Indian Institute of Technology Hyderabad

Digital Fabrication, 2023-24

Report On

3D Printing of Drone

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1 Selection of Cad Model

1.1 Object Description

Drones are unmanned aerial vehicles (UAVs) that can be remotely piloted or operate autonomously using software-controlled flight plans. Ours is a Multi-rotor drone, running typically on a battery-powered source. They vary widely in size, from small hobbyist drones to large military or commercial drones. They often have cameras for surveillance, delivery capabilities, or recreational use like aerial photography and videography.
The body of a drone, also known as the frame or chassis, is the central structure that holds all the components together. Propellers are the rotating blades on a drone that generate lift and propulsion. Projections are the components that support the drone when it's on the ground or during takeoff and landing.

1.2 Special Features

The special features of our model are distinctive body shape and movable propellers.

1.3 Why was "Drone" selected as Project?

Drone is selected as our project due to the following reasons:

1. Drones offer a complex and challenging design. They involve various components such as the frame, propulsion system, and moving parts like propellers. Designing and 3D printing a drone allows for a comprehensive exploration of these complexities.

2. Drones integrate multiple technologies such as aerodynamics, electronics, software, and mechanics. Designing a drone model involves understanding and incorporating these technologies, providing a holistic learning experience.

3. Drones are functional objects with specific purposes such as aerial photography, surveillance, delivery, or recreational flying.

4. Drones are associated with innovation, cutting-edge technology.

5. Drones are educational tools that can be used to teach principles of physics, engineering, robotics, programming, and more. Designing and 3D printing a drone model facilitates hands-on learning and skill development in these areas.

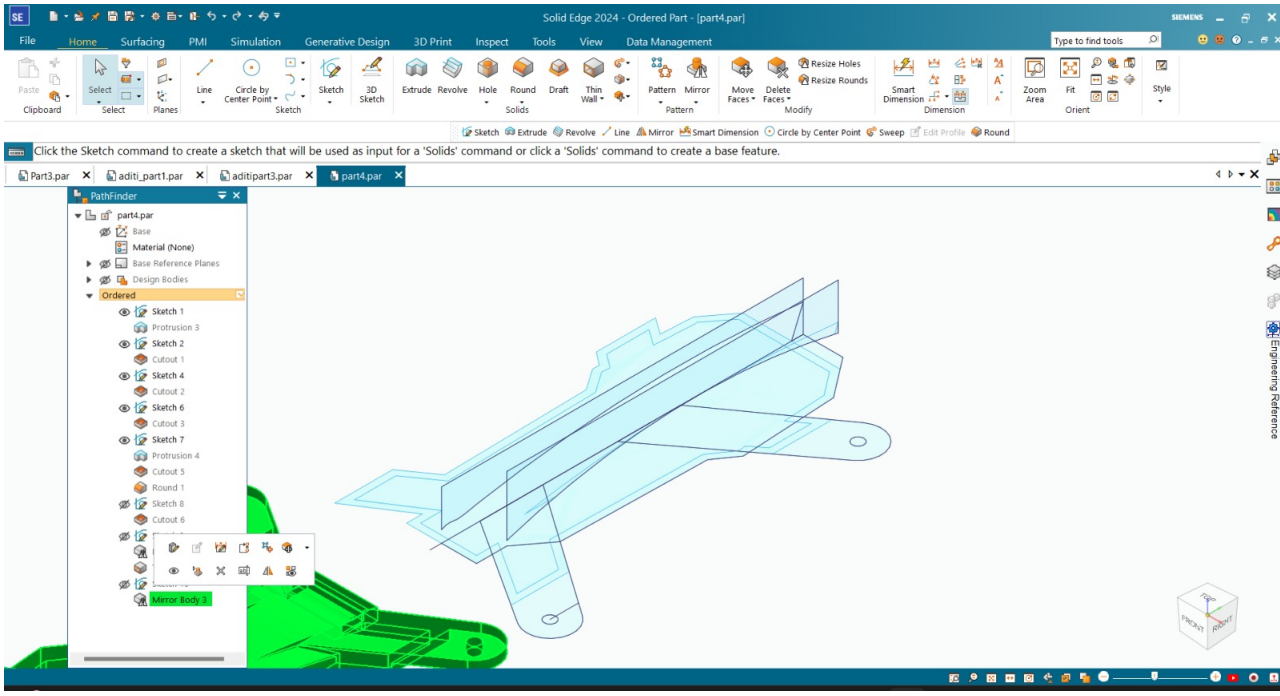
2 Making of Drone on Solid Edge

We have divided the drone to four parts as discussed in object description, which are,

