Topic: Surveillance Quadruped Robot

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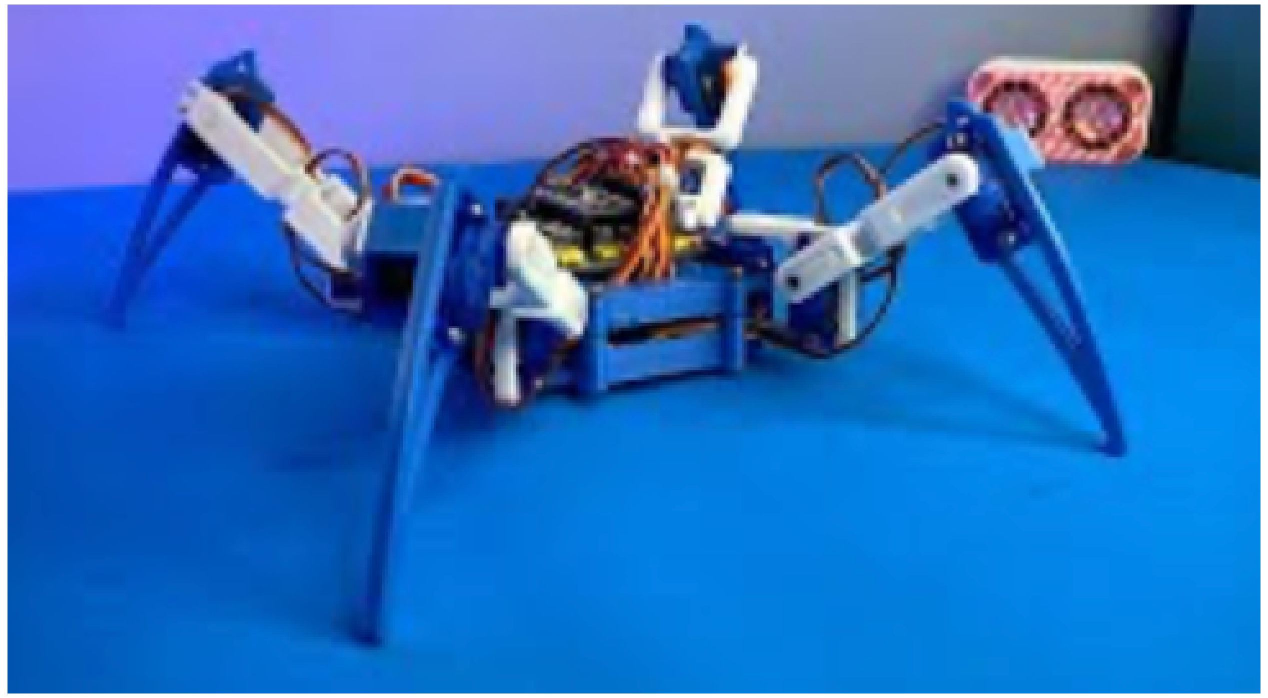
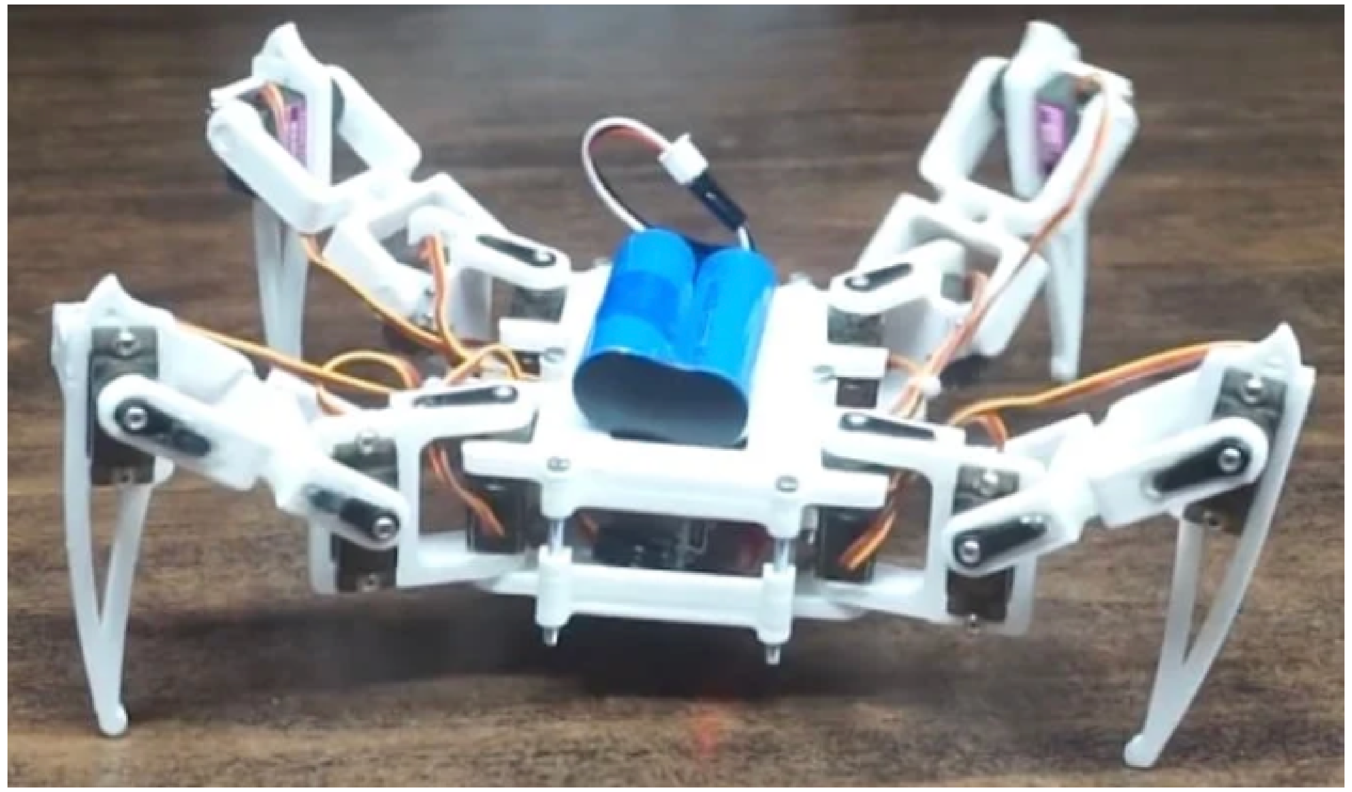
Introduction



