PROJECT VAMPIRE

Team members
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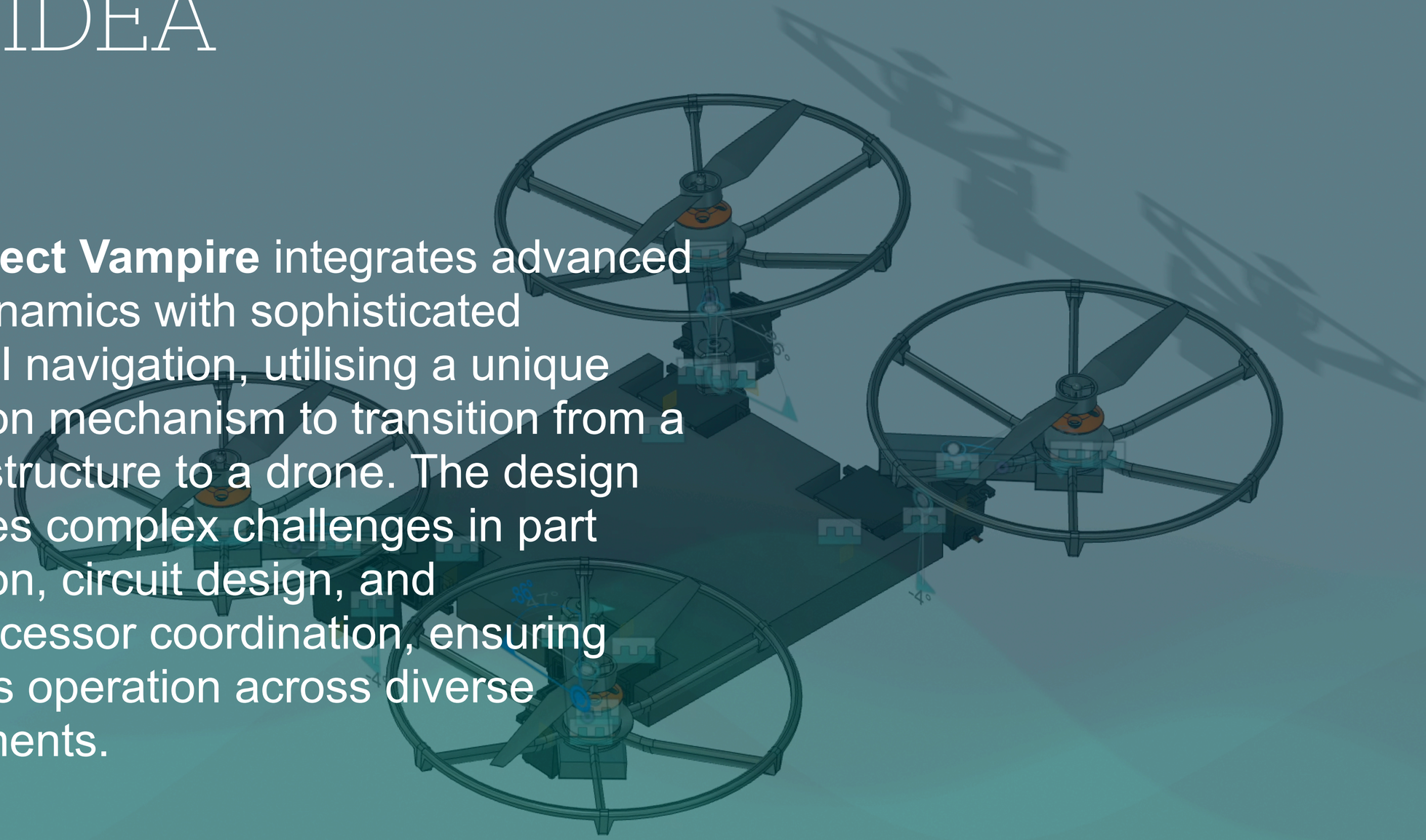
Our IDEA



Our **Project Vampire** integrates advanced aerial dynamics with sophisticated terrestrial navigation, utilising a unique orientation mechanism to transition from a car-like structure to a drone. The design addresses complex challenges in part integration, circuit design, and microprocessor coordination, ensuring seamless operation across diverse environments.