1. Main Body
2. Projections
3. Propeller

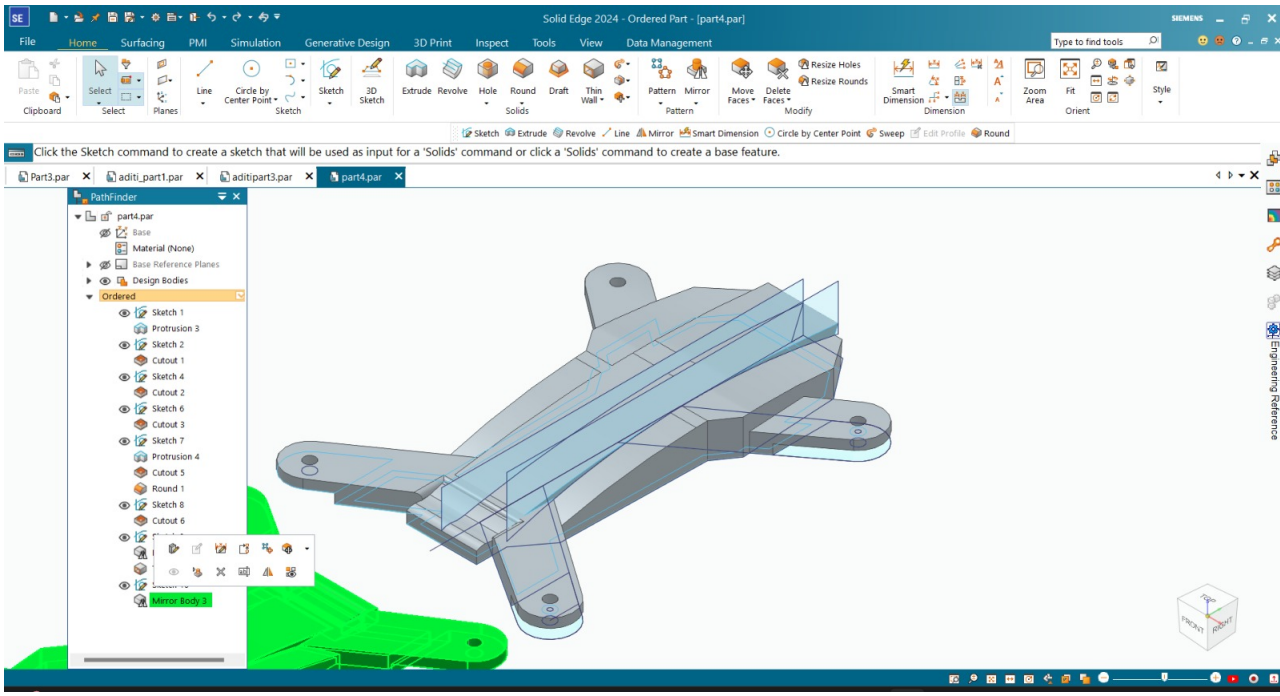
2.1 Parts

2.1.1 Body

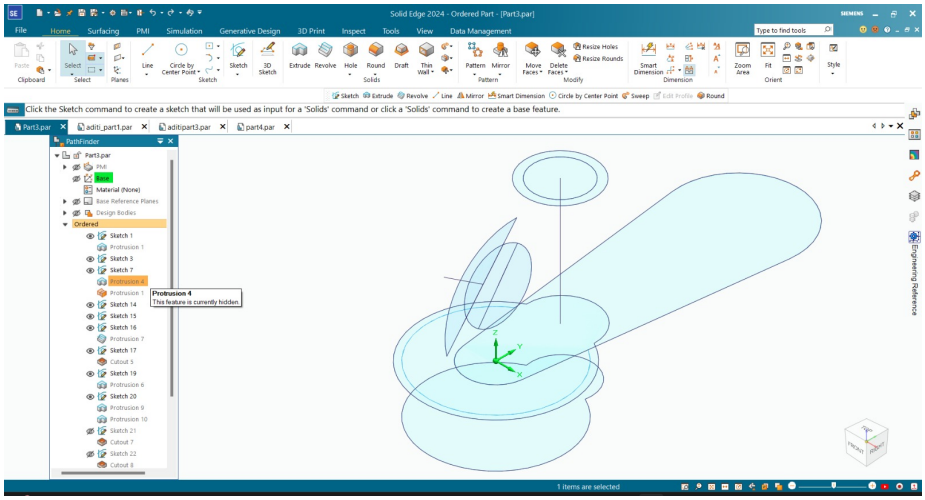


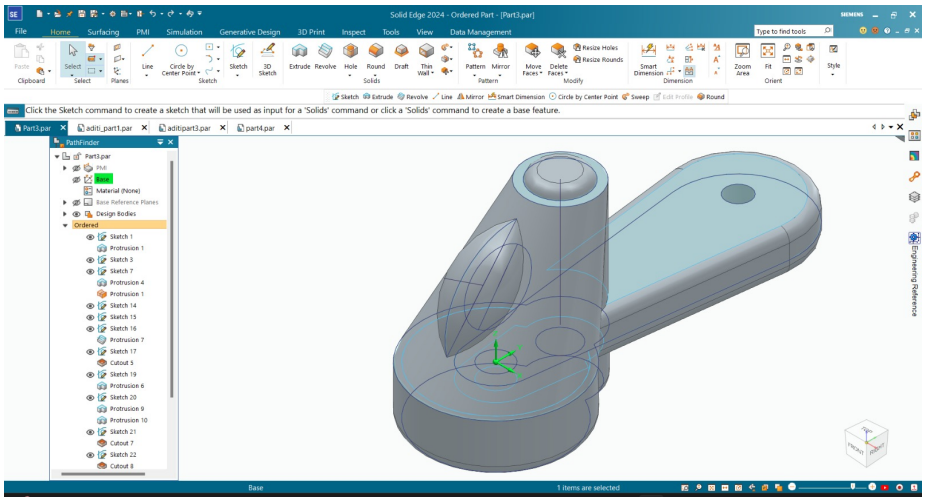
This part has two parts which are mirror images of each other and are attached to each other externally. It is done because we needed a gap in this in order to attach a screw through which the projections are attached.
The tools used in this are:

- **Extrusion:** It is used almost everywhere to convert 2D to 3D.
- **Round:** Used in order to avoid sharp edges.
- **Mirror:** Used because the body was symmetric as well and to get another symmetric body to attach from below.

