Terran Viper

Semi Autonomous Terrain Reconnaissance and Surveillance Security Robot

01

Identification

- What is the problem?
  - Traditional surveillance devices struggle with navigating narrow tunnels, debris-filled areas, or confined spaces, lacking the flexibility needed for effective reconnaissance in variable environments.
- Who is Affected?
  - Security forces, rescue teams, and military personnel requiring enhanced surveillance and reconnaissance in hazardous or hard-to-reach areas.

02

Justification

- Why it is important and What are its benefits?
  - Flexible robots excel in risky areas, accessing challenging sites like collapsed buildings. Real-time video, audio, and depth mapping enhance situational awareness and decision-making.

03

Novelty

- Unlike most traditional robots with limited movement mechanisms, this robot integrates three distinct modes of motion: serpentine, sidewinding, and rectilinear.
- These motion types are inspired by biological snakes, enabling unparalleled adaptability to diverse terrains such as narrow spaces, loose sand, or steep inclines.

A snake-inspired robot with three motion modes for versatile terrain adaptability. Equipped with a camera, it's ideal for surveillance, search and rescue and can move in confined spaces.

04

Functionality

- Yaw and pitch motion with two servo motors per segment for precise flexibility.
- Supports serpentine, rectilinear, and sidewinding motions for varied terrains.
- Operates in wireless and wired modes for versatile functionality.
- Controlled via pre-coded equations with a user-friendly interface.
- Equipped with a camera for real-time video and depth detection on a remote PC.

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Course Name: Engineering Design- DFP

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Design Detailing

Motion Mechanism of Links

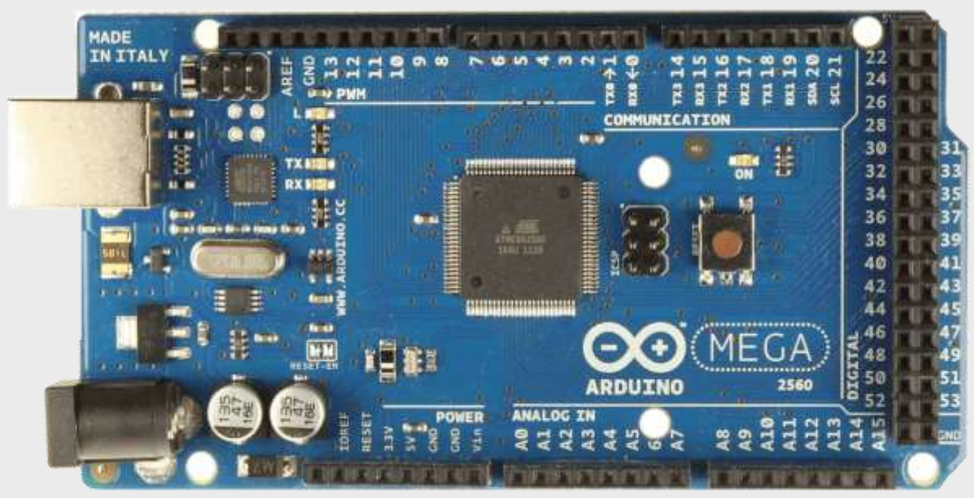
Yaw and Pitch Motion:
Two high torque MG995 Servo Motors mounted orthogonally, responsible for Yaw and Pitch motion of the links.

Camera Integration and Live Video Transmission

- A monocular camera is utilized to capture video, which is transmitted wirelessly via a dedicated transmitter. The received video feed is processed to generate a depth map and perform voxel-based mapping for enhanced spatial analysis.

Microcontroller (Arduino Atmega 2560)

- **More I/O Pins**: Offers a larger number of digital and analog I/O pins, ideal for connecting multiple servos and sensors.
- **Higher Processing Power:** Equipped with more memory (256 KB flash, 8 KB SRAM) and faster processing capabilities, making it suitable for handling complex tasks.
- **Better for Complex Projects:** Ideal for applications requiring simultaneous control of multiple components, like our snake robot.



Bill of Materials

Name	Price	Quantity	Total Cost
Arduino Mega R3 (Atmega 2560) Model: - Atmega2560	₹ 4,000	1	₹ 4,000
Servo Motor Model:- Pro-Range OT5325M	₹ 1,314	10	₹ 13,140
LoRa module (For wireless Communication)	₹ 649	1	₹ 649
RS485 series (For wired Communication)	₹ 485	5	₹ 245
Ronshin Caddx Turbo Micro F2 1/3in CMOS 2.1mm 1200TVL 16:9/4:3 NTSC/PAL Low Latency FPV Camera W/ Microphone (Camera)	₹ 4200	1	₹ 4200
Eachine TX805 5.8G 40CH 25/200/600/800mW VTX (Video Transmitter)	₹ 1720	1	₹ 1720
Eachine ROTG02 UVC OTG 5.8G 150CH Dual Antenna Audio FPV Receiver	₹ 4500	1	₹ 4500
Orange A Grade ISR 18650 22000 mAh (Power Supply)	₹ 200	10	₹ 2000
RS485 Module (MAX485)	₹ 115	2	₹ 230
Arduino Uno	₹ 523	1	₹ 523
USB TO UART TTL 5V 3.3V FT232RL	₹ 300	1	₹ 300
Miscellaneous	₹ 4000	-	₹ 4000
Total	-	-	₹ 35,507