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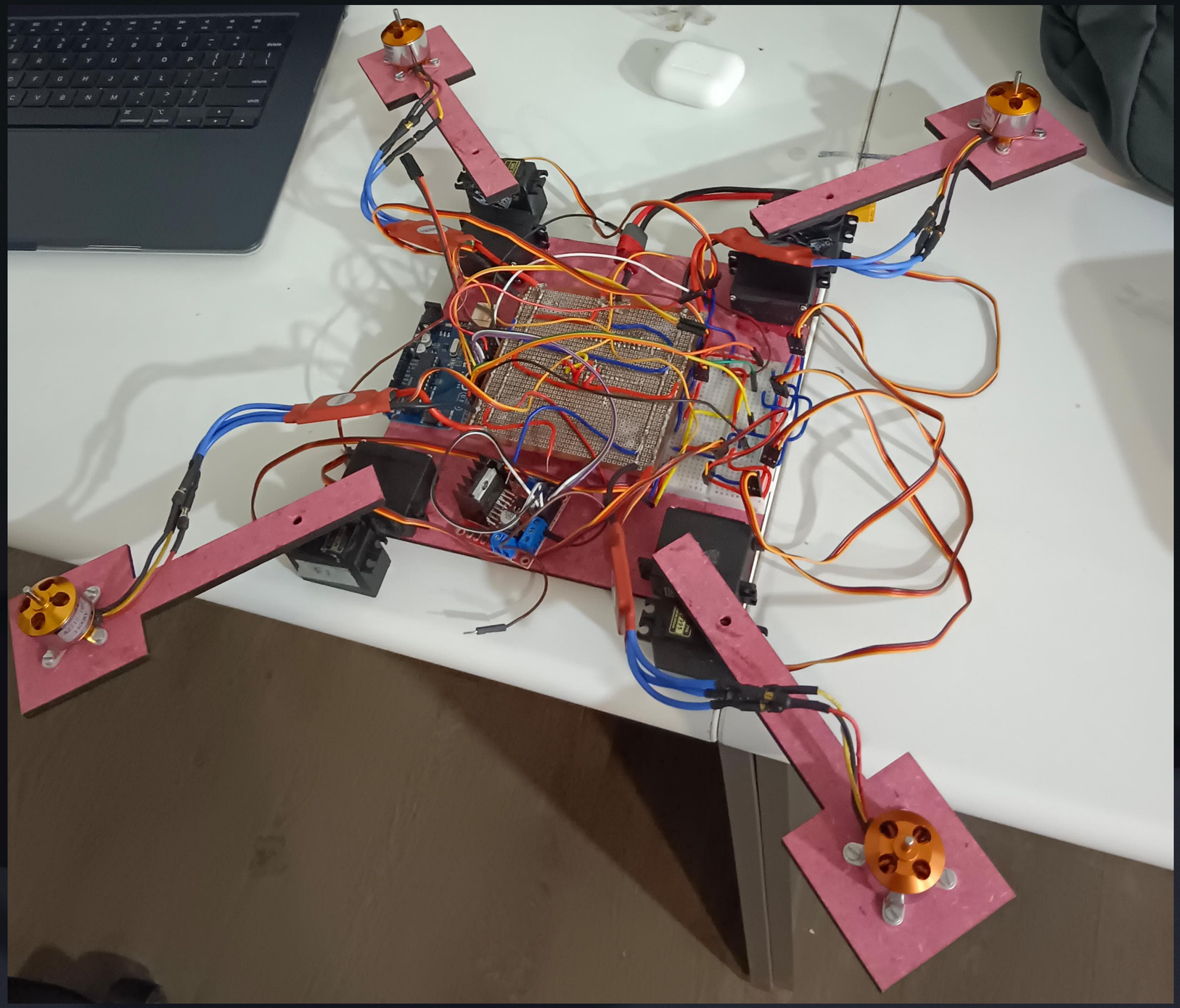
