Design and build drones for environmental monitoring and sustainable precision farming

Design Review #1

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1 Design Review #1

1.1 Sketching the drone

For the drone an x-frame design where chosen as it seemed the most familiar and not to complicated to make.
For an initial rough design the following where considered:

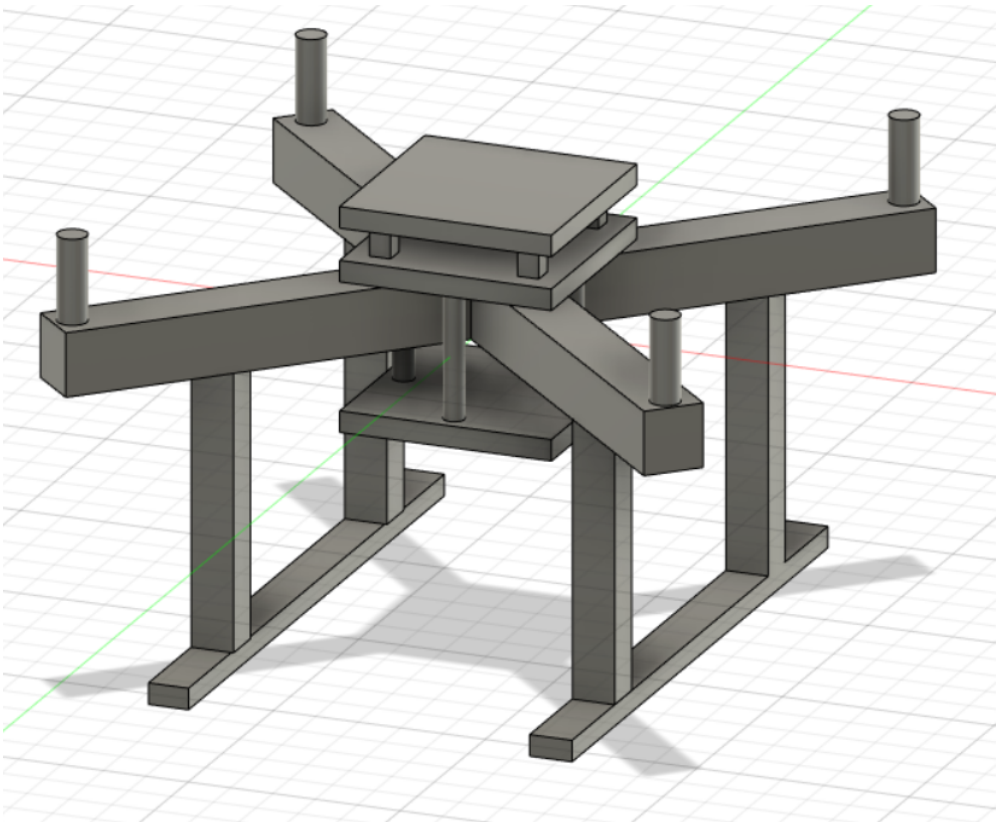

Figure 1: Initial design

After some thought the lowest platform for the battery where removed to both cut down construction time and to minimize weight and the design ended up as follows:

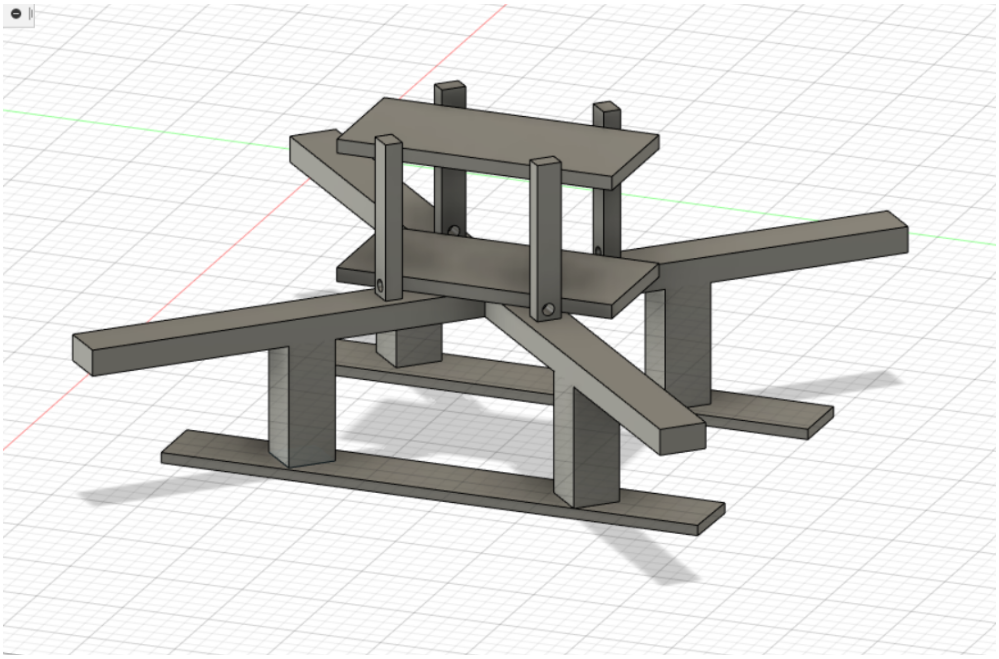

Figure 2: Final design

The drone were then measured and sketched in Fusion 360 (see figure 3). With the main focus being the propellers having enough room as to not hit anything and there being clearance under the propellers as to not loose thrust.

