1.1 Sky Dashing Pre-Flight GUI DEVELOPMENT

Jorge Dozal, Ja'Brianne Cleveland, Melissa Villatoro, Ryan Huston

Ingram School of Engineering

TEXAS STATE UNIVERSITY
The rising STAR of Texas

airogistic

Project Problem

- Drones are a pristine technology which is currently lacking an all-in-one Graphical User Interface (GUI) which monitors drone health and domestic flying conditions in its area.
- Developing accurate flight paths that incorporate local weather data as well as drone diagnostics from sensory data will aid in establishing sustainable drone ecosystems for commercial and residential use. This requires a multidisciplinary approach.

Project Purpose

- To further enable a "Highway In the Sky", the development of user-friendly GUI will display a geographic flight map, pre-flight diagnostics of drone, and a final FLY/NO FLY decision for each drone mission.
- The creation of an all-in-one dashboard will allow users to actively monitor if the flight mission is suitable considering current weather conditions in the area and the other variables previously mentioned.

Project Objectives

- Development of improved GUI using Ignition by Inductive Automation Software for drone operation which gives the user pre-flight data that also determines Fly/No Fly Decision.
- The GUI will visually display a Geographic flight path, preflight drone diagnostics, and a Fly/NO Fly decision using images and easily distinguishable choice symbols.
- The three software platforms that will be used are: *Qgroundcontrol* (Creates Flight Path), *MySQL* (stores information), and *Ignition* (Creates GUI).

Background Information

- Currently, there exists a GUI which considers only local weather station information for preflight *wind speed, temperature, and chance of rain*. The text is too small.
- User interaction with the current GUI does not allow for a complete data analysis of current conditions for the drones pre-flight. Final decision should be more evident.

Figure 1: Current State of GUI

Graphical User Interface (GUI) Layout

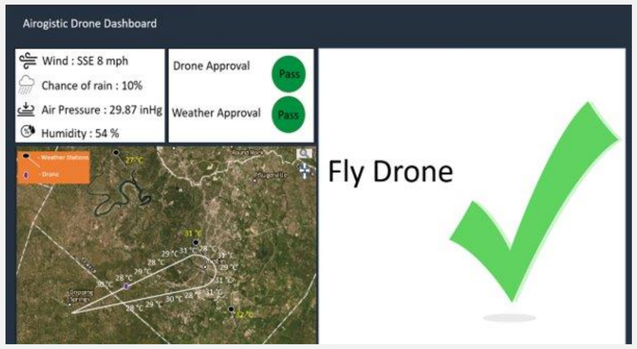

Figure 2: Fly Decision

Pre-Flight Drone Diagnostics: Using the provided data stored in MySQL by the Electrical Engineering Team, the Ignition Software will display information from the *ultrasonic sensor, force mount weight sensor*, *onboard power sensor*, *drone battery* percentage, and *temperature sensor* from each motor.

Figure 3: Ultrasonic pre-flight drone diagnostics

Weather Data: Using Ignition Software's connection to *MySQL and Python,* micro-weather and weather stations from point A to point B shall be displayed throughout the flight path.

Flight Path: Using *QGroundControl*, a .kml file will be created for each flight path. The .kml file will be translated in the Ignition Software by utilizing Python. This will allow the flight path do be displayed onto the graph as shown.

Figure 4: No Fly Decision

Figure 5: Drone

Fly/No Fly Decision: Utilizing the parameters from the weather data and the pre-flight drone diagnostics, alarms from *Ignition* will allow the dashboard to display two decisions. The first being the drone data approval. This will be decided upon if drone *engine*, *motors*, and *optics* are good to fly or not. The second decision will be weather data approval. This will be decided by the *wind speed, air pressure*, *temperature*, and *chance of rain*. Finally, a big FLY/NO FLY will be decided based on both approvals.

Ignition by Inductive Automation Software

Figure 6: Ignition Standard Architecture

- The improvement to the GUI Development will be produced by Ignition by Inductive Automation Software.
- The Ignition server will connect to the drone controller by a OPC UA Client and connect to our database such as MySQL and MariaDB.
- Once server has its connections, we are then able to connect to our own devices.

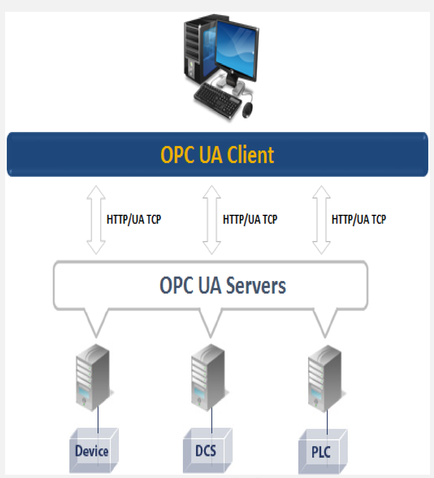

Figure 7: PLC Platform

Progress

- Throughout the duration of the GUI Development Design, the team has made tremendous progress such as:
  - The obtainment of a wide and working knowledge of commercial use of UAVs in the industry from a variety of academic articles and literature.
  - Effectively communicating with the Airogistic EE Team, Technical Advisors, and Program Sponsor to establish clear and obtainable goals for project deliverable(s).
  - Evaluation of two visual development applications and then further determining which application to move forward with based upon specific project performance measures, boundaries, and constraints.

Future Goals

- Future improvement to the GUI will be fulfilled by the following responsibilities:
  - Learning the Ignition software
  - Learning Python Coding Language
  - Testing software and pinpointing failure modes.
  - Troubleshooting and collaborating with Airogistic Electrical Engineering Team to ensure drone parameter diagnostics are being met.

Team Members

Figure 8: Team Picture

Ryan Huston | Melissa Villatoro | Ja'Brianne Cleveland | Jorge Dozal

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