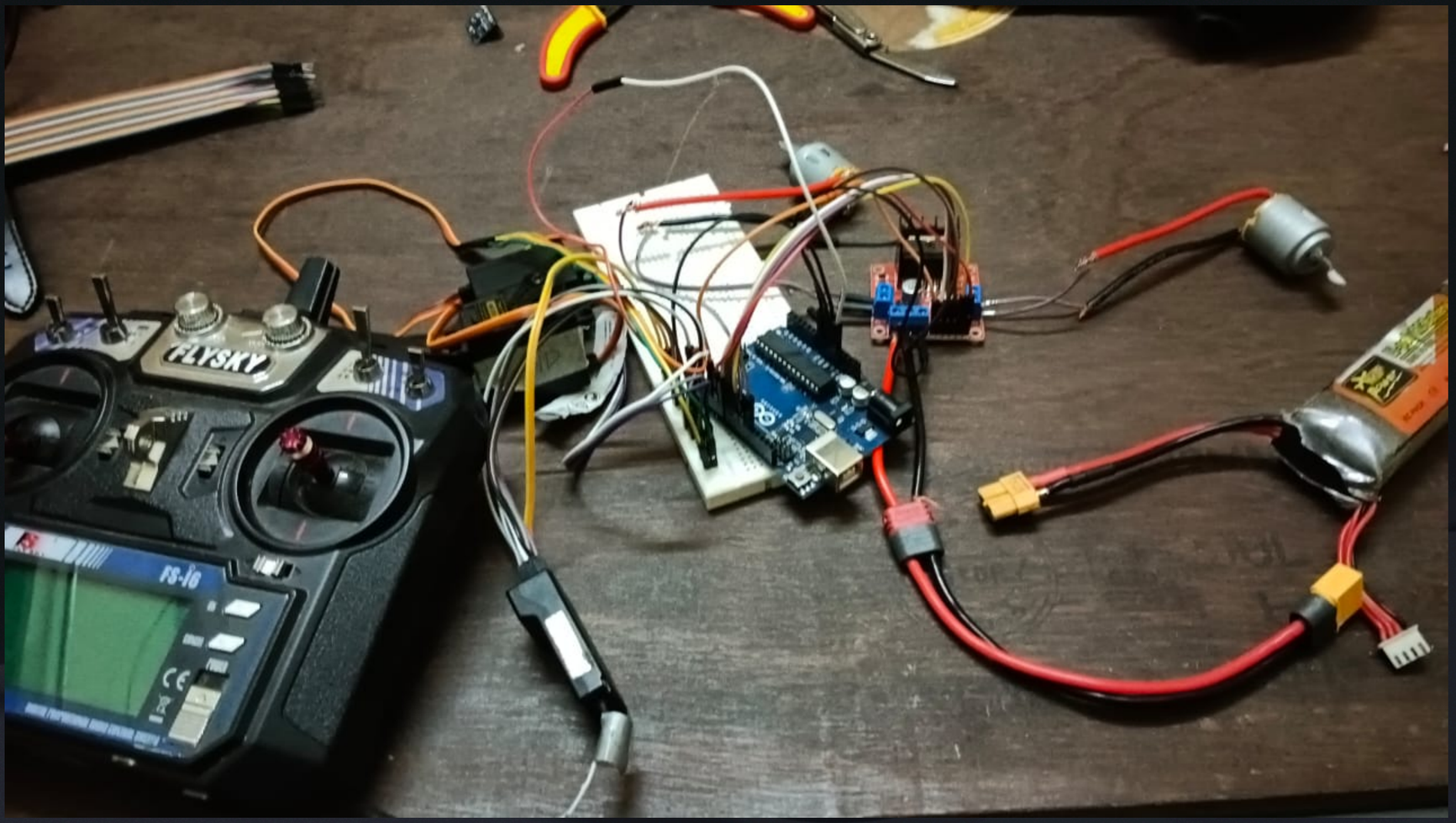
Key features

