

Automated Drone Navigation: Weather Processing

Milestone 1 Progress Report

Team Members:

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Faculty Advisor:

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Client:

Associate Professor of Computer Engineering and Sciences at Florida Institute of Technology, Dr. Siddhartha Bhattacharyya: sbhattacharyya@fit.edu

Milestone 1 Progress Report

Task	Completion	John	Naomi	Mason	Todo:
Access github repository / lab key access	50%	-	-	-	Awaiting lab keys
Develop scheduling	99%	33%	33%	33%	Finalize setup of tasking software
Requirement Document	33%	33%	33%	33%	None
Design Document	33%	33%	33%	33%	None
Test Plan Document	33%	33%	33%	33%	None
Investigate weather data collection tools	75%	25%	25%	25%	Determine which weather service is most compatible with X-Plane

Milestone 1 Tasks:

- We have been introduced to the current navigation program by the graduate advisor, and a branch of the program will be ready for our changes.
- We have recognized some challenges that may occur during development of our algorithm. Unlike navigating based on preloaded population density data, weather data is more dynamic and requires updates to stay accurate. In addition, weather data is a collection of various measurements representing conditions such as high speeds, storms, hail, and more. We will need to interpret this data and then group it together on a coordinate system so that a particular type of weather can be recognized within a grouping of weather coordinates.
- Requirements document is complete
- Design document is complete
- Test Plan document is complete
- We have searched for different sources of weather data. The challenge is that we will not know how the existing navigation program handles data in its decision making, and we do not know the specifics of X-Plane's weather system. We also do not know the relationship between Soar and X-plane in the sense of how the addition of weather would work between the two. As

we continue development on these features, we will determine which service suits the project the best.

The table below compares these potential services:

Service Provider	Cost	Service Platform	Data Information
Visual Crossing	1000 free records per day	Online API web calls	Daily/hourly records at requested coordinates by nearest stations. Lists general atmospheric data.*
OpenWeather	1000 free records per day, \$0.0015 per record over limit	Online API web calls	Allows: Minutely forecasts for 1 hour, Hourly forecasts for 48 hours, Daily forecasts for 8 days, Previous weather data record lookups.
X-Plane-11 Real Weather	Free with X-Plane 11	X-Plane embedded process	METAR reports. Implementation potentially outdated, not reliable
National Weather Service - API Web Service	Free	Online API web calls	General forecast of atmospheric data.* Information at particular latitude/longitude. Hour-by-hour API available.
Aviation Weather Center Dataserver	Free	Text Data Server, 5-minute refreshed database containing XML/CSV/GZIP files	Stores past 3 days of weather reports. No forecasts. Formats include: METARs, Aircraft reports, TAFs, SIGMETs, G-AIRMETs, STATION INFO

* General atmospheric data : data such as humidity, dew, pressure, visibility, wind speed, etc.

Milestone 1 Individual Contribution

- **John Sellock:** Performed preliminary research on weather systems, different weather data formats. Set up initial drafts with outlines/templates for requirements, design, test, and progress documents. Worked on Section 1 of the Requirements document, Section 2 of the Design document, and on Section 1 of the Test document. Provided initial process plan (diagram in Design Document) and design.
- **Naomi Cotti:** Worked on Section 3 of the Requirements document, Section 1 of the Design document, and on Section 3 of the Test document. Provided additional clarification and explanation of specifications and limitations of the program.
- **Mason Elizondo:** Worked on Section 2 of the Requirements document, Section 3 of the Design document, and on Section 2 of the Test document. Provided additional clarification and explanation of product functionality and characteristics. Provided GUI mockup in Design document.

Milestone 2 Plan

Task	John	Naomi	Mason
Review existing codebase	Review SOAR architecture	Review XPC	Review {something}
Investigate insertion of weather data into X-Plane	Research file format for METAR and wind	Research X-Planes' usage of METAR and wind files	Research how to convert weather data into X-Plane's file formats
Investigate insertion of weather data into SOAR	Research data organization for use by SOAR	Research data organization for use by SOAR	Research data organization for use by SOAR
Demo data collection call from API	Make request of weather conditions at a given location	Make request of weather conditions at a given location	Make request of weather conditions at a given location
Demo usage of custom weather files in X-Plane	Test file and implementation	Test file and implementation	Test file and implementation

Planned Milestone 2 Tasks

- The first task is to review and become familiar with the existing navigation program—including its functionality, process flow, and data requirements—in order to understand how and where to modify the program to achieve our goals.
- We will investigate how X-Plane handles custom weather files and how it can manually be automated, if it is possible. While X-Plane does have a built-in 'weather refresh' function, we will investigate whether it is possible to use XPC to invoke that refresh with our own custom weather data.
- We will investigate what data SOAR requires and how to prepare data for its usage, if there is a standard set by either SOAR or the existing program. If there isn't, we will design an organization for this data.
- We will develop a demo that requests weather data from an online service's API and extracts relevant weather data. We will also demo a X-Plane's custom weather system using our own data.

Date(s) of meeting(s) with Client:

- TDB

Client feedback:

(if Client and Faculty Advisor are the same, write "see Faculty Advisor Feedback below")

Date(s) of meeting(s) with Graduate Student Advisor and Faculty Advisor:

- January 16th, 2023
- January 24th, 2023

Faculty Advisor feedback:

Faculty Advisor Signature: _____ Date: _____

Evaluation by Faculty Advisor

- Faculty Advisor: detach and return this page to Dr. Shoaff by email with scores to wds@fit.edu
- Score (0-10) for each member: circle a score (or circle two adjacent scores for .25 or write down a real number between 0 and 10)

John Sell ock	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
Noa mi Cotti	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
Mas on Elizo ndo	0	1	2	3	4	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10

- Faculty Advisor Signature: _____ Date: _____