MULTI - TERRAIN VECHILE

STEN101

GROUP MEMBERS: VARUN, SHRAVANI, AKHILA

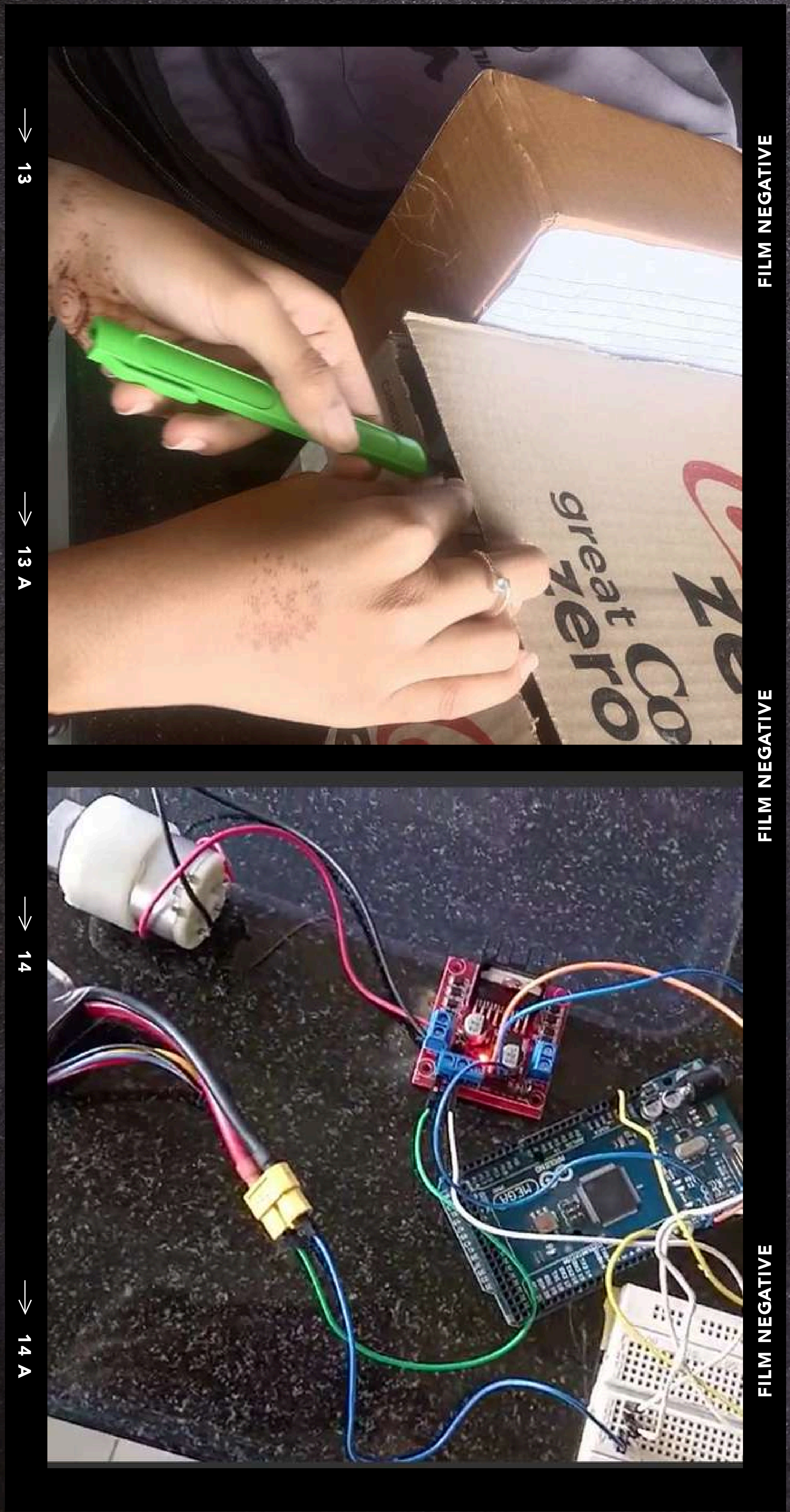
ABOUT

- A multi-terrain vehicle (MTV) is a specialized vehicle designed to traverse diverse landscapes and challenging terrains effectively.

- Unlike conventional vehicles, MTVs are engineered to operate across a wide range of surfaces, including snow, mud, sand, rocks, and water.

