Project Glasswing

Team Mockingbird: Austin Malmin, Conrad Murphy, ShanHong Mo

Autonomous Navigation System for Drones

- Search and Rescue Missions

- Transportation and Delivery

- Film and Photography

- Agricultural Crop Spraying

- Complete Mapping of Ecosystems and Their Microenvironment

Our Sponsor – Dr. Alexander Shenkin

- Background in Computer Science, Electrical Engineering, Physics and Forestry

- Studies forest structure and its impact

- Uses simulated maps of real-world environment for testing

The Problem

Two members of Dr. Shenkin's research crew scanning the forest using a 360 degree LiDAR on a tripod.

Our Solution

- Autonomous navigation system for drone

- Detect and avoid objects

- A UI which details the drone's direction to move, and how far

- Create routes safe to travel given the size of the drone

Project Requirements

- Functional requirements

- Performance Requirements

- Environmental Requirements

Functional Requirements

Minimum requirements:

- Automatic detection of objects
- Able to move towards a destination
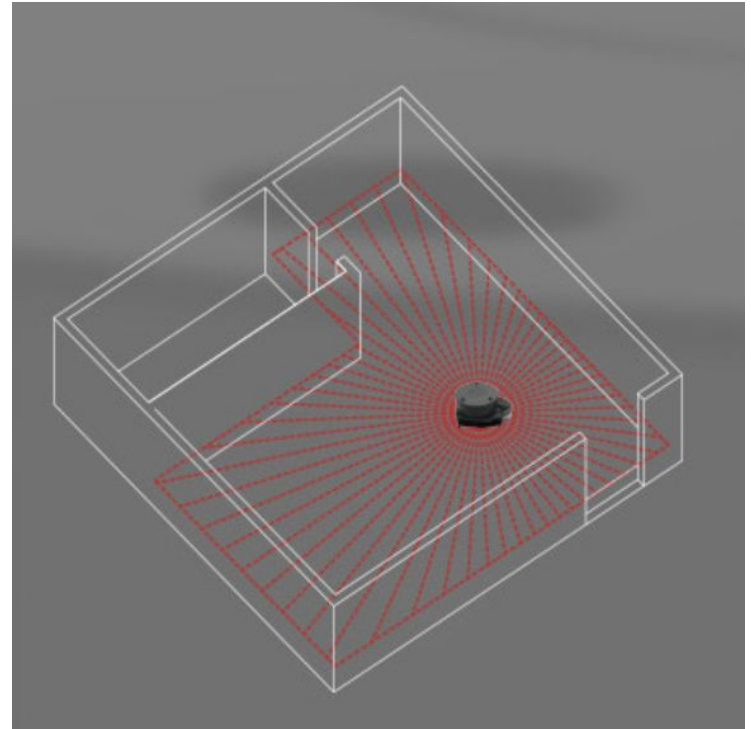- Tell the user which direction it is moving

Stretched requirements:

- Show a display screen of the planned path that it will take
- Visit as much as the designated 3D space as possible

Extended requirements:

- Store and display/print the area visited

Breakdown of Functional Requirements

Detection of Objects

Performance Requirements

Object Detection Size

- 1cm or larger

Field of View

- 20 degrees up and down

Memory Write Speed

- 100 MB/s

Environmental Requirements

Physical

- Direct sunlight

- Weight of system

Technological

- Raspberry Pi

- Power

- On-board flight software
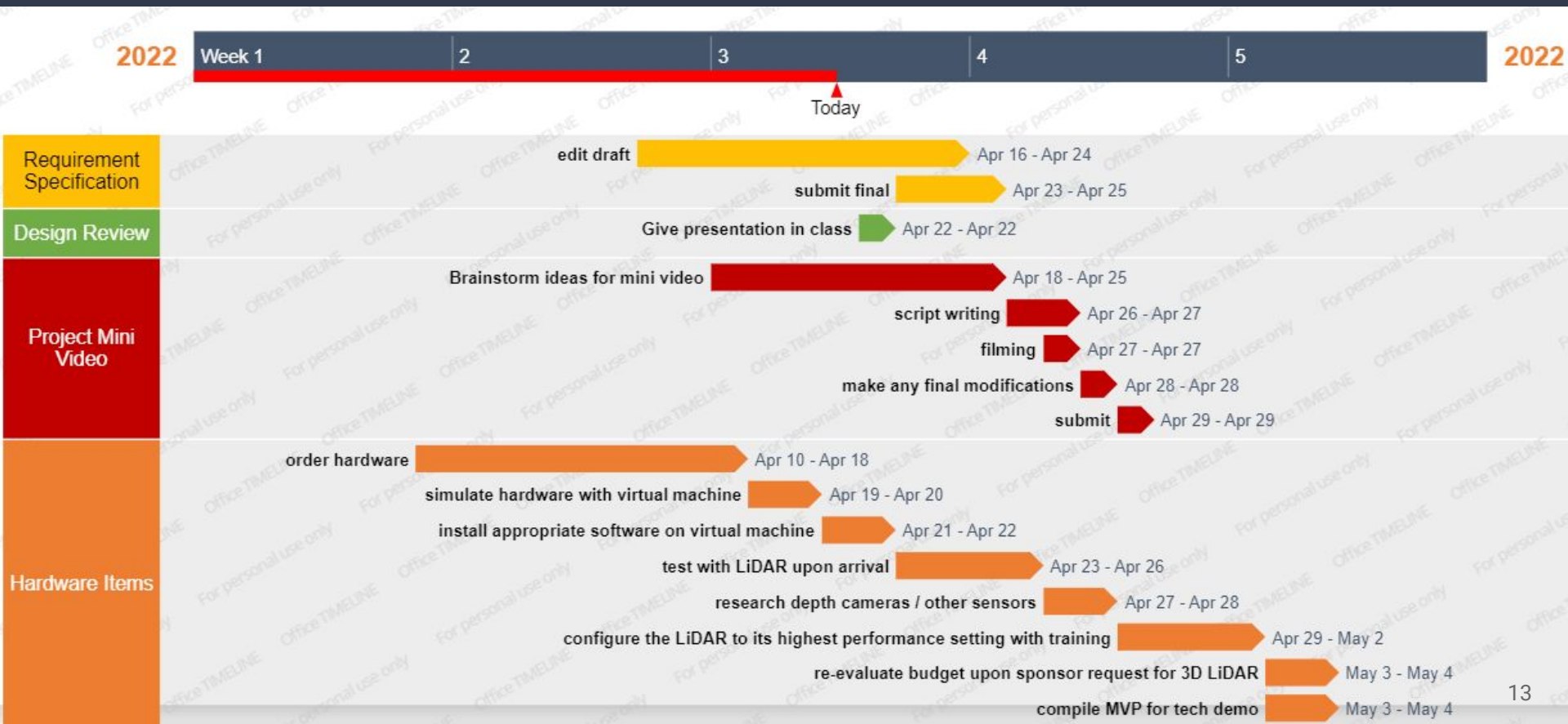
Risks

Risk groups

- Sensors and other Hardwares
- Shipping times
- Environment
- Users/Bystanders
- Team

Risks mitigation

- Check equipments before using it
- Backing up data
- Training with equipments
- Use equipments under proper conditions
- Inform team of issues

Schedule

A Well Done Project Would…

- Have lasting impacts on studying ecology and micro-environments of forests

- Create a powerful, expandable, customizable module

- Remove humans from dangerous tasks

In Conclusion,

- Fully autonomous drone navigation system

- Provides the following
  - Automatic detection
  - Basic goal-oriented movement towards a preferred direction
  - Ability to display to users the direction the drone will move via tethered connection