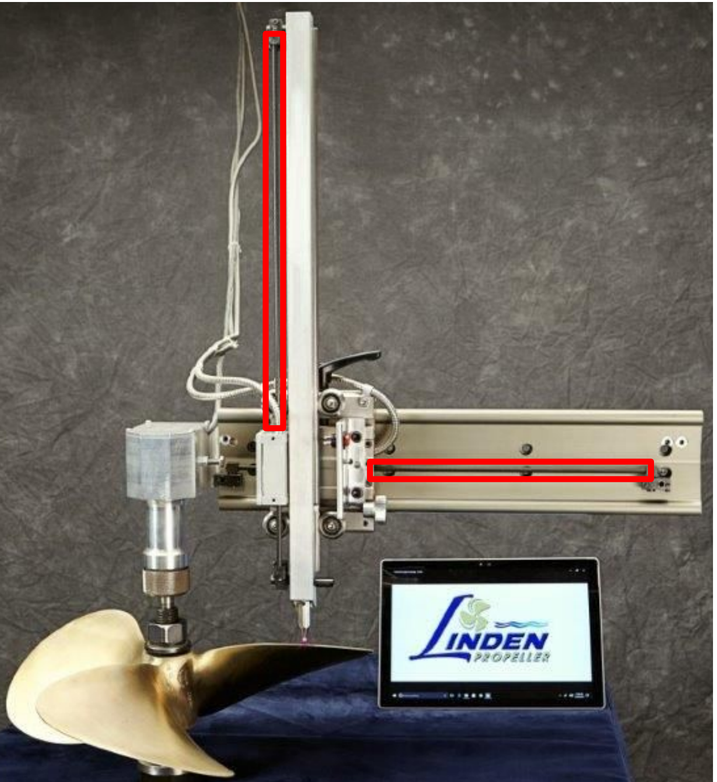
Detailed Design

Elias Colsch, Denny Dang, Alan Whitehead
(and Mani Mina)

Project: Laser Scan Readings for Propeller Measurement

Group: sdmay25-34

Project Overview



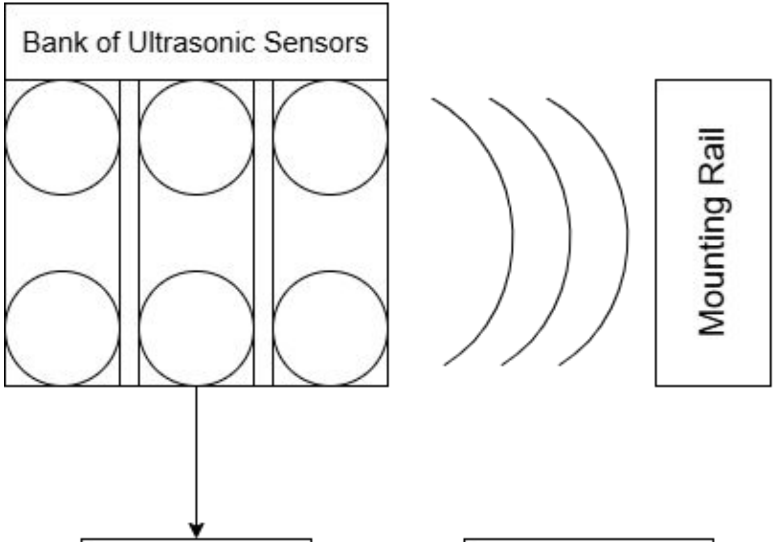
Project Name: Laser Scan Readings for Propeller Measurement

Goal: Replacing propeller measurement system of Linden Propeller

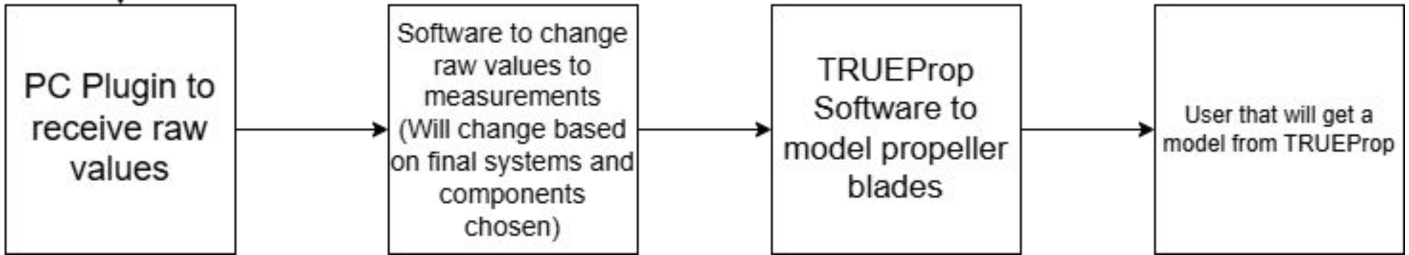
Reason for change:

- Carbon fiber rods attached to scales are brittle
- Expensive to replace/repair
- Extended lead times

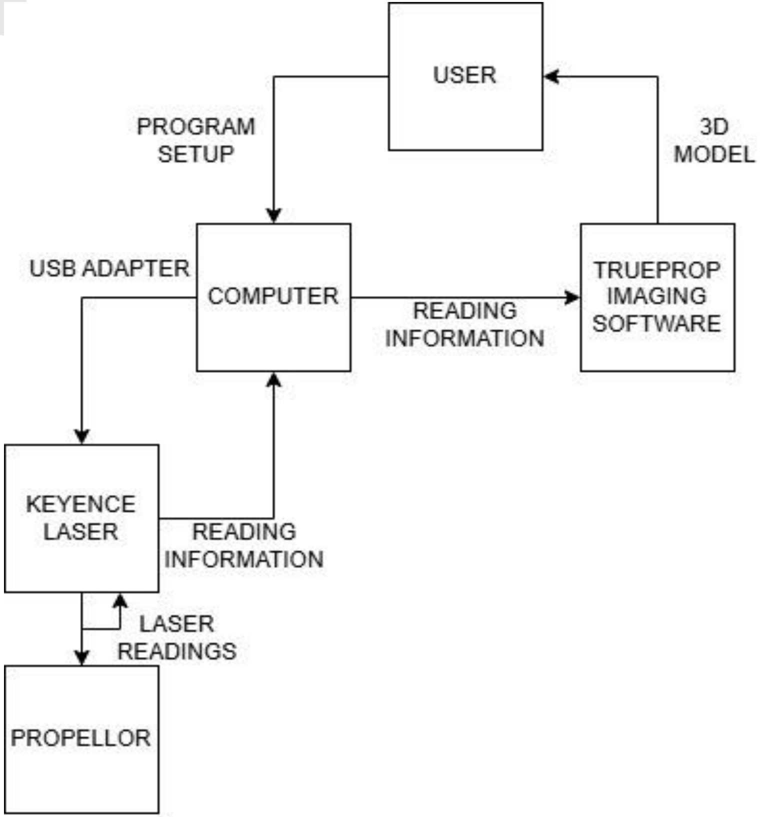
Detailed Design and Visuals - Ultrasonic



This design incorporates a bank of at least 3 ultrasonic sensors. These sensors will all get independent values, and as values are received, our program will run on whatever software we use. This software will differ from product to product, so we may have to adjust our code based on the product's software. This code will incorporate data fusion to make the values as accurate as possible. This data will then be converted to a measurement in micrometers. The measurement will then be exported to the TRUEProp software to generate a model.



Detailed Design and Visuals - IR



This is a process map of the user working with the KEYENCE laser. The user begins the process by setting up the scanning process on their computer. This initial action may include setting the width, height, material, and other various settings that are involved in the process of scanning propellers. The computer then communicates with the laser device via a USB adapter that allows communication through the laser and computing devices. The laser is now sending off an array of lights that bounce off the propeller blades and is programmed to calculate precise distances depending on the characteristics of the light arrays. Once the laser has these measurements, the information is sent back to the computer where it communicates with the TRUEPROP imaging software. The imaging software includes the measurements in its programming and develops a 2D/3D scan of the propellor, showing detailed physical features. The user then works with the scan and starts working on fixing any deformities.

Functionality

Our design is meant to be used with Mr. Lindens current system. The process of taking measurements using the system would not change, making it ideal for his shop as his employees would not have to learn a new system. The current system uses a touch probe to trace the blade and the scales will output x and y coordinates corresponding to the probe. Our design will be outputting the same results, just from a safer and less fragile sensor. This will result in higher productivity and fewer losses for Linden Propellers as a whole.

Technology Considerations

KEYENCE Laser

- Possible Consideration
- Highly precise
- Adaptable
- Lightweight and compact
- Costs more than our budget

IR Sensors

- Not precise
- Need higher end
- Adaptable
- Lightweight and compact
- Fairly cheap

Ultrasonic Sensors

- Not precise
- Need higher end
- Adaptable
- Lightweight and compact
- Fairly cheap

Areas of Concern and Development

Concerns

- Data fusion may not result in accurate enough readings. This would mean that Mr. Linden will either have to spend more money for a better sensor or stick with the system he has, which is fragile.
- Our current design is too expensive for Mr. Linden. As long as our data fusion design works, this concern will be negligible

Developments

- Mr. Linden has resisted buying the best sensor at the lowest cost point that we could find. The issue being that even the lowest cost sensor with the correct specs is too expensive for a small business. We can circumvent this using our second design idea.
- Data fusion is our best option right now, though it might not pan out.

Conclusions

- We are making steady progress with our current designs towards our goals and milestones
- We have been circumventing and solving our problems by working with our client, advisor, and each other