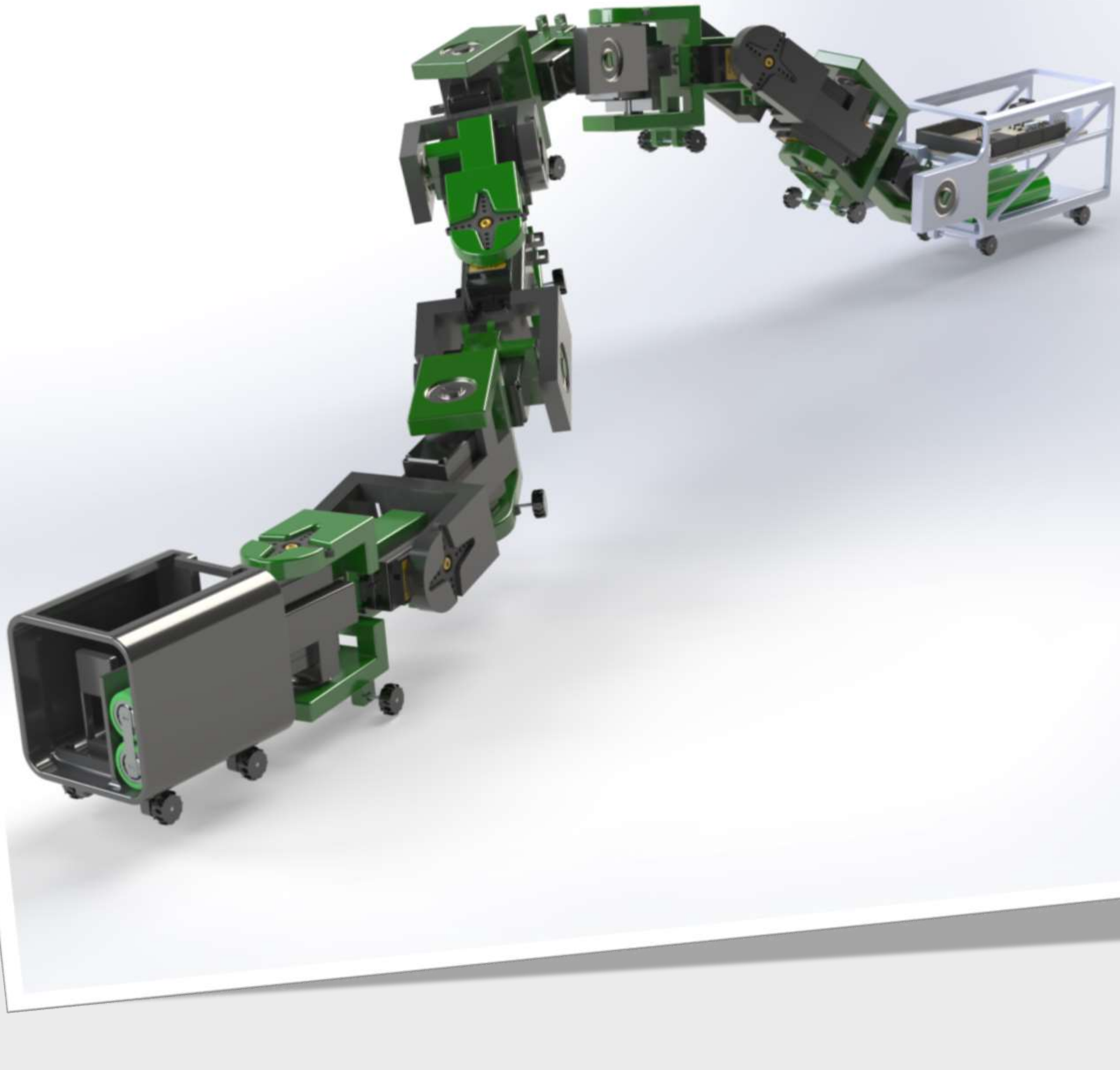
Terran Viper

Semi Autonomous Terrain Reconnaissance
and Surveillance Security Robot



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Mentor: Dr. M.Z. Ansari, Associate Professor