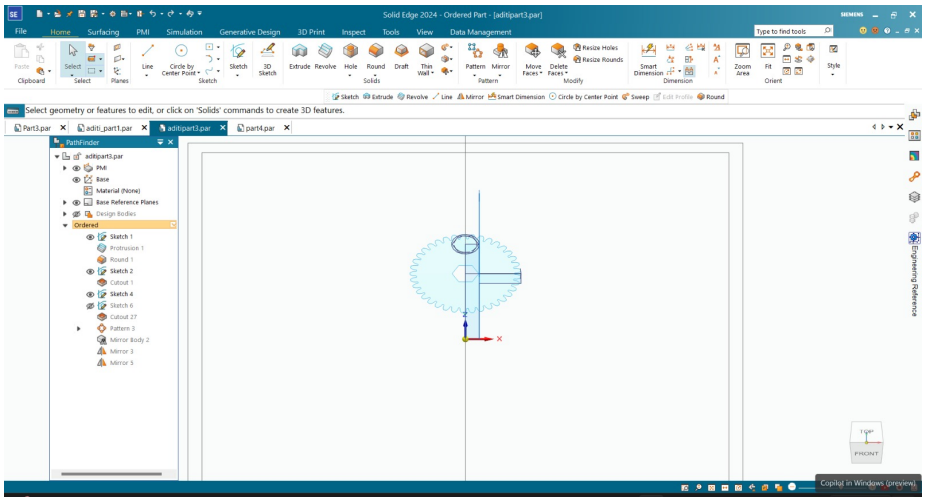


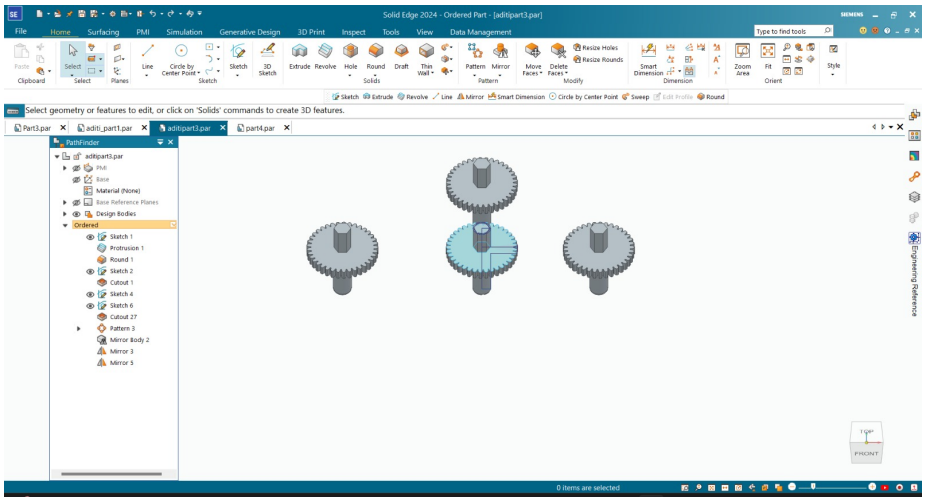
2.2 Projections





When we're creating projections, we start by making the shape we want to show. Then, we use extrude to stretch or pull it in different directions. In the figure we're given, there's a hole