] This design is easier than using legs and by using wheels they are easier to design and program for movement in flat, not-so-rugged regions. They are also better to control than other types of robots. Limitations of wheeled robots are that they cannot navigate well over obstacles, such as rocky region, sharp drops, or areas with low friction.[6] Wheeled robots are most famous among the consumer market, their differential steering gives low cost and simplicity. Robots can have any number of wheels, but three wheels are adequate for static and dynamic stability. Extra wheels can add to support; however, additional mechanisms will be required to keep all the wheels in the ground, when the ground is not flat.

C. IMPLEMENTATION METHODOLOGY

As its name defines it, our robot is a basic representation of the spider movements but it will not perform the same body moves since we are using only four legs instead of eight legs. Named also a Quadruped robot since it has four legs and make its movements using these legs, the movement of each leg is related to the other legs to identify the robot body position and also to control the robot body balance.

Legged robots control terrain better than their wheeled equivalents and move in different and animalistic ways. However, this makes legged robots more complex, and less available to many makers. And also the production cost and the high depenses that a producer should spend to create a full body quadruped since it is based on servo motors or stepper motors and both are more costly than DC motors that could be used in wheeled robots.

You will find quadrupeds abundant in nature, because four legs enables passive stability, or the power to stay standing without actively adjusting position. The same is true of robots.

A servomotor as a rotating actuator or linear actuator that enables for accurate control of angular or straight position, speed and acceleration. It consists a proper motor linked to a sensor for site feedback. It also needs a moderately complex controller, usually a dedicated module created especially for use with servomotors.

Generally the control signal is a square wave pulse train. General frequencies for control signals are 44Hz, 50Hz, and 400Hz. The positive pulse width is what determines the servo position. A positive pulse width of about 0.5ms will cause the servo horn to turn as much as it can to the left (generally around 45 to 90 degrees depending upon the servo in question). A positive pulse width of about 2.5ms to 3.0ms will cause the servo to turn.

The right as far as it can. A pulse width of around 1.5ms will cause the servo to hold the neutral position at 0 degrees. The output high voltage is usually something between 2.5 volts and 10 volts (with 3V typical). The output low voltage varies from -40mV to 0V.

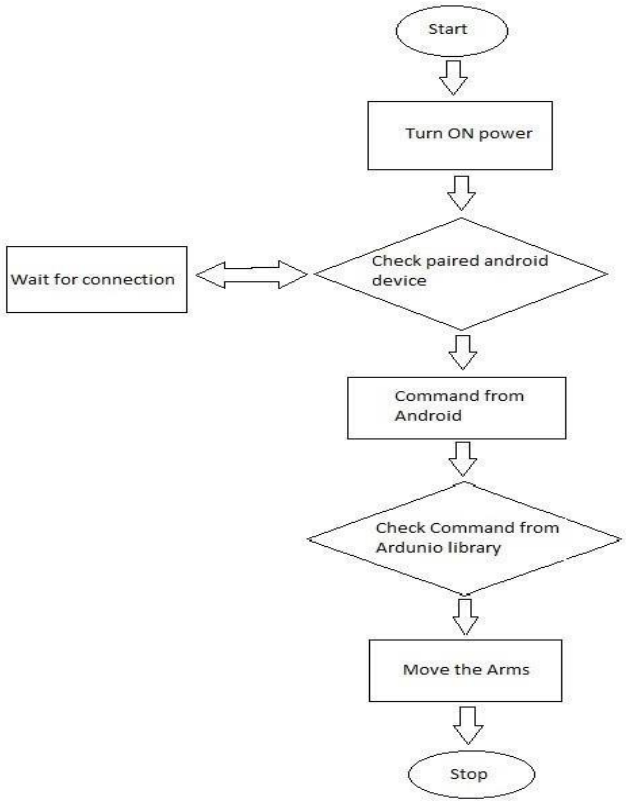
Now let's review the necessary components that we need for this project, we are using an Arduino Nano to run all the 12 servo motor of the robot four legs. The project also includes a Bluetooth module to control the robot through an android app.Components: PCB, 12 Servo motors, One Arduino Nano, HC-06 Bluetooth module, And the robot body pieces.

Setting Servo Centre Position:

Attach a Servo Arm to the servo and then lightly twist the Servo Arm clockwise until the arm stops. It is okay if the Servo Arm does not stop at the equal angle shown in the picture above. What is necessary is that we find the end stop of the Servo.

Remove the Servo Arm from the Servo and reposition it to be perpendicular to the Servo body as displayed in this picture.

Lightly rotate the Servo Arm counter-clockwise until the Servo Arm is parallel with the Servo body as displayed. After the Servo Arm is parallel with the Servo Body, separate the Servo Arm and set it away for later assembly. This is the Servo's centre position and all 8 Servos included in the kit must be centred before starting the mePed assembly.



IV. RESULT

Since this robot is so simplistic, it is very easy to transform or extend it. You can add sensors and peripherals, or control it remotely from mobile application. The possibilities are infinite, an interface can be powered from a single LiPo battery, and doesn't weight too much for the robot to carry it. It can walk in all four directions controlled by an android application. Compact in size so can fit in narrow spaces. Sturdy and durable body. Can be used for surveillance activities.

- It can walk in all four directions controlled by an android application.
- Posses four legs to maneuver.
- Compact in size so can fit in narrow spaces.
- Sturdy and durable body.
- Can be used for surveilance activities.
- Camera attached for live video footage and controlling.

V. CONCLUSION

Android based and Bluetooth controlled Quadapod is a robot which can manuer on 4 legs consisting of two servo motors on leg and can move in all four directions, it can be used for surveillance activities and fit into narrow spaces because of its compact size., Quadrapod being a 4-Legged robot can be used in many different sectors from improved surveillance to moon expedition bots. It can be integrated with Artificial Intelligence. Wheeled robots are fast, but not fit for rugged area. Tracked robots are slower, but more fit to rough area. Legged robots are slow, much challenging to control but remarkably powerful in rugged area.

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