A surveillance quadruped robot is a robotic system designed to perform surveillance and monitoring tasks in various environments. Unlike traditional wheeled or tracked robots, quadruped robots have four legs, providing them with unique mobility capabilities such as traversing uneven terrain, climbing stairs, and navigating cluttered spaces.



These robots are equipped with sensors, cameras, and communication modules to gather information, perform analysis, and transmit data for surveillance purposes. The design and functionality of surveillance quadruped robots make them well-suited for applications in security, defense, search and rescue, environmental monitoring, and exploration.

Applications

1. Security and Defense
2. Search and Rescue Operations
3. Environmental Monitoring
4. Exploration and Mapping
5. Urban and Indoor Surveillance

Objective

The objective of surveillance quadruped robots is to enhance surveillance and monitoring capabilities in various environments by leveraging the unique mobility and sensor integration features of quadruped robot platforms.

It also provides a versatile, adaptable, and efficient platform for enhancing situational awareness, operational capabilities, and safety in surveillance, monitoring, and security applications across various domains.

Input

1. <u>Sensor Data</u>:
   - Camera Feeds: Visual data from onboard cameras, including RGB, infrared, thermal, or night vision cameras.
   - LiDAR Data: 3D point cloud data for mapping, obstacle detection, and navigation.
   - Environmental Sensors: Data on temperature, humidity, air quality, gas detection, radiation levels, etc., for environmental monitoring.
   - Motion Sensors: Accelerometers, gyroscopes, and encoders for measuring movement, orientation, and speed.
   - Proximity Sensors: Ultrasonic sensors, infrared sensors, or laser range finders for detecting obstacles and proximity to objects.

2. <u>Navigation and Localization Data</u>:
   - GPS Data: Global positioning system data for outdoor localization and navigation.
   - IMU Data: Inertial measurement unit data for orientation, angular velocity, and acceleration measurements.
   - Odometry Data: Wheel encoders or leg joint encoders for measuring distance traveled and estimating position.

3. <u>User Inputs</u>:
   - Command Inputs: Instructions or commands from operators or control systems for mission planning, task execution, and control modes.
   - Waypoints: Navigation waypoints or target locations provided for autonomous navigation and path planning.