Importance

1. Versatility
2. Accessibility
3. Efficiency
4. Safety
5. Innovation
6. Environmental Impact



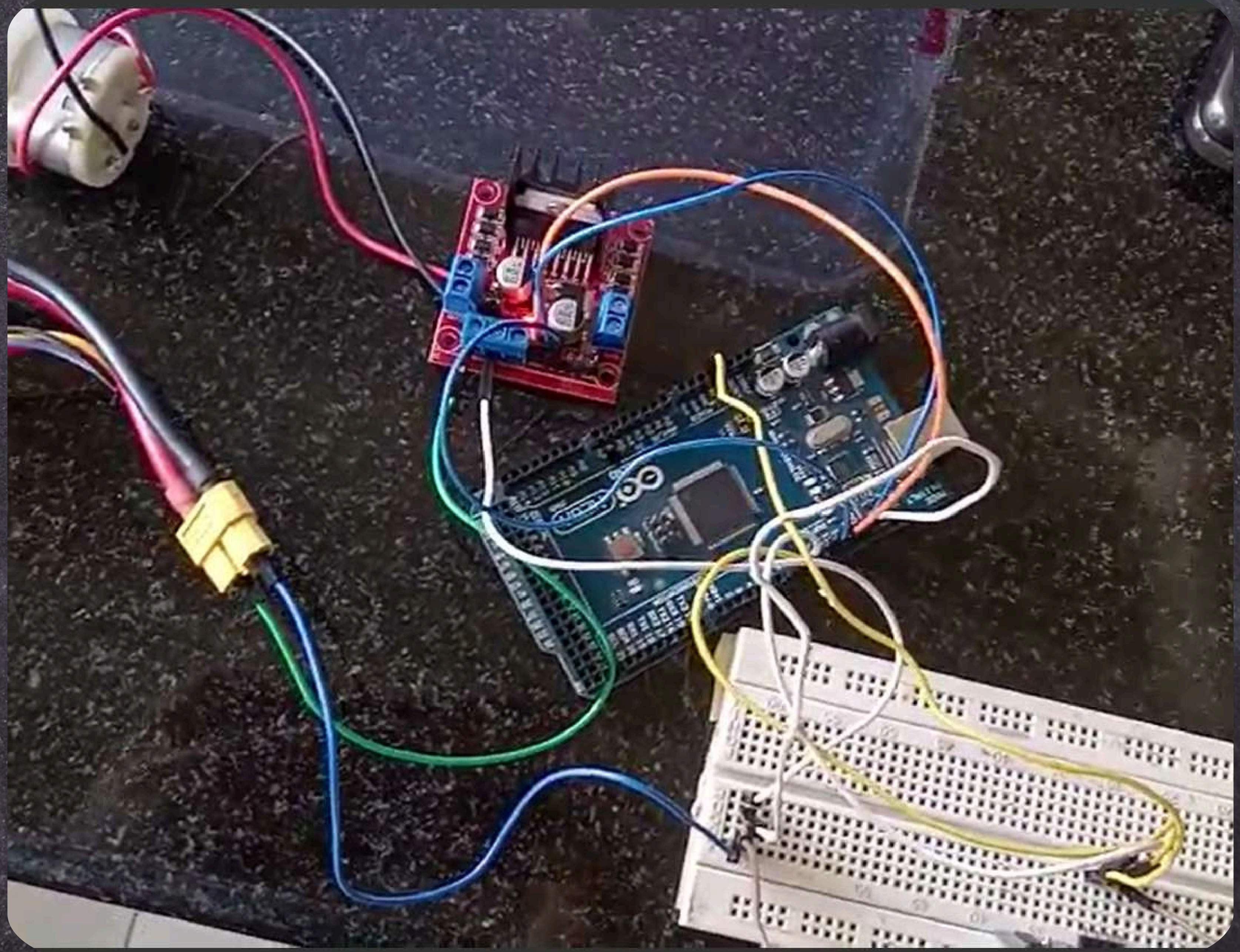
DESIGN CONSIDERATION

- Terrain Types: Account for diverse terrains.
- Payload Capacity: Determine maximum load requirements.
- Mobility and Maneuverability: Optimize for agility and tight-space navigation.
- Durability and Ruggedness: Ensure resilience to harsh conditions.
- Power Source: Choose between electric, hybrid, or internal combustion engines.
- Adaptability: Enable attachment of various components for versatility.
- Maintenance: Prioritize easy access for servicing and repairs.
- Safety Features: Include occupant protection and accident prevention measures.
- Environmental Impact: Address fuel efficiency and emissions reduction.
- Cost-effectiveness: Balance performance with affordability.

MATERIALS USED

1.Hardware Components

- Mega Arduino board
- Breadboard
- Wheels
- Power Source
- Motor, Motor Drivers
- Ultra-Sonic Sensors
- Connecting wires
- Layout Model