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Motion Visualization

1. Serpentine



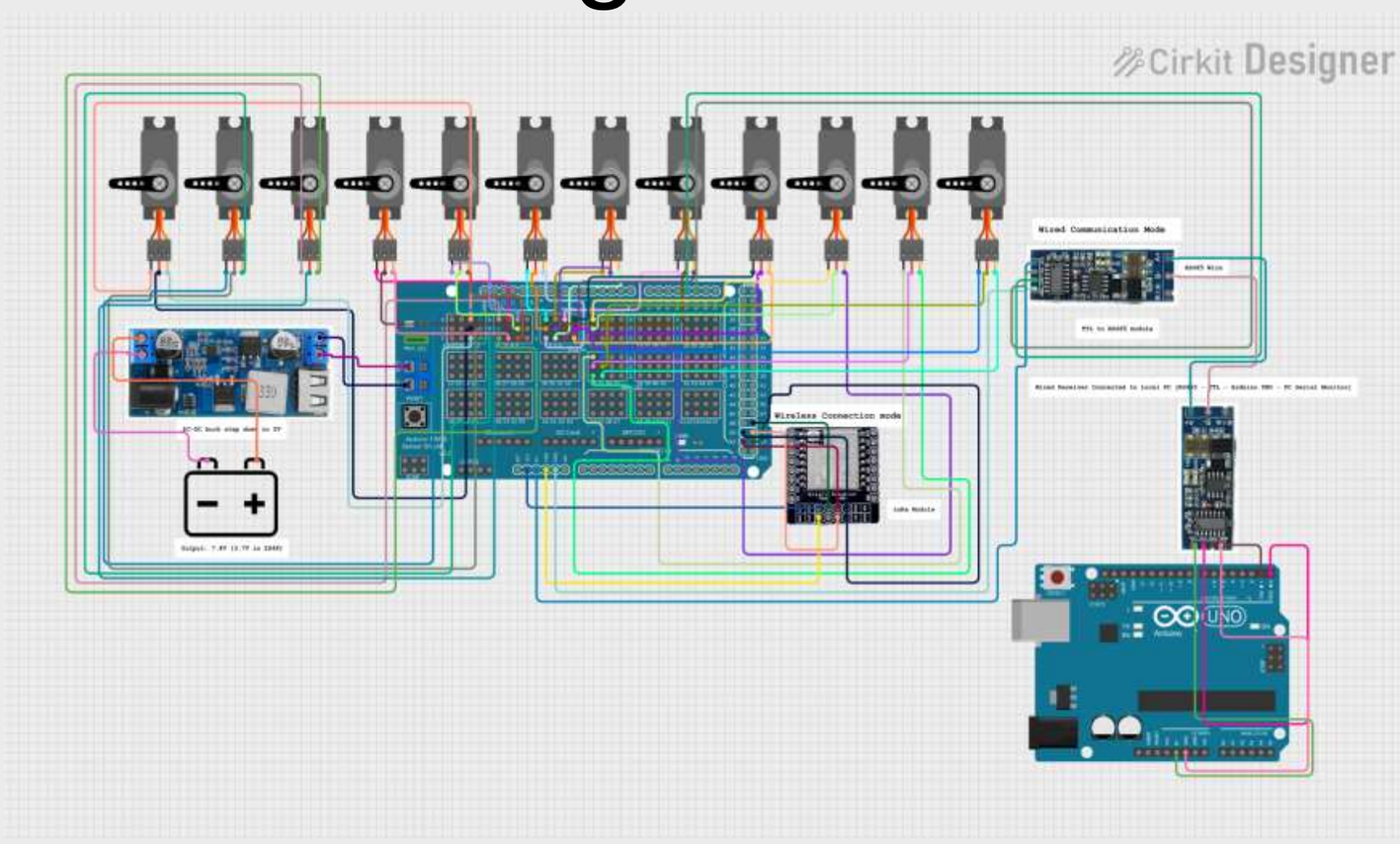
2. Rectilinear



3. Side Winding



4. Circuit Diagram



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