Output

1. **Control Outputs**:
   - Motor Commands: Control signals for actuators such as motors, servos, or hydraulic systems to control leg movements, joint angles, and body orientation.
   - Manipulator Commands: Control signals for robotic arms or grippers to perform manipulation tasks, such as picking up objects or pressing buttons.
   - Communication Commands: Transmission of data packets, telemetry information, or status updates to external systems or control centers.

2. Communication Outputs:
   - Wireless Communication: Transmission of data, video feeds, and commands over Wi-Fi, cellular networks, or other wireless protocols.
   - Network Communication: Integration with networked systems for data sharing, remote control, and coordination with other robots or devices.

3. Alerts and Notifications:
   - Alarm Signals: Alerts or alarms triggered by detected anomalies, intrusions, or safety hazards.
   - Status Updates: Status reports, system diagnostics, and error notifications for operational monitoring and troubleshooting.

Methodology

1. **Define Requirements:** Clearly define the project's objectives and scope.
2. **Research and Analysis:** Research existing technologies and analyze their suitability.
3. **Conceptual Design:** Develop conceptual designs of the robot's structure and components.
4. **Select Components:** Choose hardware components and sensors based on requirements.
5. **CAD Modeling:** Create detailed 3D models and simulate the robot's behavior.
6. **Electronics Integration:** Integrate electronic systems for control and communication.
7. **Software Development:** Develop software for autonomy, navigation, and control.
8. **Testing and Validation:** Test the robot's functionality and performance in various scenarios.
9. **Iterative Refinement:** Refine and optimize the design based on testing feedback.
10. **Deployment:** Deploy the robot in real-world environments and conduct field testing.
11. **Documentation and Training:** Document the design and provide training for users.

Hardware Requirements

Arduino Nano – V3 235

Raspberry Pi Zero W - 1.5K

Raspberry Pi camera – 380 (5MP)

5V to 3.3V logic level Shifter – 23

Nano 328 P Expansion Adapter - 100
Breakout Board IO Shiel

SG90 Mini servo 12 pieces – (72x12)

