SPIDER ROBOT FOR SCOUTING AND DEFENSE PURPOSE

Project Reference No.:*45S_BE_2717*

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Keywords

EPF, IOS, Android, Face Recognition, Database, Machine learning, CMake, Dlib, PyCharm, Android studios.

Introduction

ROBOTS

Important developments have been made in the history of science and technology. Among them, the concept and applications of robots is developing year by year. Speed and economic advantages in daily life and industrial applications have increased the use of robot's day by day. Robots enhance the quality of our lives by performing tedious works and providing assistance to people with disabilities. Some of the early robots in the 1940's was used to handle the radioactive materials. In the early 1960's the robots were used to pick up and place objects in new locations. The robot is an electromechanical system which is capable of autonomous or preprogramed tasks. Robots independently can also operate under the control of a computer program such as can be directly operated by operator. Robots are powerful machines that are immensely useful in different walks of human life. They do the tasks which may be potentially risky to human life.

ROLE OF ROBOTS IN DEFENSE

Defense robots are professional service robots that are deployed by the military in combat scenarios. They're often intended to enhance a soldier's existing capabilities while keeping them out of threat as much as possible. Defense robots contribute to military superiority by giving troops an advantage at the ground level. Defense robots come in many shapes and sizes, but most serve the same basic functions of protecting and enabling soldiers in combat. These robots can be enabled for operating in dangerous situations to keep soldiers at a safer distance like Spybots, to gain access to places stealthily which may be difficult for humans or may pose a risk to human life.

MOTIVATION

To show Support and Gratitude to our Brave Soldiers of the country who have dedicated their life to safe guard us every day by putting their lives at risk. So, concerning about their safety we are developing this project so that we could join our hands towards our Soldiers safety.

Objective

(a) To develop a device that is useful for military application and can be controlled by the Indian army to scout the war fields.
(b) To achieve the surveillance of the enemy territory in stealth mode.
(c) To carry out rescue operations in a collapsed building.

Methodology

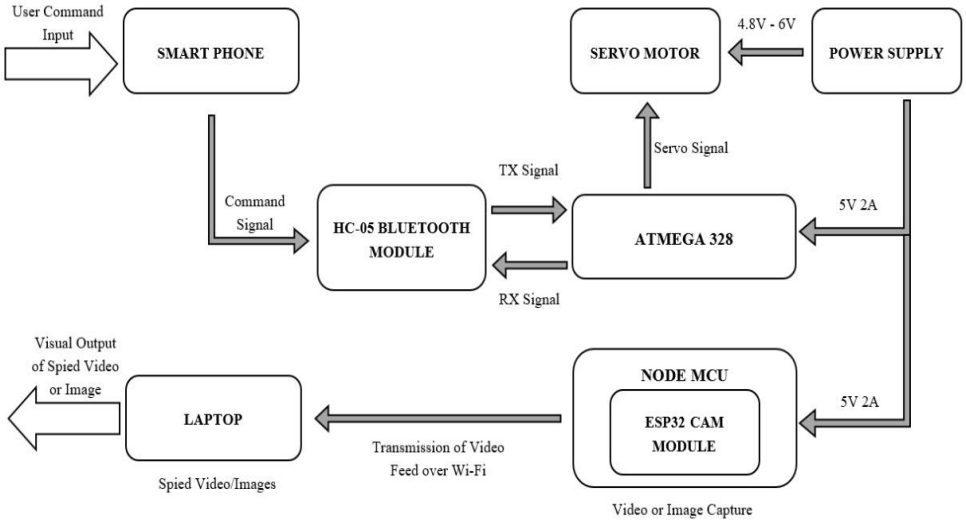

Figure 2.1 - Block Diagram of the Spider Robot

Commands are sent from the user through android application “Bluetooth RC Controller” to the HC-05 Bluetooth module, further the commands are sent through the transmitter signal to the Atmega328P Microcontroller.