at the bottom for a screw. So, we'll need to make sure that hole gets included in our projection.



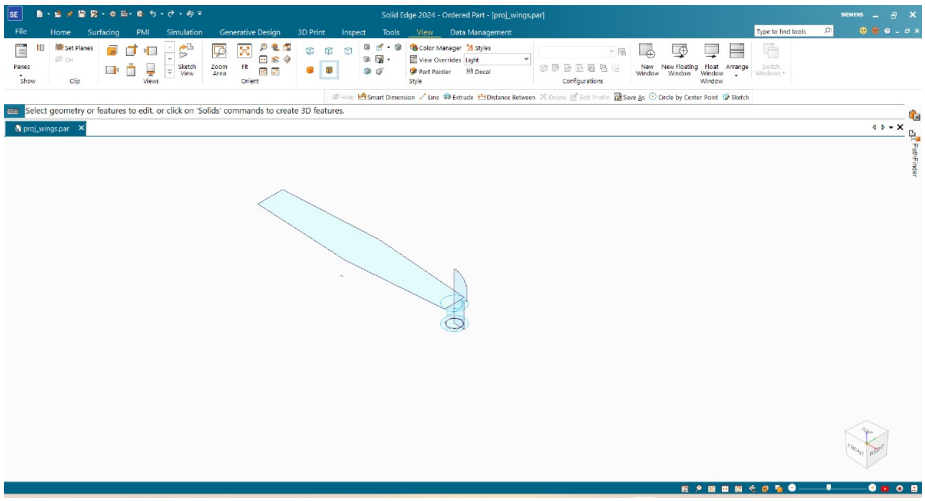


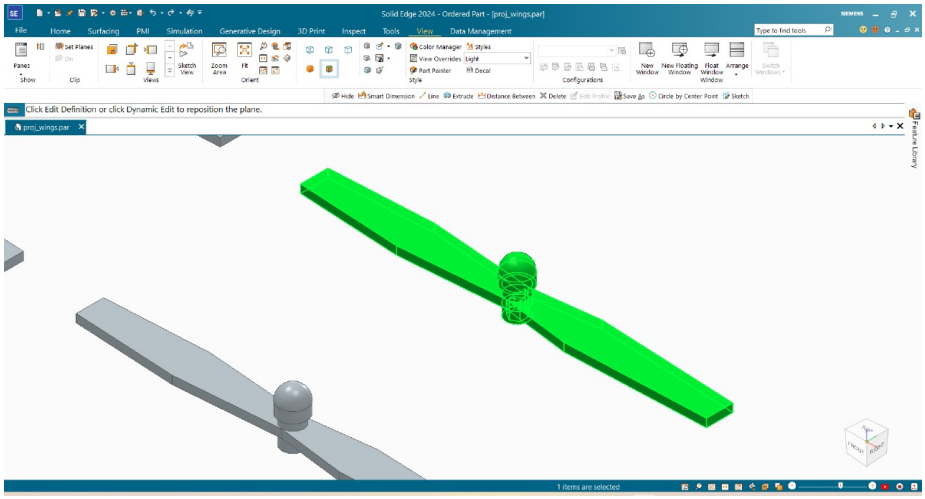
For the screw, we extruded it so as to cut out in the required shape and then used "Circular Pattern" tool.