- With help of belt drive system this vehicle can be driven on terriastial terrian like a car.
- With help of propellers and rotatory arms , this can generate thrust and fly like a drone.
- Co-centric axis of rotation of bldc motor and tyre with help of ball bearings
- Servos helping to provide 3 degree of freedom to arm in a controlled manner.
- Efficient power consumption.
- Unique transformational ability distinguishing from other normal vehicles.
- High milage even in uneven terrians like mountains and Valles even without proper infrastructure.
- Lightweight and Durable Construction- Built with high-strength, lightweight materials to maximize performance and durability in both flight and ground operations.

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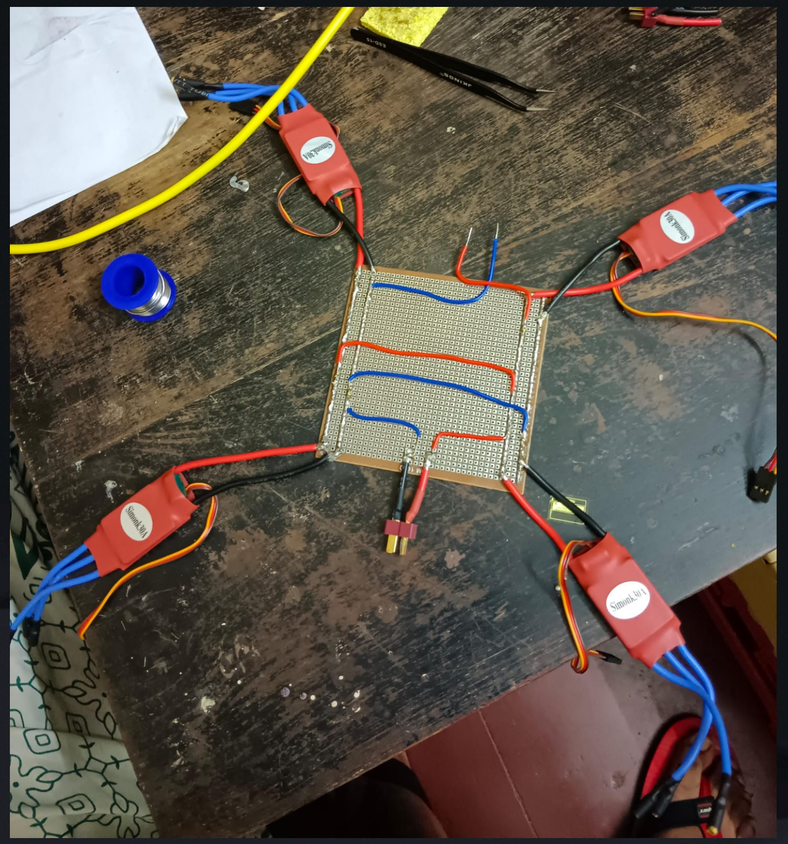