Course Name: Fabrication Project - DFP

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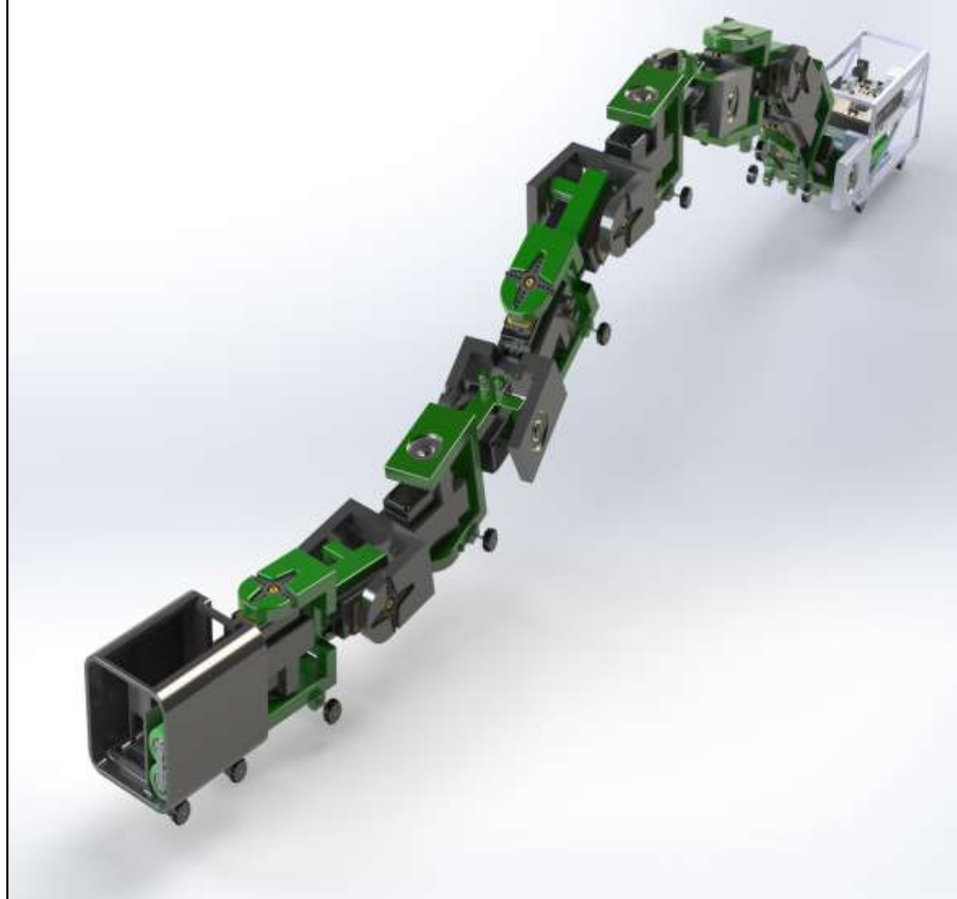

01
Identification

- 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 in alternate links 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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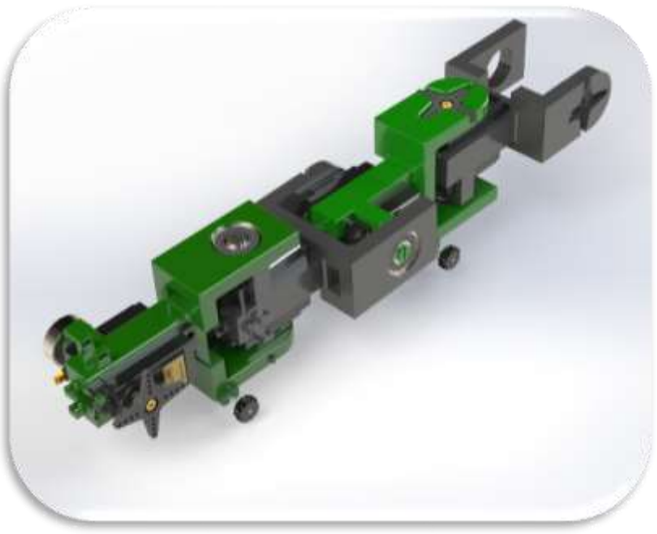
Design Detailing