Buck converter LM2596 – 45

Lithium ion Battery 2 pieces – 130

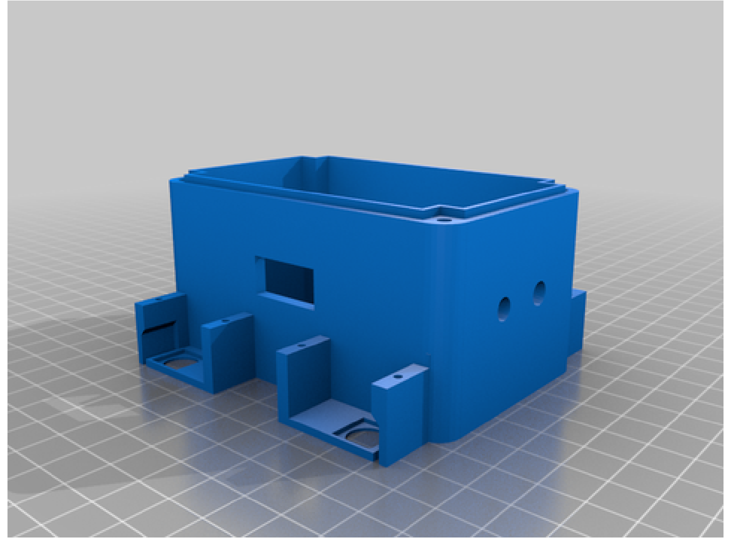
Leds * 2 pieces - 160

Jumper wires – 100

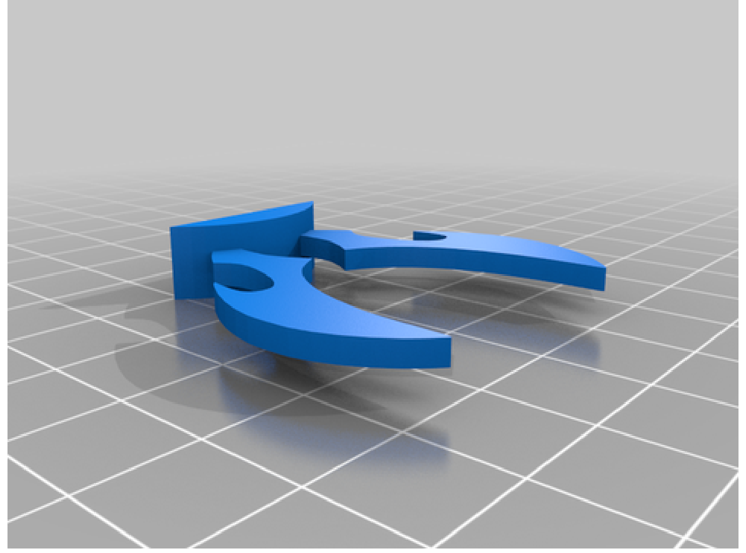
TOTAL : 3537/-

Per person : 884.25/-

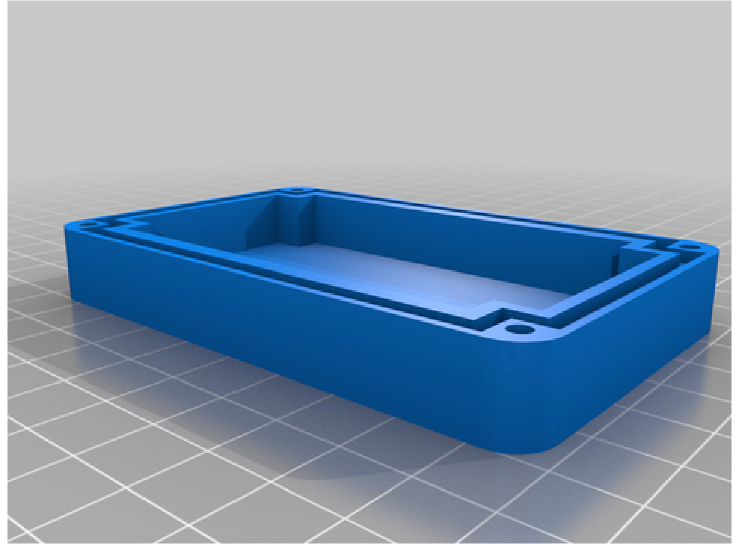
Parts of the Model



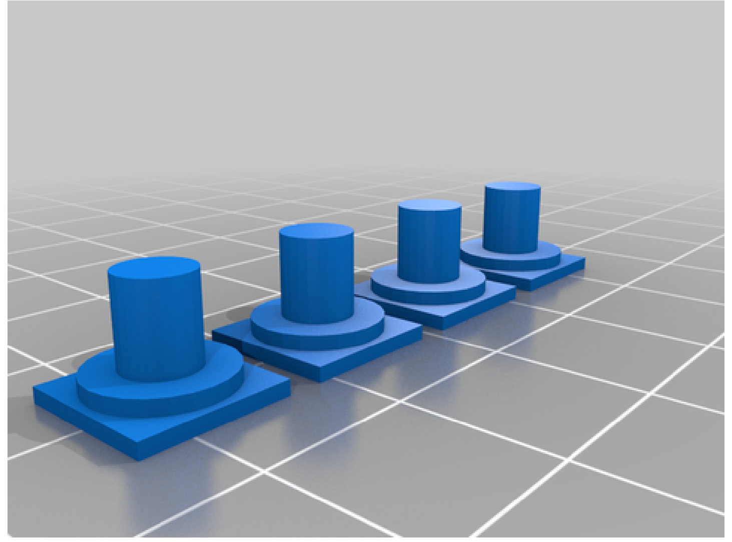
Robot_Base x 1



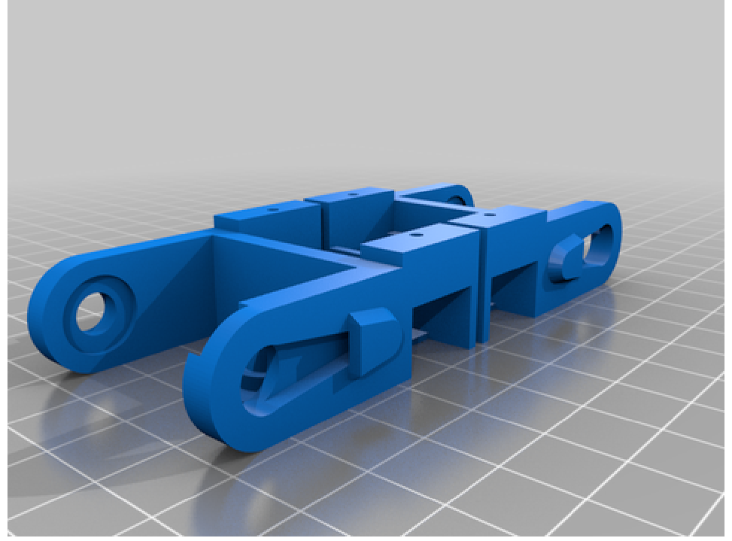
Robot_Front x 1



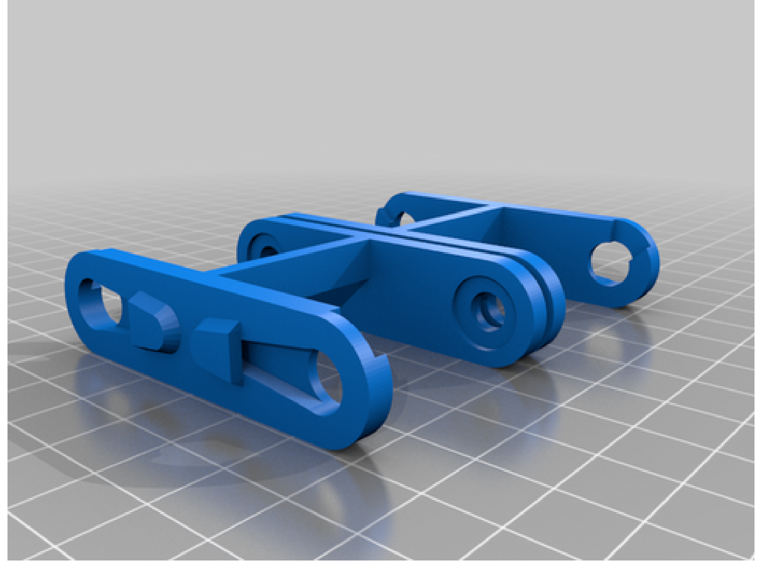
Robot_Top x 1



Robot_Shafts x 1



Robot_Coxa x 2



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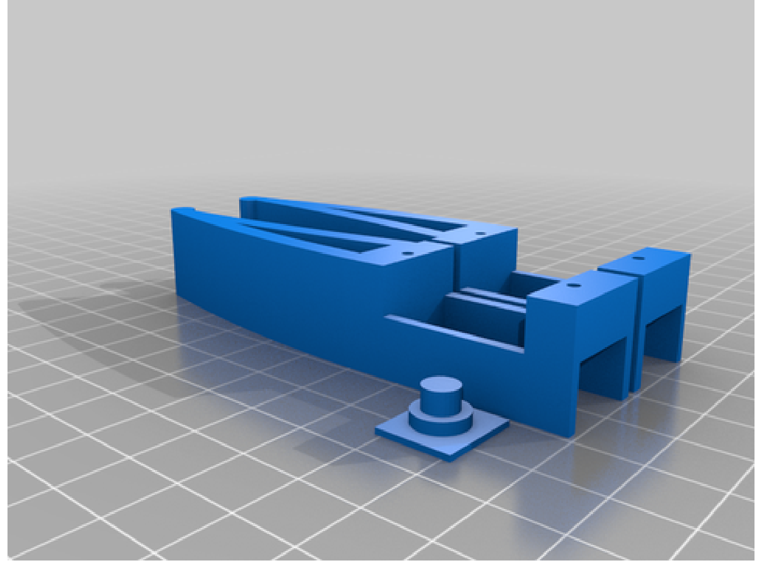

Robot_tibia x 2

PEAS

1. **Performance measure**: This component specifies the criteria for evaluating the agent's behavior. It defines what success means for the agent and how its performance will be assessed.
2. **Environment**: This refers to the external context or surroundings in which the agent operates. It includes all the entities, objects, events, and conditions that the agent interacts with or perceives.
3. **Actuators**: Actuators are the mechanisms or components through which the agent can act upon the environment. They enable the agent to perform actions or tasks based on its goals and decisions.
4. **Sensors**: Sensors are the input devices that allow the agent to perceive and gather information about the environment. They provide feedback to the agent by capturing data from the surroundings. Sensors can include cameras, microphones, temperature sensors, motion detectors, and more.