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IOT BASED QUADRUPEDAL SPIDER ROBOT FOR SURVEILLANCE

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Abstract **-** This project talks about design and fabrication of multipurpose quadruped spider robot. A quadruped robot, which is in the classification of multi-legged robots, is defined as a robot with four legs to walk or move. There are so many possibilities for leg placement, leg designs and gait patterns in quadruped robots. The objective of this project is to develop a four legged robot, which looks like a biological spider. It consists of real time web control system that detect the real time status of the environment like forests, big farms etc. This is done by using wireless device.

Keywords: Quadrupedal, Spider, Robot, Web.

INTRODUCTION

Using robots nowadays is very common, and people use them in many applications. The idea here was to have a robot that can be used by individuals to reach their desired goals and to make it easy for them to control. To reach the desired results, two approaches have been considered. First of all, robot design Inspired by a biological spider, which has the ability to navigate through different terrains, a spider robot is ideal for the application intended.It was essential to concoct a reduced plan for the robot so it can openly move around and do the developments required. The plan required a reliable leg plan, which was able to move every which way. In this plan, wellbeing is something vital to think about so a large portion of the robot outline is smooth and has no sharp edges. Additionally, the electrical parts are reusable like servos and the microcontroller to limit the ecological impact this robot could cause. Second, the software part is offering the rationale for the spider. Offering the client a moment move with no postponement is extraordinary. The client is having a robot with a smooth development and with a decent speed. A basic control framework is expected to make it simple for the client to guide and control the robot. Additionally, thinking about consuming energy and depleting the battery; the robot ought to keep going quite a while for it to be solid. Toward the end, the robot ought to be direct and simple to set up while assembling. It should be easy to build when entering the production line.

WHY LEGGED ROBOT?

There are a few fundamental robot types: wheeled, tracked and legged robot. Wheeled robots are quick, however not reasonable for unpleasant regions. Tracked robots are more slow, however more reasonable to tough regions. Legged robots are slow, much hard to control however very strong in unpleasant region. Legged robots are equipped for crossing enormous openings and can work even subsequent to losing a leg. Many investigates were acted in this field in the beyond couple of years, due to its huge potential. Legged skeleton are particularly great for space missions. There are likewise a few tasks in military examination. Legs have obvious focal points over wheels. The greatest benefit is in cross over capacity and capability. Legged robot has a unique ability to isolate their body from territory abnormalities. Legged robots are more energy efficient as compare other robot types.

WALKING THEORY

The robot manufacturing in this paper has total.12 degrees of freedom, with each leg having 3 degrees of freedom. This means being able to move 12 different joints in different positions. Legs are positioned symmetrically on both sides. Servo motors provide movement of joints. Servo motors that connect the legs to the body allow it to rotate sideways. The other two servo motors provide movement of the joints.

BLOCK DIAGRAM

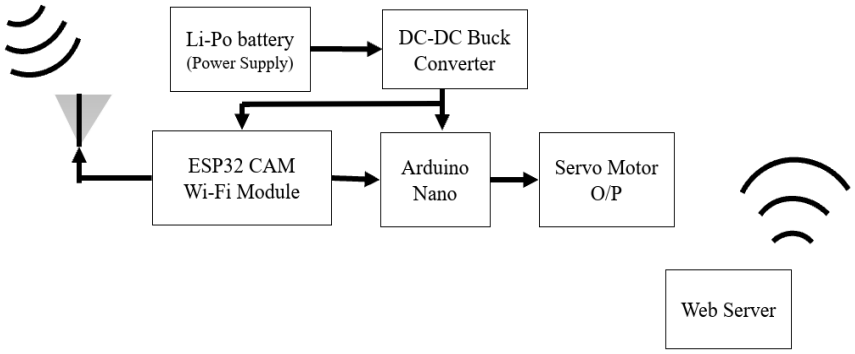

Figure (1): block diagram of spider robot system

HARDWARE SPECIFICATIONS

ESP32 MODULE:

In this project we used ESP32- CAM Module as the main microcontroller of the robot.