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.

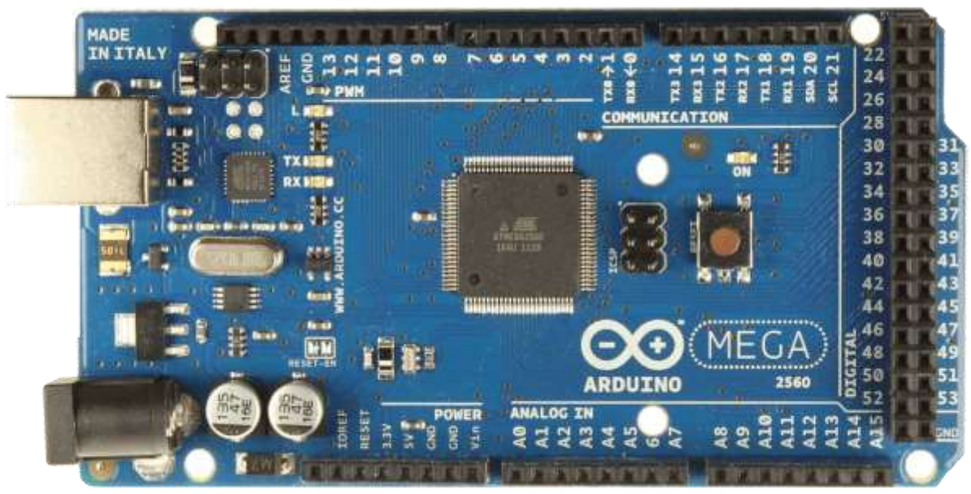


Camera Integration and Live Video Transmission

- A monocular camera is utilized to capture video, which is transmitted wirelessly via a ESP32 Cam Module. The received video feed is processed to generate a depth map 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 2560-16U2) Model: - Atmega2560	₹ 1199	1	₹ 1199
TowerPro Servo Motor Model:- Pro-Range MG995	₹ 272.5	12	₹ 3720
SX1278 LoRa module (For wireless Communication)	₹ 398	2	₹ 796
LoRa Antenna (For wired Communication)	₹ 54	2	₹ 108
600TVL 170 Degree Mini FPV AV Camera with Audio for Mini 200 250 300 Drone (Camera)	₹ 838	1	₹ 838
Boscam FPV 32CH 5.8G 600mW Wireless Transmitter (Video Transmitter)	₹ 2028	1	₹ 2028
5.8G UVC OTG Android AV Phone Receiver	₹ 2370	1	₹ 2370
DMEGC INR21700-45E 3.7V 4500mAh Li-Ion Battery (Power Supply)	₹ 272	5	₹ 1360
MAX485 TTL To RS485	₹ 24	2	₹ 48
Arduino Uno	₹ 229	2	₹ 458
eSun PLA+ 1.75mm 3D Printing Filament 1kg-White	₹ 1239	1	₹ 1239
DC-DC Step-up Module with Adjustable Booster Power Supply Module	₹ 139	1	₹ 139
Male to Male Jumper Wires 40 Pin 30cm	₹ 67	1	₹ 67
LWC-CA-SMA-JACK-BH-ST-UFL-1.13mm RF Cable Assemblies-15cm	₹ 69	2	₹ 138
Male to Female Jumper Wires 40 Pin 40cm	₹ 107	1	₹ 107
EasyMech M4 X 16mm CHHD Bolt and Nut Set-20 pc	₹ 29	2	₹ 58
RF433Mhz Module	₹ 271	2	₹ 542
Total	-	-	₹ 15,412