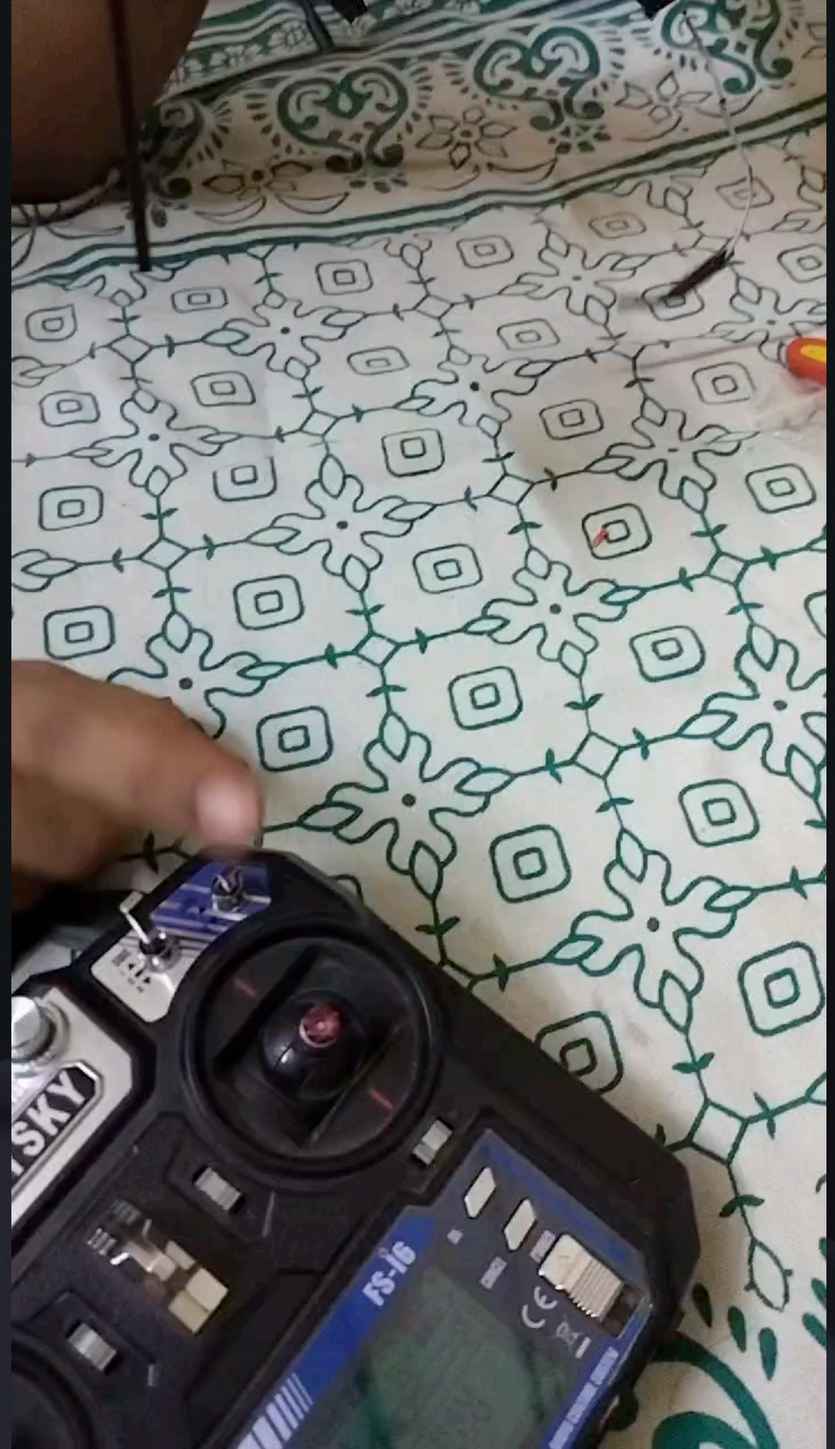

You can see here our model (without motors attached) is working absolutely fine , the model here was worked till completion of all electrical circuit and distribution the outputs of ESCs and motor driver have be checked with multimeter which confirms the proper passing of current according to our idea of controlling the vehicle.

Work Report - project Vampire

Ayush Bhaskar- Dawar Jyoti Deka -Rahul Singh- Aman Raj

** dropped ideas and discussions has not been included in work report

Our **Project Vampire** integrates advanced aerial dynamics with sophisticated terrestrial navigation, utilising a unique orientation mechanism to transition from a car-like structure to a drone. The design addresses complex challenges in part integration, circuit design, and microprocessor coordination, ensuring seamless operation across diverse environments.

15th May to 6th June -

a. Decided upon the project idea , decided and built the team started ideating on the design and Abstract.
b. Started the technical research , digged research papers and similar projects that other universities are working on and found resources relevant to our project.
c. Drew out a basic design and made a basic working CAD model of the Chassis,decided the components like strong Servos , BLDC Motors for propellers and DC motors for Wheels , decided to make it a two wheel drive bot and Arduino , Motor Driver and electronic Speed Controllers for its technical performance as a drone.
d. Decided and designed the systems of control and command, parallelly worked on the mathematical analysis of the forces , weight and torques that the parts of the decided model might face and decided the specs of the components (Both mechanical and electrical) on the basis of that.

7th June to 13th June i.e June Second Week -

a. Decided the control system we will be using to control the vehicle. Flysky FSi6a transmitter- receiver set.
b. Designed simulations and circuit for arm motion in tinkercad.
c. An online calculator or simulator **ecal** , and **rc plane online** was used to calculate the thrust generated and other information.
d. Number of servos and deciding their orientation for arm movement.
e. Ordering of some electrical parts.
f. Code for arm rotation part ready with tests on real models.