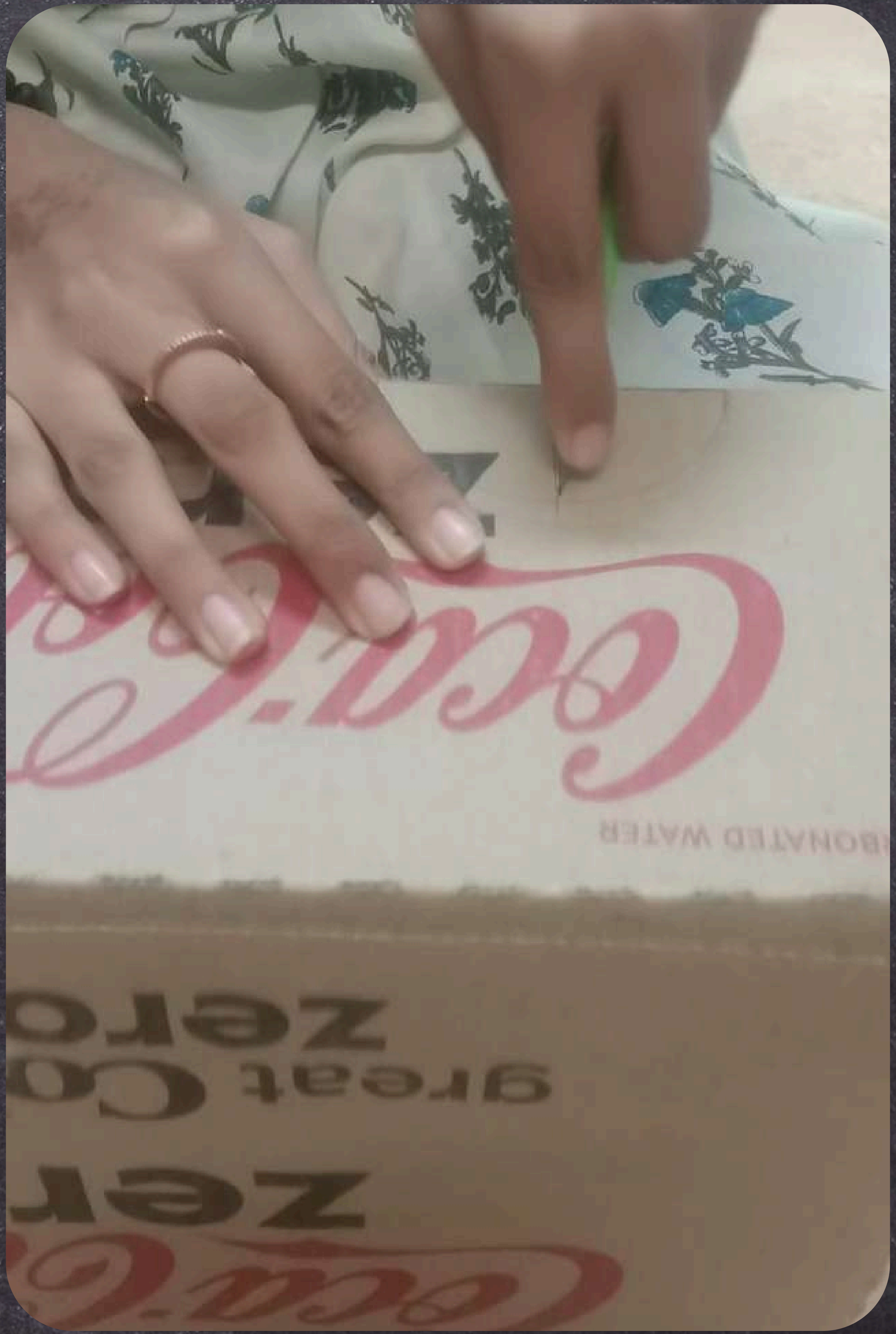


2. Software Components

- Arduino Code

PROCEDURE

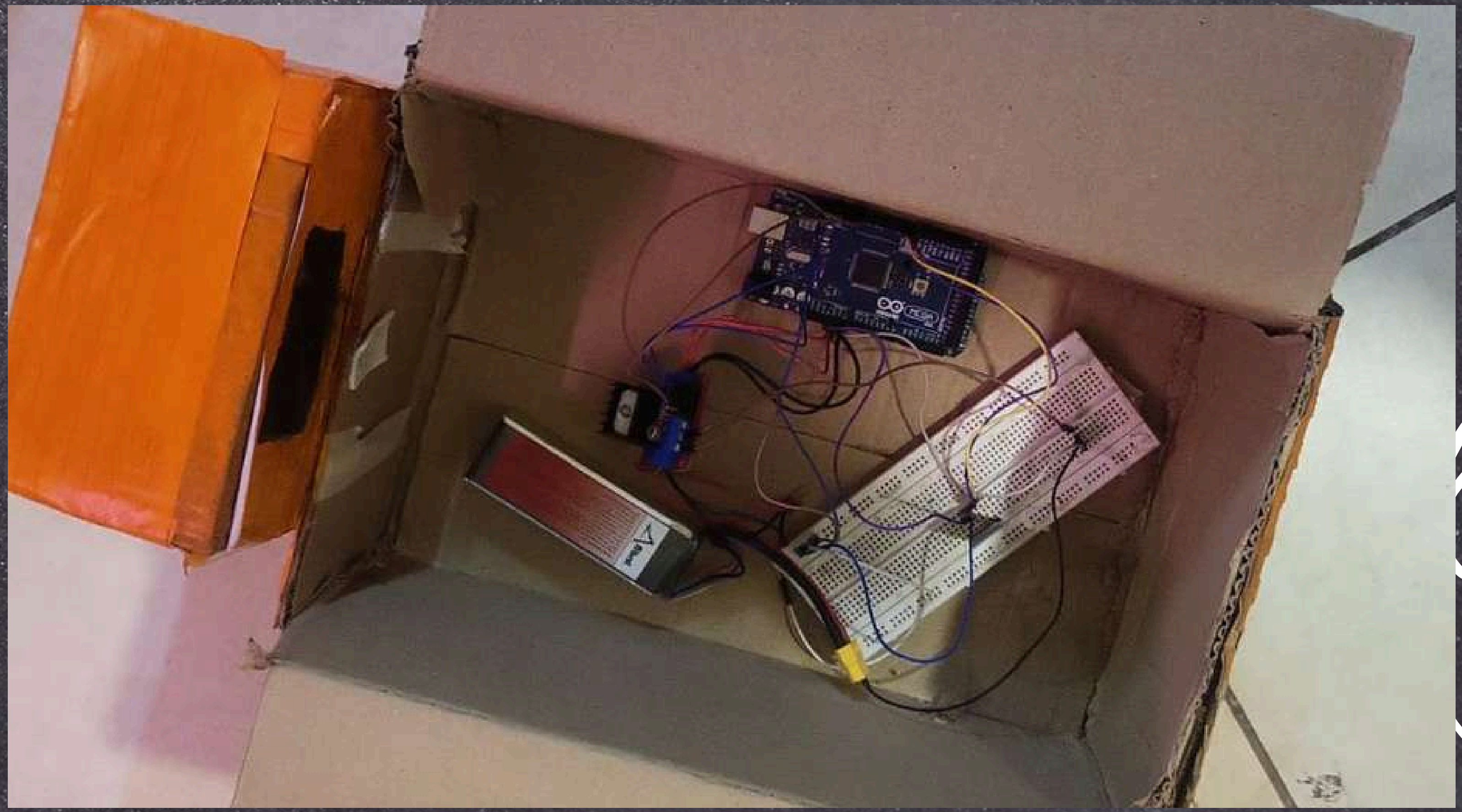
1. **Design Layout:** Choose a sturdy, lightweight chassis.
2. **Mount Motors and Wheels:** Secure motors and attach wheels.
3. Connect Motors to Motor Driver: Use jumper wires to connect.
4. Connect Motor Driver to Arduino Mega: Wire to digital pins.
5. Power Source: Connect suitable battery pack to motor driver.
6. Upload Arduino Code: Write and upload code for motor control.
7. Test and Calibrate: Verify motor response and adjust if needed.
8. Add Sensors (Ultra Sonic): Integrate sensors for navigation.
9. Arrange in the Layout Design: Arrange all the materials and connections in the Layout Designed.
10. Optimize and Refine: Adjust settings for best performance.
11. Finalize Assembly: Secure components and tidy wiring.



CIRCUIT SYSTEM

THE CIRCUIT SYSTEM IS A SIMPLE CONNECTION MADE USING

- Arduino
- Jumper Wires
- Arduino MEGA
- Motor Driver
- Wheels
- 150 rpm motors
- Bluetooth Module