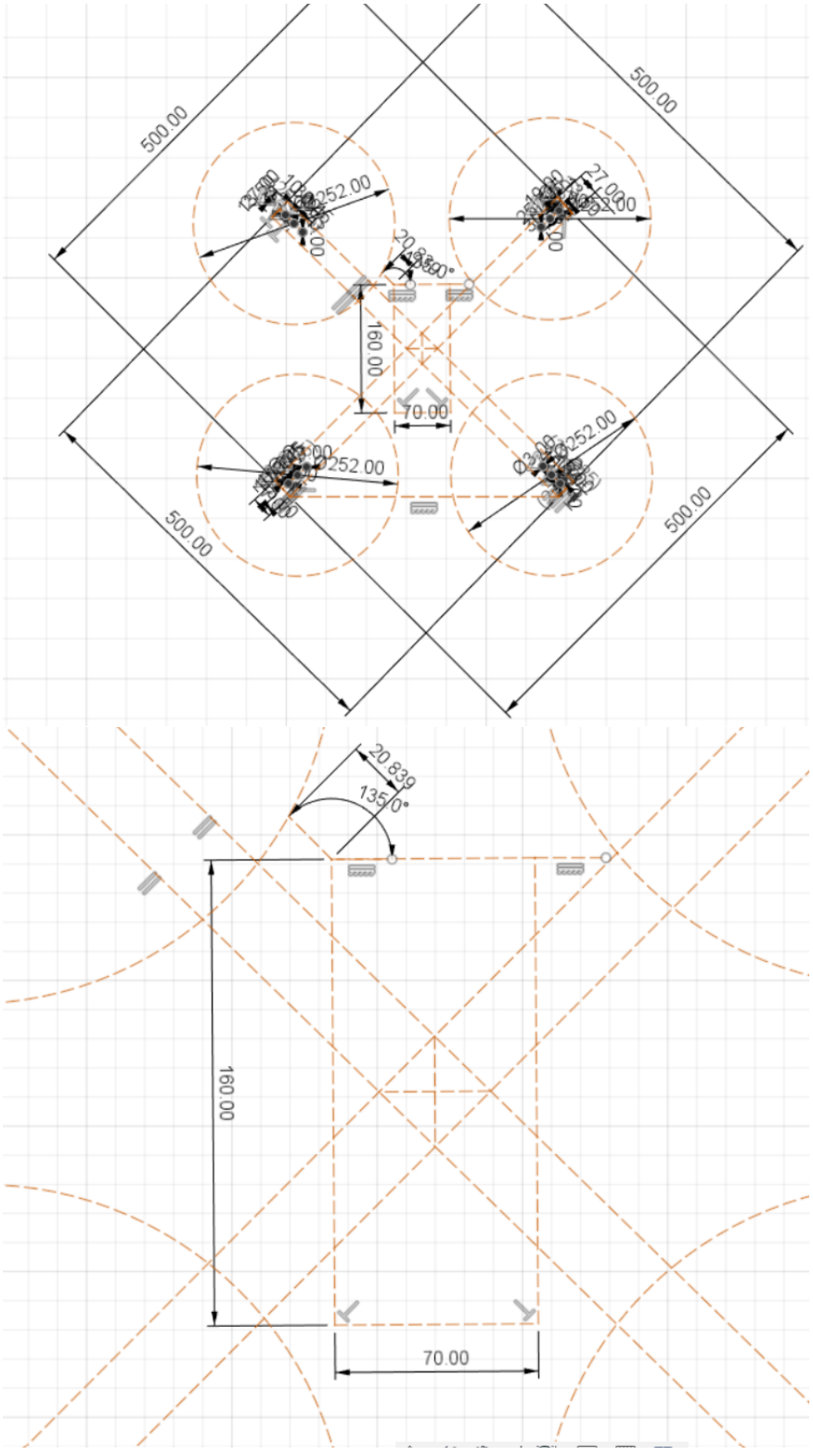

Figure 3: Drone sketch

1.2 Construction and considerations

The intersection of the two pieces of wood making the x-frame where connected via a joint that where cut into both pieces of wood (see figure 4). For a more robust connection some glue where added the the joint.

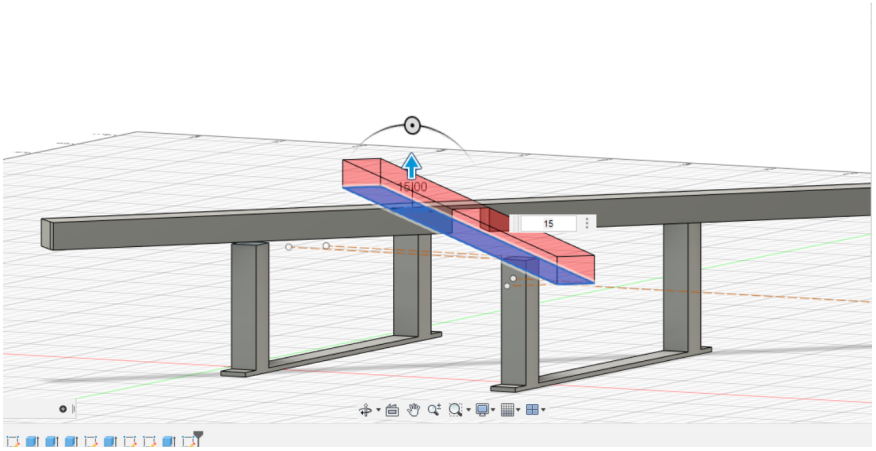

Figure 4: x-frame joint

In order to mount the electronics to the drone, two platforms where constructed and connected to the x-frame (see figure 5).