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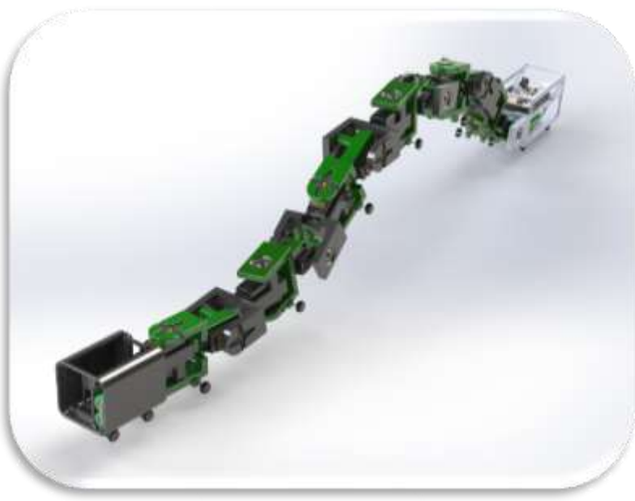
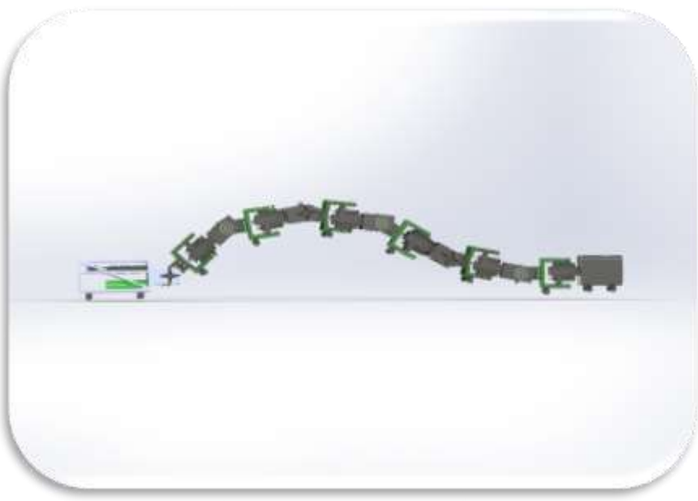
Motion Visualization