The ESP32 CAM Wi-Fi Module Bluetooth with OV2640 Camera Module 2MP for live information translation has an extremely serious little size camera module that can work autonomously as a base framework with an impression of just 40 x 27 mm; a deep sleep current of up to 6mA and is generally utilized in different IoT applications. It is reasonable for home smart devices, industrial wireless control, wireless monitoring, and other IoT applications

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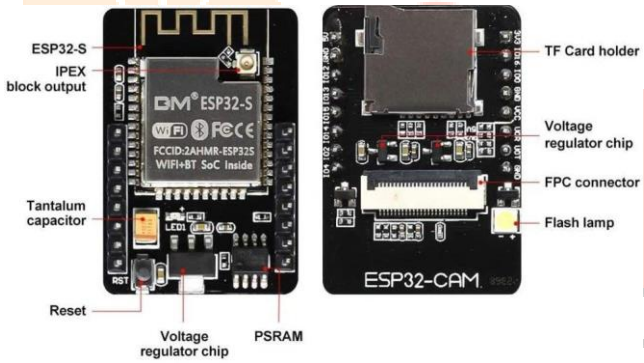

Figure (2): esp32 cam wi-fi module

ARDUINO NANO:

Arduino Nano is used to provide final output to the servo motors (i.e. Robot Legs). ESP32 module takes input from the web by Wi-Fi connection and gives output to the Arduino Nano. After taking input from the ESP32, Ardino Nano gives suitable output to the servo motors.

Figure (3): arduino nano

SERVO MOTOR:

Servo motors are used to drive the Robot. A servo motor is a small and very energy efficient motor excellent for small as well as large projects that require positioning of the shaft. Inside a micro servo motor, there is a small DC motor, potentiometer and a control circuit. The servo motor has three terminals: Position signal (PWM Pulses), VCC (From Power Supply), Ground. The servo motor angular position is constrained by applying PWM beats of explicit width. The span of pulse changes from around 0.5ms for 0 degree rotation to 2.2ms for 180 degree rotation. The pulses should be given at frequencies of around 50Hz to 60Hz.

Figure (4): dc servo motor

DC-DC BUCK CONVERTER:

The buck converter is an extremely straightforward kind of DC-DC converter that delivers an output voltage less than its input. The buck converter is so named because the inductor generally "bucks" or acts against the input voltage. The output voltage of an ideal buck converter is equal to the product of the switching duty cycle and the supply voltage.

Figure (5): dc-dc buck converter

Like many power supply topologies, the buck converter operates on the principal of storing energy in an inductor. The voltage drop across an inductor is proportional to changes in electric current flowing through the device.

SOFTWARE SPECIFICATIONS

ARDUINO IDE SOFTWARE:

The open-source Arduino Software (IDE) simplifies it to make code and move it to the board. It turns on Windows, Mac OS X and Linux. The environment is written in Java and considering handling and other open-source programming. This is the place where you type the code you need to incorporate and ship off the Arduino as well as other development boards.

ARDUINO IOT CLOUD:

In this project we are using Arduino IoT Cloud to monitor the robot though the web by Wi-Fi Connection.
Arduino IoT Cloud is a stage that unites IoT gadget advancement, network the executives and an IoT application manufacturer in a simple to utilize climate. Arduino IoT Cloud is an application that assists creators with building associated objects in a speedy, simple and secure way. You can associate various gadgets to one another and permit them to trade constant information. You can also monitor them from anywhere using a simple user interface.

Arduino IoT Cloud is fully integrated in the Arduino Create ecosystem, you will be able to generate a template code in Arduino IoT Cloud and then edit and upload it to your board using the Arduino Web Editor.

RESULTS:

Figure (6): the robot leg

figure (7): the robot leg guard

figure (8): the robot leg joints

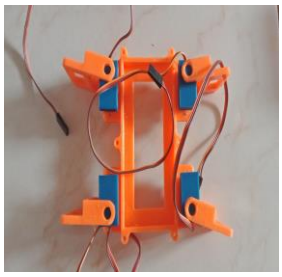
Figure (9): the robot body


figure (10): the robot assembly

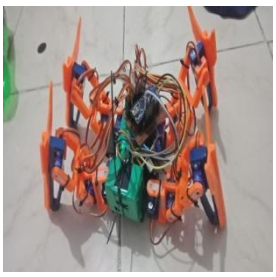
figure (11): the complete robot

CONCLUSION

The main theme of this project is to build a quadrapedal Spider Robot, which can be used for real time detection purpose. This designed architecture is suitable for all terrains like rigid and smooth surfaces. A quadrapod robot can take an advantage of multiple legs to walk easily. The control of robot can be wirelessly done by means of ESP-32 CAM Wi-Fi module The project "IOT BASAED QUADRAPEDAL SPIDER ROBOT FOR SURVELLENCE" has designed and tested. Integrating features of all the hardware components and have developed it. Presence of every module has been reasoned and placed carefully thus contributing to the best working of the unit. Secondly, used advanced hardware and with the help of innovating technology the project has been successfully implemented.

FUTURE WORK

The robot can be made more adaptable by involving different connection lengths for front and back legs. Intelligence can be improve by introducing different types of sensors and vision to improve the effectiveness of this robot in future Scope of movement and minutes accessible at each joint are the best worry as it is significant for accomplishing position and bug strolling. The robot can also be optimized in its movement. This could be done by extensive testing and coding.

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