The circuit system acts as the nervous system of the MTV. It carries electrical signals that control various functions like Power Management, Engine Management, Steering and Breaks, Sensor Data Processing.

ARDUINO MEGA: PROGRAMMING

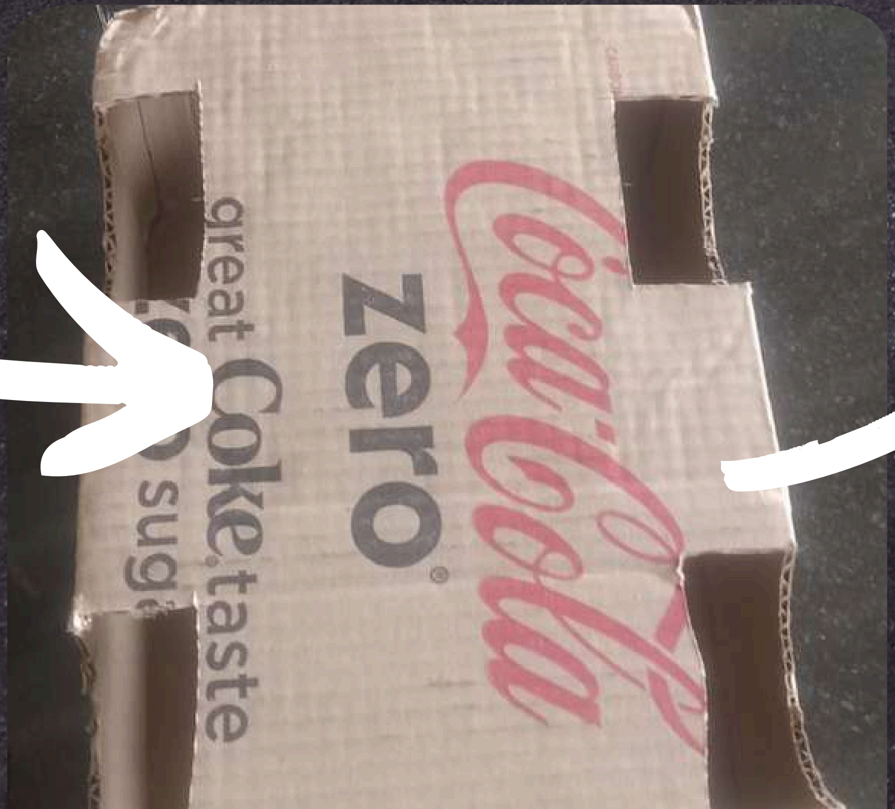
```
int in1 = 11;
int in2 = 10;
int in3 = 9;
int in4 = 8;
char turn;

void setup() {
  // put your setup code here, to run once:

pinMode(in1, OUTPUT);
pinMode(in2, OUTPUT);
pinMode(in3, OUTPUT);
pinMode(in4, OUTPUT);

Serial.begin(9600);

}

void loop() {
  // put your main code here, to run repeatedly:
  if(Serial.available()) {
    turn = Serial.read();
    Serial.println(turn);
  }

  // Serial.println(distance);


   if (turn == '1') {
    digitalWrite(in1,LOW);
    digitalWrite(in4,HIGH);
    digitalWrite(in2,HIGH);
    digitalWrite(in3,LOW);
  }
  if (turn == '2') {
    digitalWrite(in2,LOW);
    digitalWrite(in3,HIGH);
    digitalWrite(in1,HIGH);
    digitalWrite(in4,LOW);
  }
  if (turn == '3') {
    digitalWrite(in2,LOW);
    digitalWrite(in2,HIGH);
    digitalWrite(in4,LOW);
    digitalWrite(in3,LOW);
  }
```