2.3 Propeller

This part has four propellers which are mirror images of each other and are attached to four projections of drone. These are the movable parts of drone and can be rotated.A hole is made at bottom of each propeller to attach it to screw. The tools used in this are:

- **Extrusion:** It is used to extrude wings and make hole at bottom of propeller.
- **Revolve:** Used to make middle part of propeller.
- **Mirror:** Used to two times to create 4 copies of propeller.

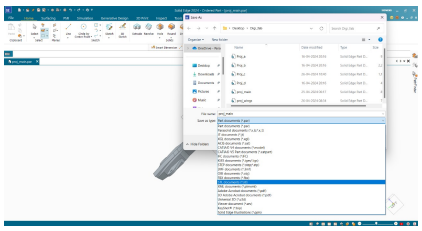


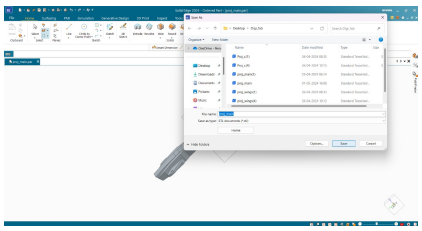


3 Conversion to STL file

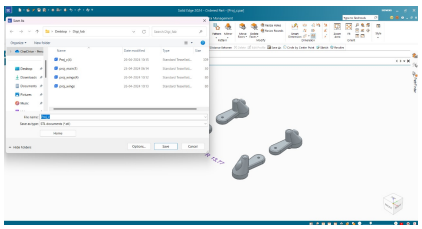
PAR files are converted to STL files by choosing the 'Save As' option and selecting 'STL Documents' as the file type.