Raising Leg: The robot is perfectly balanced on four legs. When one of the robot's legs is elevated, the robot's centre of mass must shift or the robot will fall. As a result, balancing the robot is critical.

Forward/backward/left/right movement One of the legs is elevated first, and then it is moved to the appropriate position. The servo connected to the body continuously reaches its initial angle in order to step forward, backward, left, or right. The servo motor in each leg will adjust its angle to the appropriate position. Through the use of inverse kinematics.

Walking pattern: Stability is the key criterion for the quad robot to stand upright and walk, and there are two sorts of stabilities: active and passive. Passive stability requires no control or adjustment for a robot to remain upright, whereas active stability necessitates constant placement for the robot to remain upright. When a quad-robot stands, it maintains passive stability by keeping three of its legs on the ground while the fourth leg moves to the desired position. The quad-robot requires a unique walking pattern known as "GAIT" in order to walk. The creep gait is utilised here. Now, choosing leg one for the first swing has resulted in 3! =6 gaits.

Servo mechanism: The servo motors used in this application are mg90s. It has 2.2kg cm torque. It contains mechanical gears and an operating voltage range of 4.8v to 6v dc. The servo motor can position itself from a minimum of 180 degrees.

Creep gait mechanism:

The robot maintains its centre of gravity within the triangle depicted in the figure below. If the centre of gravity moves outside the triangle for an extended period of time, the robot will lose stability and fail.

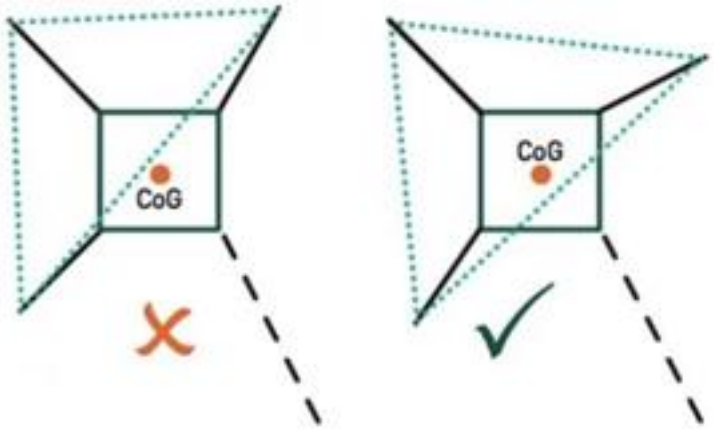

Figure 2.2 – Balancing of Spider Robot

Creep gait step by step procedure:

1. To the left, is the initial position, where two legs are pulled inwards and the other two are extending out on one side.
2. Top right leg reaches out and steps first.
3. Remaining legs move backwards, resulting in the body to move forward.
4. The left leg of the lower portion of robot lifts and steps ahead of the robot.
5. Now the left leg to the top reaches ahead of robot.
6. Now all legs shift back and push the body forward.
7. The right leg to the lower part of the body. steps back into body bringing to initial position.

Figure 2.6 – Assembled Structure & Figure 1.5 - Laser Cut Physical Parts

Results and Conclusion

As mentioned in the methodology, we have completed the structure development of the spider robot by assembling the laser cut physical parts as shown in Fig 2.4, 2.5, 2.6. Further we are referring technical papers to implement continuous walking algorithm and take the live video feedback from the spider robot.

Scope for Future Work

Because this robot is basic in design, extra sensors and a mechanism to control this robot remotely from a remote site may be added. It can also carry a payload of 850 grams, which is the actual size of grenade that can be employed as self-destructive. The possibilities are numerous, but it is necessary to consider the weight of the extra components because servos have a weight tolerance limit. In that circumstance, servos with higher torque are employed. Implement face recognition for rescue operations, such as in hijacked locations. We train hostages data so that enemy(non-hostage) positions are marked and take the further actions required. And also send the robot in enemy base camp so that it can recognize criminals