Arduino Mega programming is crucial for building this Multi-Terrain Vehicle (MTV) because it provides the brains and decision-making power for the machine and helps in:

- Controls movement based on user input or sensors.
- Makes sense of sensor data (like terrain) for better control.
- Enables autonomous functions for obstacle avoidance and balancing.
- Offers customization for specific needs and terrains.

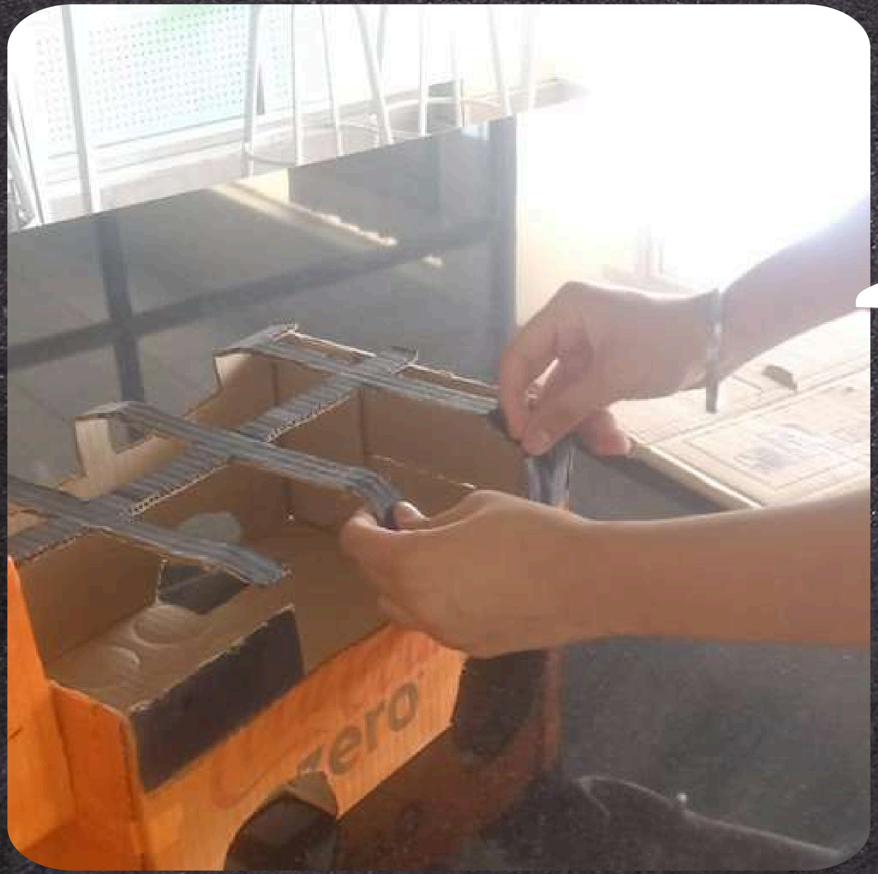
LAYOUT BUILDING

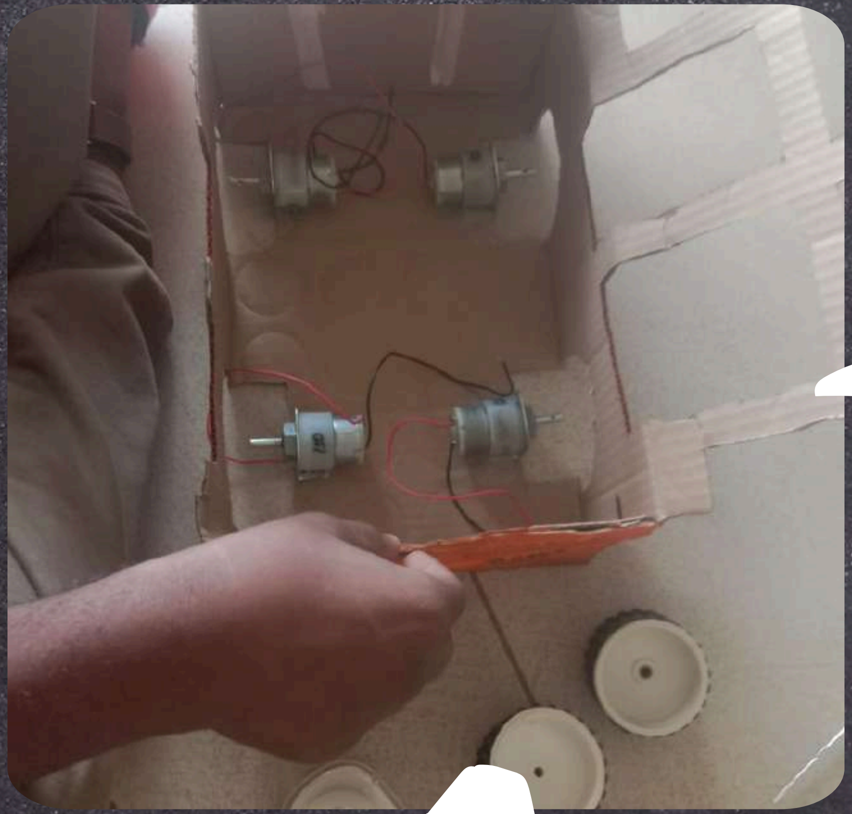
- Designed a Cardboard Layout.