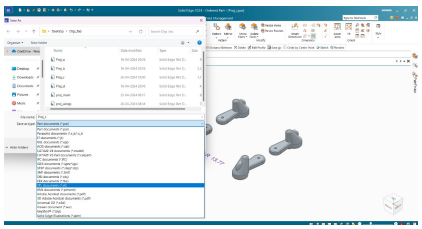
3.1 Main Body



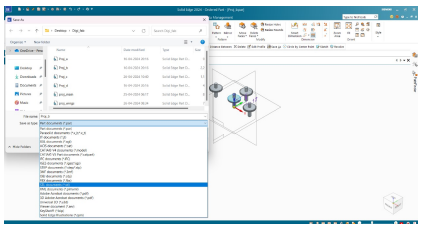


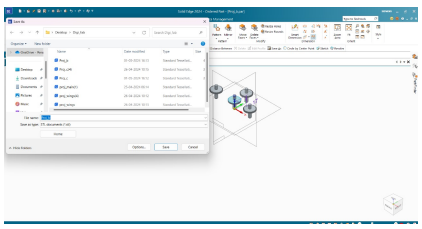
3.2 Projections



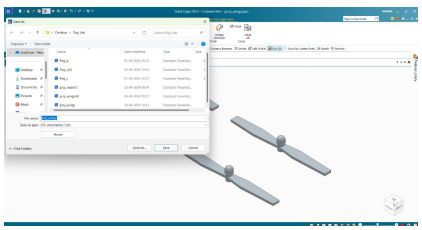


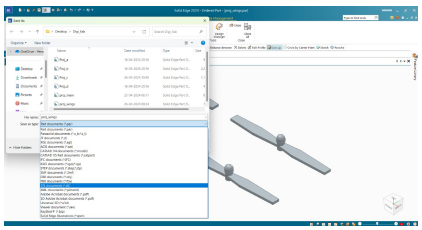
3.3 Screws





3.4 Wings

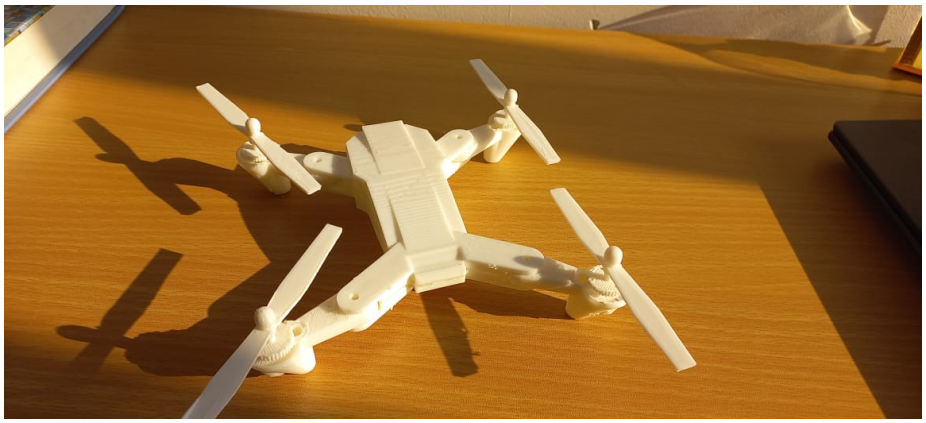


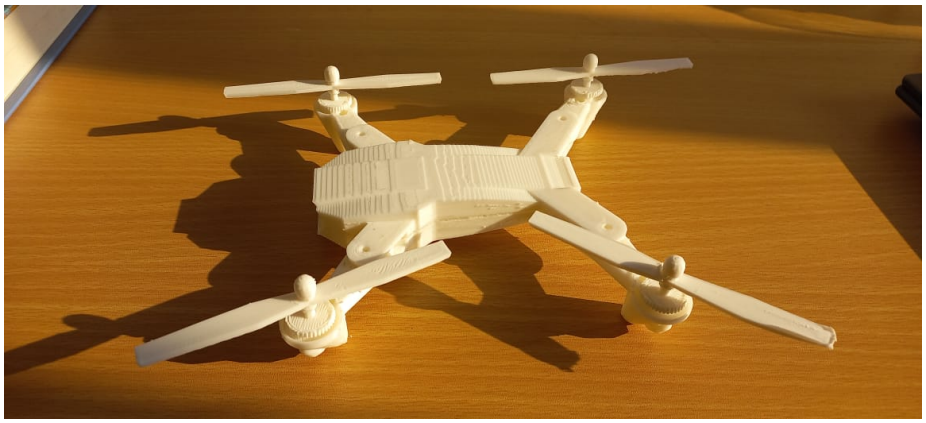


4 Final result as 3D Printing

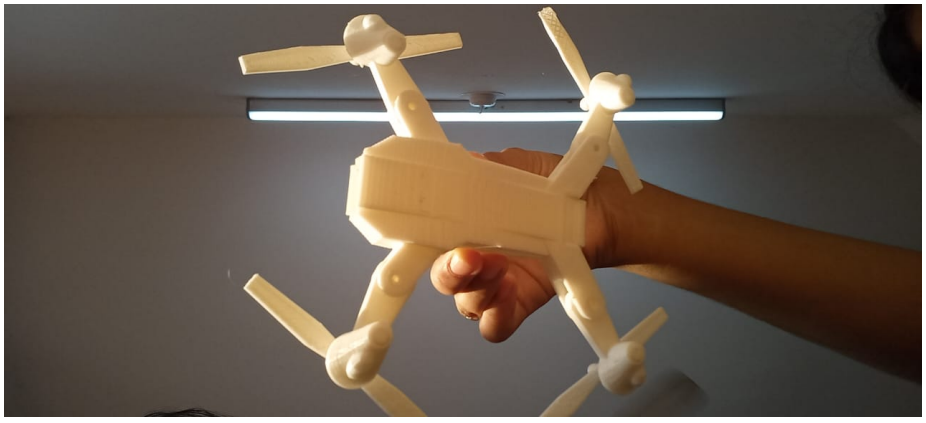
4.1 Viewing Features

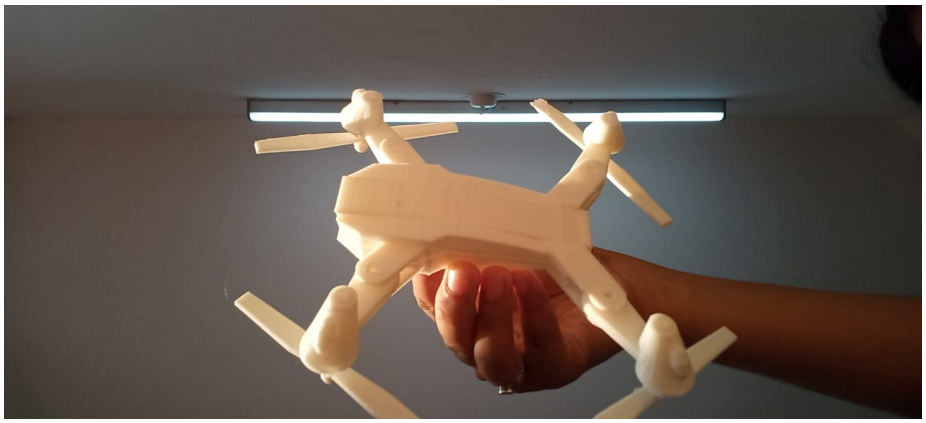
4.1.1 Body



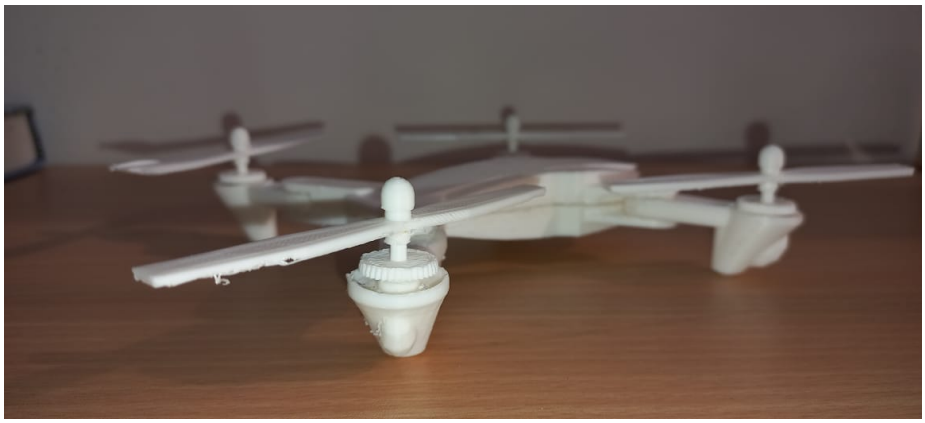


4.1.2 Back-view





4.1.3 Propeller



4.2 Inaccuracies

When we made our model, we noticed a few things that could've been better. Firstly, some parts had sharp edges, which didn't look quite right. We realized we could've added more details to make it stand out even more. Another issue was that the model had some rough scales after printing, which was because of a problem with the printer. These setbacks taught us a lot. Next time, we'll make sure to smooth out those edges and pay closer attention to the printing process to avoid any unexpected surprises.

5 Observations

5.1 Experience

Designing a drone in Solid Edge was super cool! It felt like building something out of a sci-fi movie. I got to use all these neat tools to make sure the drone looked awesome. Sometimes it was tricky, but I learned a lot by trying different things and asking for help when I needed it. Working with friends on the project was fun too because we could share ideas and make the drone even better together. Overall, it was an exciting experience that taught me a ton about using technology to create cool stuff.

5.2 Challenges

In the first place, making all the parts accurately with proper dimensions was challenging and we had to look the actual drone and decide how we were going to make. This required a lot of attention and time, to think of different parts and to fix their lengths. Then we had to think of a mechanism to make it, like what tools to use and for that we did a bit of research about solid edge. Finally, slicing it properly and printing was a challenge of another level. Our parts like the propeller and screws took many attempts.

5.3 Learnings from 3D printing

Learning about 3D printing was like stepping into the future! It was amazing to see how we could turn our ideas into real objects just by using a special printer. I got to understand how different materials work and how to design things that would print correctly. Sometimes, things didn't turn out perfect on the first try, ours especially took a long time, but that's where the real learning happened. By experimenting and making adjustments, I discovered how to make stronger, better prints. 3D printing taught me that with a bit of imagination and some tech know-how, there's no limit to what we can create!