1. Serpentine

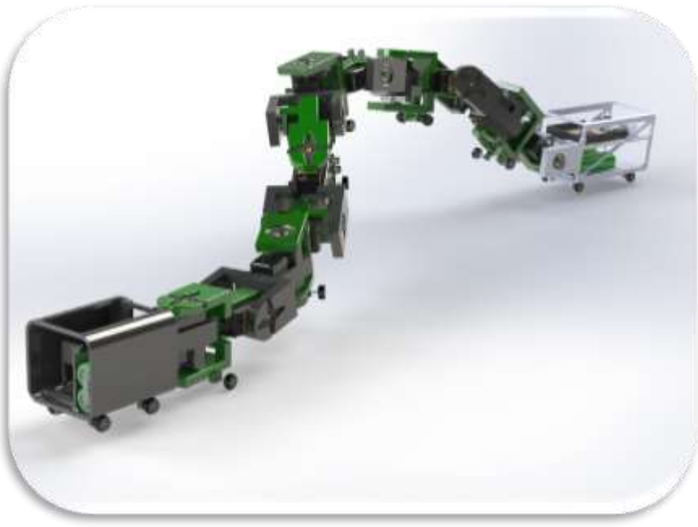


2. Rectilinear

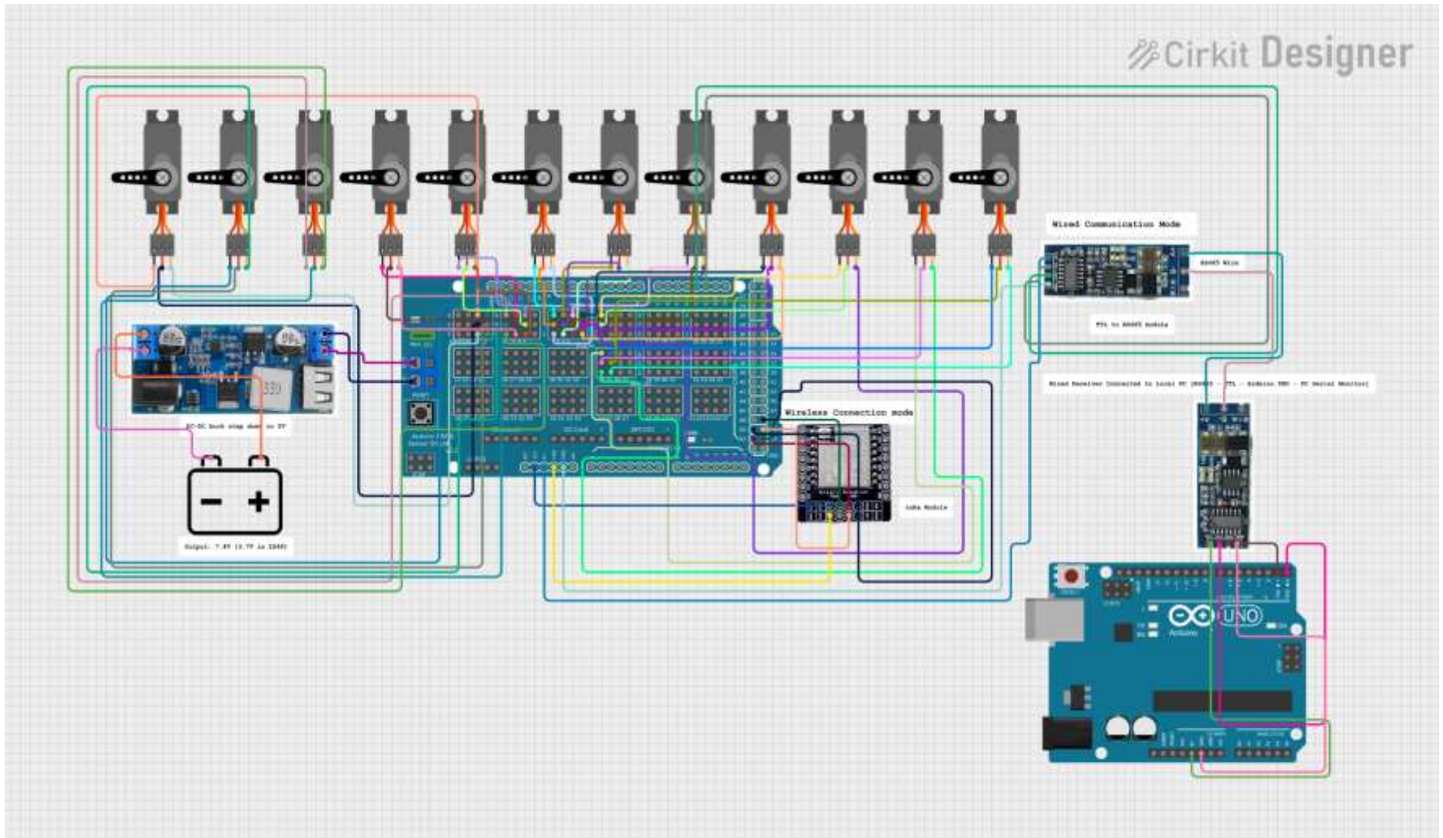




3. Side Winding





4. Circuit Diagram



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