LAYOUT BUILDING

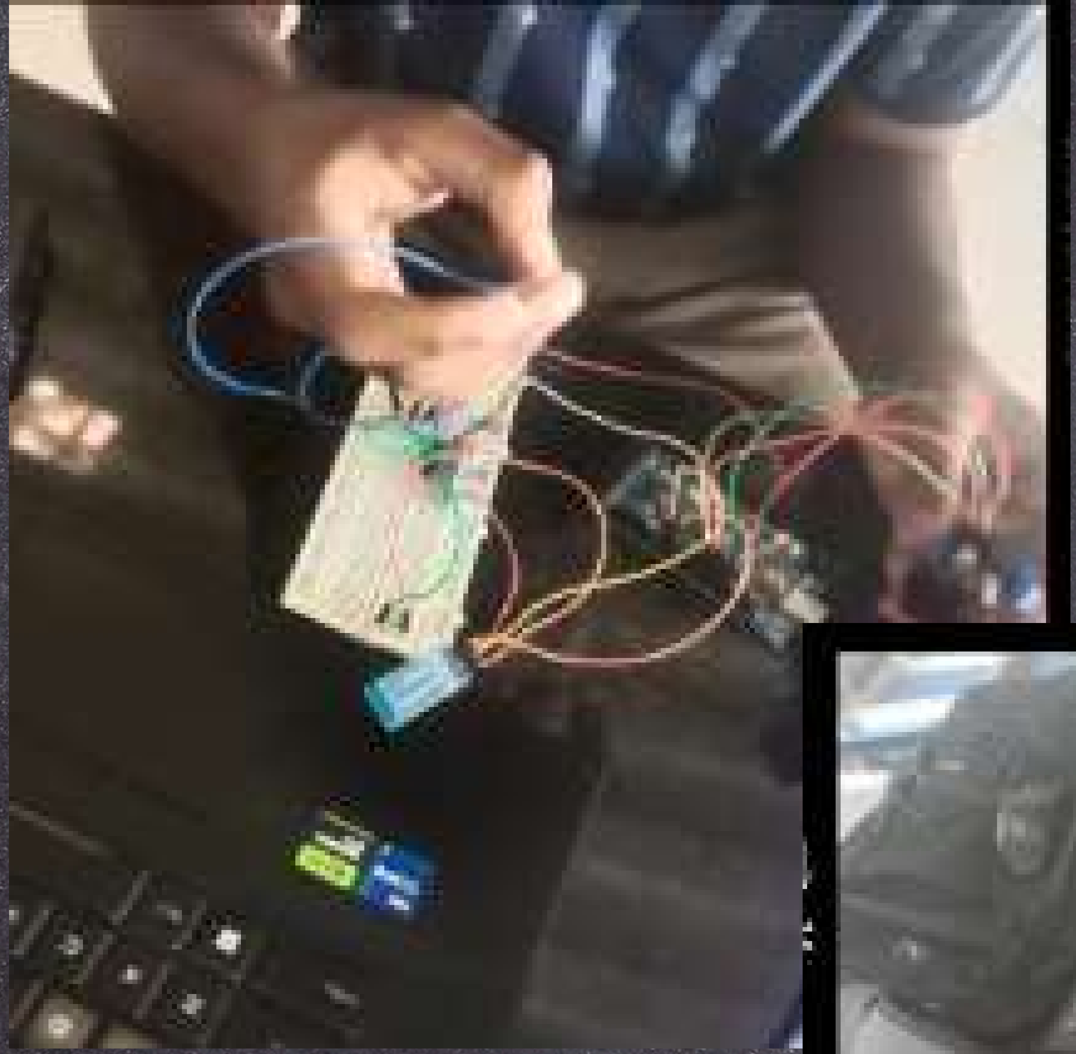
Continuation

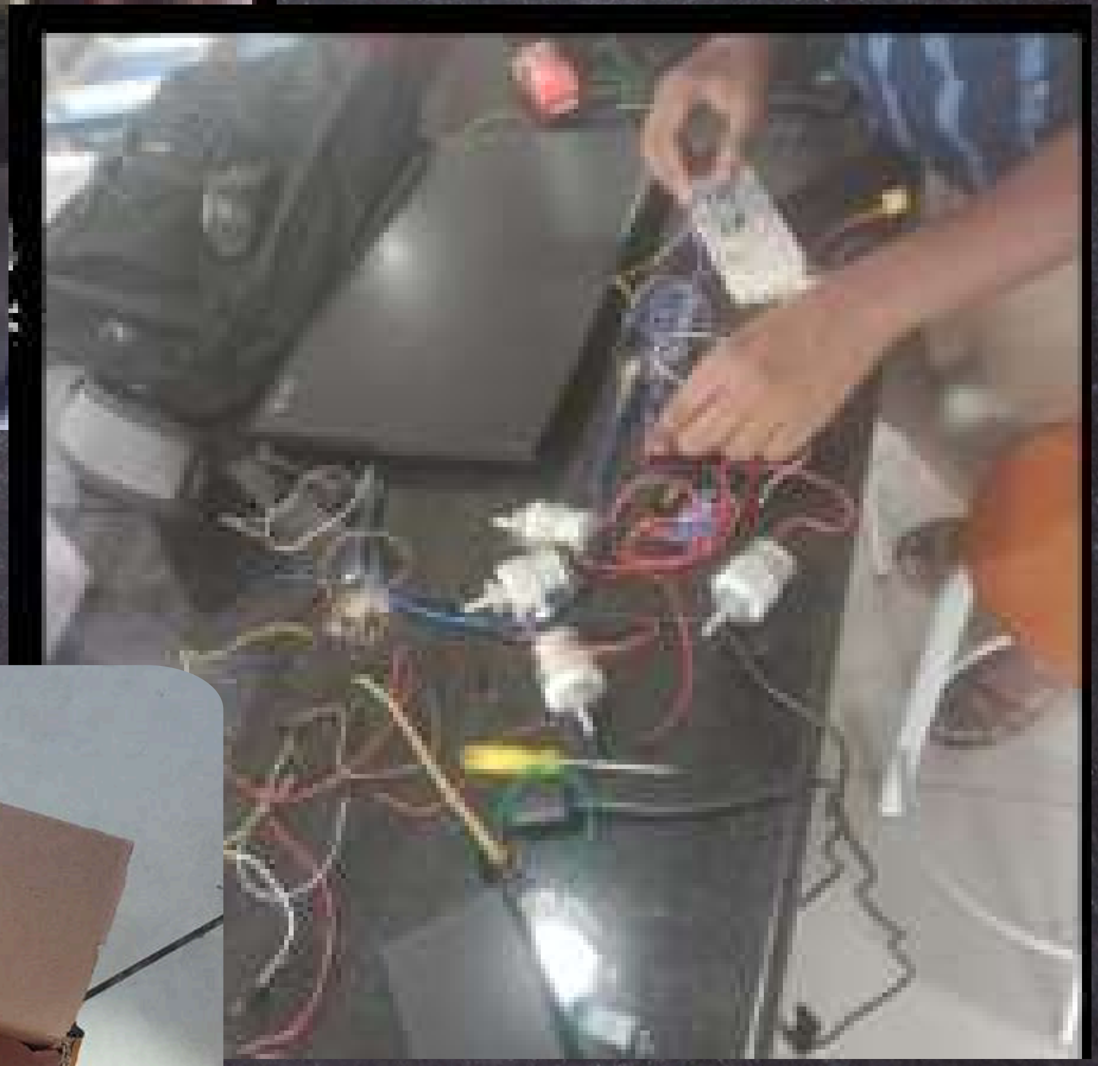


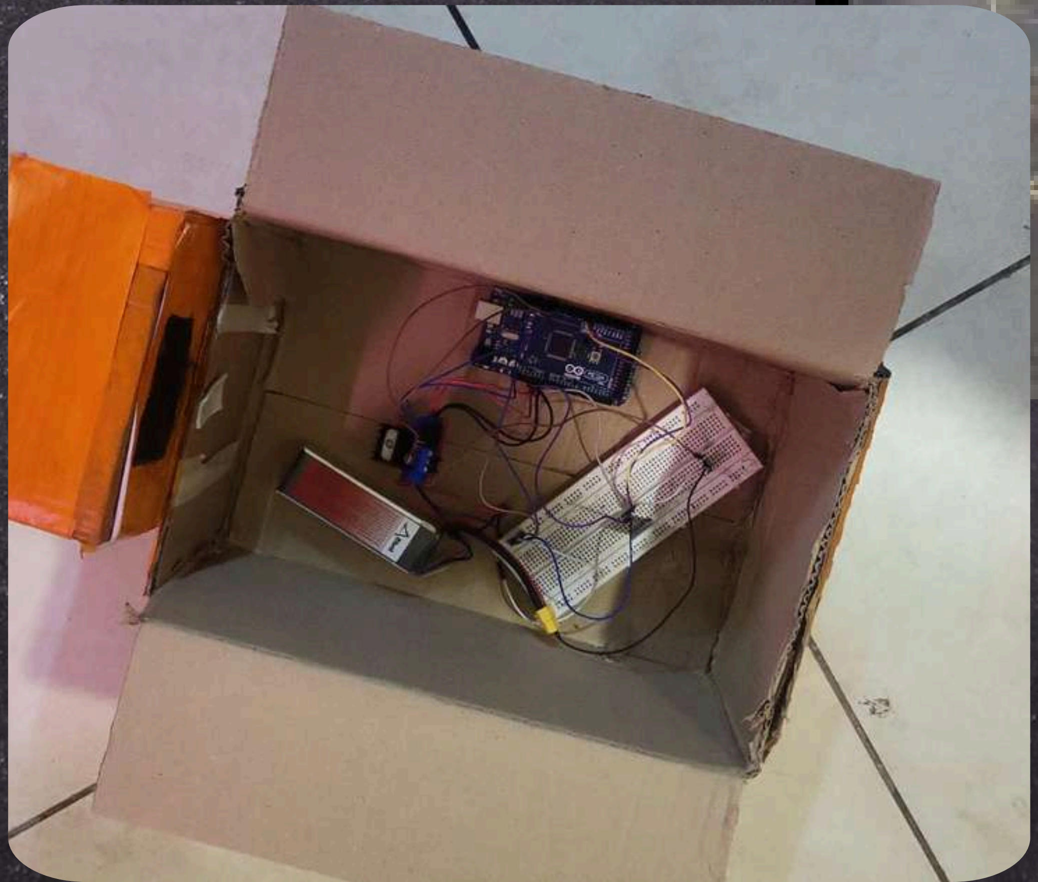


ASSEMBLING THE PARTS

1. Designing the Layout
2. Testing the circuit
3. Connecting the Auridno - Mega code
4. Assembling the complete circuit system in the Design model
5. Connecting the Model to the Auridno Mega
6. Testing the Complete Model







Subsanitation

DISTANCE PER MINUTE

- Distance per minute is calculated using the formula DPM = Circumference * RPM, RPM = 150.
- Finding Circumference = 2 * Pi * r
- Circumferences = 2 * Pi * 0.037 = 0.2325 Meters.

- Distance per minute = 0.2325 * 150
- Distance per minute = 34.38Meters

ACCELERATION

- Acceleration is the Change in velocity/ Time taken.
- Change in velocity = final velocity - initial velocity.
- Change ion velocity = 0.785 M/S(Circumferences of the wheel *RPM/60 seconds) - 0.