14th June to 20th June i.e third Week-

a. 3d sample model of drone with motion study formed.(in videos section of link)
b. Code for drone and other functions are ready to be uploaded on respective electronic controllers.
c. Decided the material to be used for the drone body , and laser cut it .
d. Soldered the pcb board to form a power distribution board and installed sensor and arduino nano on it.

21st June to 27th June i.e fourth Week-

a. Used epoxy glue to stick servos and power distribution board to the main chassis.
b. Decided the structure of the arm , decided to use double layered wood, with a 4mm hole in the outer side and servo horn cut on the inner part to fix it with a servo motor.
c. Made the model and tested it with code.
d. Building all connections on a breadboard.

28th June to 4th July i.e fifth Week -

a. Discussion on stand.
b. Discussion on concentric motion of tyre and propeller with different driving motors and without interference.
c. Usage of acrylic rods as stand to reduce stress on servo while changing mode and protecting battery
d. Buying materials(wires, glue,ball bearing)

5th July to 11th July i.e sixth Week -

a. Discussion and brainstorming on creating concentric independent motion for tyre and propeller.
b. Laser cutting of sample parts which will be used as tyres.
c. Buying material for creating tyre and belt driven motion for tyre.

12th July to 18th July i.e seventh Week-

a. Finalizing the design and making a 3d model for the coaxial tyre system.
b. Working on a Work report for the final review meeting.

19th July to 20th July i.e eight Week-

a. Worked on work report.
b. Buying material for laser cutting the tyre with spokes and coaxial system to be used in vehicle.

The drive link with all screenshots , video of simulations, code, 3d models and bill : https://drive.google.com/drive/folders/1VQIHgKka7rpowqe24aDche_vBiRUvNMP?usp=share_link

Some key components with key features to be used in our project are as listed

component	usage
L298 Motor driver	used to control motor for car type model
Arduino nano	coded as flight controller for controlling drone
MPU6050	used as gyroscope to maintain stability during flight
Arduino Uno	used as controller to control signals to l298 and servo motors
MG995 Servo	used to control motion of arms of vehicle
A2212 1400kv BLDC motor	used to rotate propeller to produce thrust
ball bearing	to create concentric independent motion
wood sheet	to create body of vehicle and arm

BT Faced

- Controlled signal distribution to car driver and drone driving microcontrollers from receiver.
- Servo mg995 not working properly when power supplied from Arduino uno.
- Creating co-centric axis independent motions with different driving force.
- Extra weight of 3d printed stand(as per simulation).
- Placement of ball bearing on arm.
- Spokes creation and placement. (Initially metal spokes were decided)

How we deal them??

- Using pin 12 of Arduino uno as power supply of Arduino nano.(tentative)
- Changing power supply to ESC to reach required current for servo movement.
- Analysing the principle of working of one ball bearing and implying it to it’s set.
- Decided to use acrylic rods as an stand and battery strap to hold battery.
- Decided to use geometry to figure out bet possible points.
- Decided to use same material as tyre as spoke and analyse , and if required to add metal spokes further to add strength.

Practical applications

Improved Accessibility: Hybrid vehicles can provide better access to remote or rural areas where traditional infrastructure is lacking or underdeveloped.

Emergency Response: They can quickly reach areas that are otherwise hard to access by road, providing crucial support in emergencies.

Traffic Reduction: Flying cars can alleviate ground traffic congestion by providing an alternative transportation layer above existing road networks.

Reduced Commute Times: They can significantly shorten travel times, especially in densely populated urban areas with heavy traffic.

Disaster Response: They can be used to reach disaster zones quickly, providing medical supplies and evacuation services.

Versatile Deployment: These vehicles can be deployed in various terrains, including mountains, forests, and urban environments, for search and rescue operations.

Aerial Surveillance: They can provide an aerial view of disaster areas, helping in the coordination of rescue efforts.

Efficient Logistics: Flying cars can streamline the delivery process, reducing the time and cost associated with last-mile delivery.

Remote Destinations: They can provide access to remote and scenic destinations that are difficult to reach by conventional means.

Door-to-Door Service: Hybrid vehicles can provide door-to-door transportation, combining the flexibility of a car with the speed of a drone.