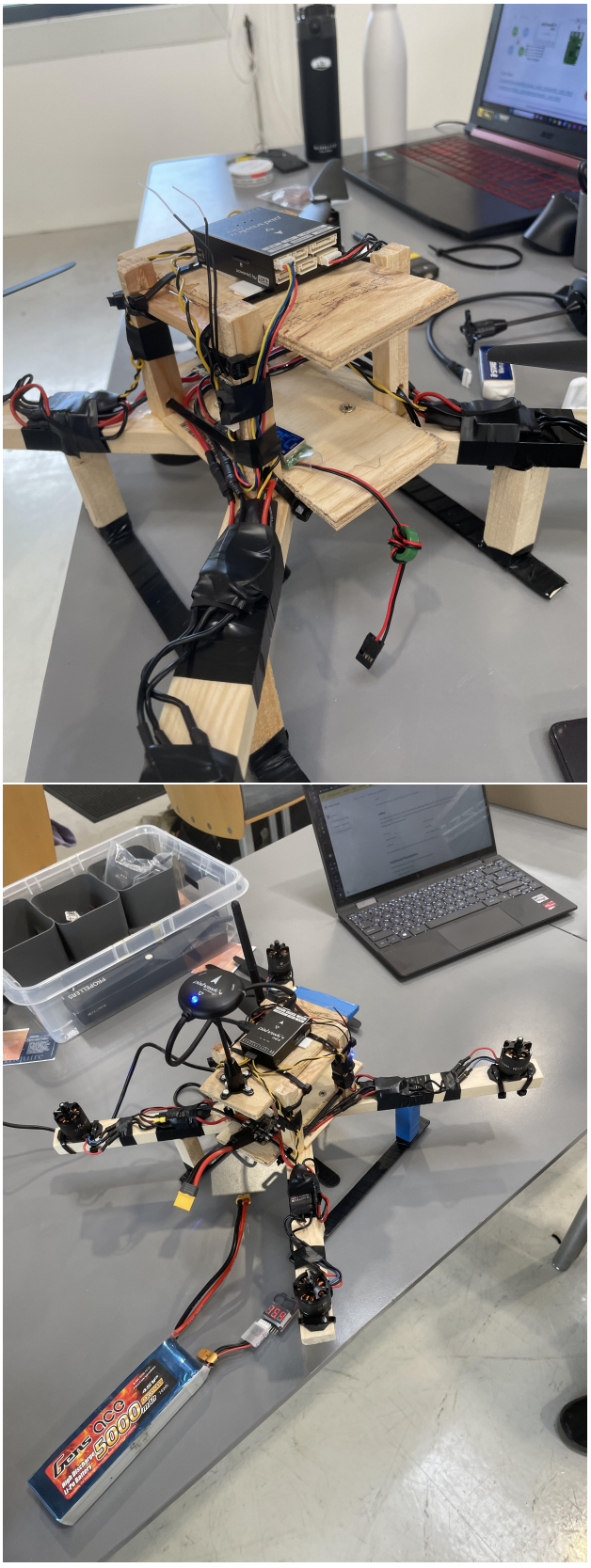

Figure 5: Finalized drone

This is mostly held together with wood-joints, zip-ties and glue. The uppermost platform houses the

flight controller and GPS module. The bottom platform holds the power distribution board and the Pi, with enough room to the uppermost platform to connect the power distribution board and camera to the Pi in the future.
The battery is mounted to the underside of the drone with Velcro straps and is protected by landing gear made in a 'ski-like' fashion, connected to the x-frame.

1.3 Value sensitive design

Mostly ideas for future work, due to a lack of time in the short span of a summer course.

- Privacy: As a camera is going to be installed on the product in order to do environmental monitoring, this could compromise privacy for indirect stakeholders. A solution to this could be a filter to filter out peoples faces or entire body.
- Transparency: An App for the phone where the drone can be located via the GPS module. Here a stakeholder would be able to see what the drone is doing and where it is at all time while active.
- Transparency: Paint job; make the drone a light green/yellow like agricultural machinery.
- Accessibility: in the case of vision impaired stakeholders, a potential GUI controlling the product could include text-to-speech and a colorblind setting.
- Involving indirect stakeholders: this could include normal citizens living close to the area of operations, due to drones making a lot of noise. Special propellers with reduced noise could be utilized.
- Environment: The drone is made up of mostly biodegradable materials like wood. For future iterations the electrical tape is going to be replaced by biodegradable options and so will the zip-ties.

1.4 Things to correct in the future

As for the aforementioned x-frame joint (see figure 4) the connection where too snug and it ended up warping the wood slightly, making the landing gear a bit uneven. This could be corrected a bit for future designs, in the form of not making the joint that tight.