- Change in velocity = 0.581
- Acceleration = 0.581 / 20 seconds
- Acceleration = 0.02906 m/s^2

FORCE

- In order to calculate the force, Force = Mass * Acceleration. Where in Mass = 1 KG.
- Force = 1 * 0.02906
- Force = 0.02906 Newtons

CALCULATING TORQUE

- To calculate the Torque, The formula is Torque = Force * Radius
- Torque = 0.02906 * 0.037
- Torque = 0.001075294 Newton Meter.

CHALLENGES

1. Terrain Diversity: Designing for varied terrains requires balancing traction, suspension, and weight considerations.
2. Weight Management: Balancing durability and payload capacity while keeping weight in check is crucial.
3. Durability and Reliability: MTVs must withstand harsh conditions like temperature variations and rough terrain.
4. Power and Efficiency: Providing sufficient power while maintaining efficiency is a challenge.
5. Adaptability: Designing systems to adjust to changing terrain conditions dynamically is key.
6. Control and Navigation: Advanced control and navigation systems are needed for obstacle detection and autonomous operation.
7. Regulatory Compliance: Meeting safety and regulatory standards adds complexity to design.
8. Environmental Impact: Designing eco-friendly MTVs with reduced emissions is important.

CONCLUSION:

In conclusion, building a multi-terrain vehicle requires careful consideration of design, engineering, and technological challenges. From design construction to control systems, each component plays a vital role in ensuring optimal performance across diverse landscapes. As we continue to innovate and overcome obstacles, multi-terrain vehicles will remain indispensable in various fields, offering versatility, efficiency, and adaptability. Let's push the boundaries of MTV technology, driving advancements that meet the demands of tomorrow's challenges.

THANK YOU VERY MUCH!