Aerial Land Inspection System

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Contents

1 Introduction

1.1 Project statement

The Aerial Land Inspection System (ALIS) is a solution to remotely and autonomously map the terrain of a potential work site from the air by taking several aerial photos and later stitching them into a Google Maps-like program. This document introduces the proposed design of ALIS developed by the second development team.

1.2 purpose

The work done here will be used in an ALIS application that can be used onsite to survey an area using a drone connected with the mobile device, which has the application installed. The drone will be able to survey autonomously and collect photos to use with the base station computer onsite to produce an accurate 2D map of the area, that can be used for drilling purposes of narrowing down where pipes are already located in a timely manner.

1.3 Goals

We hope to create a working application that will utilize and add onto the previous version of the ALIS project. The project will be reworked to autonomously capture photos and then stitch them together to make a 2D map similar to Google Maps. Some of our research and development goals are to learn more about GIS and OpenLayers, then adeptly apply them to this project.

2 Deliverables

The end result of this project will be the advanced prototype of a system that enables the remote mapping of worksites and will be composed of three main parts:

1. An autopilot survey with the drone using the Android Application
2. The resulting pictures stitched together in a GIS application, preferably OpenLayers
3. A high quality 2D map of the area photographed by the drone with an offline mode

3 Design

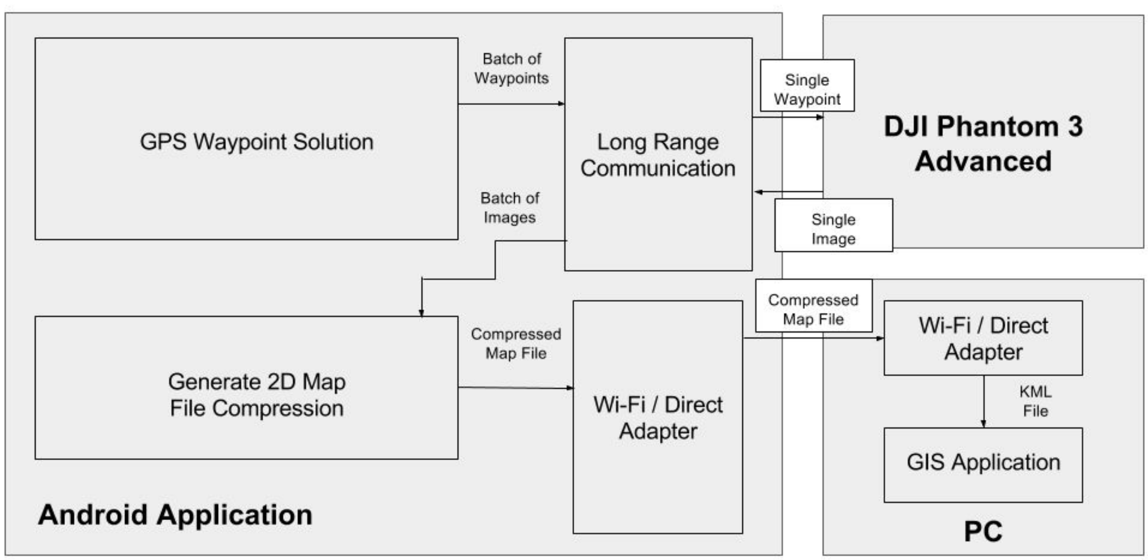
The following includes possible methods and/or solutions for approaching Project ALIS. In the future, this will contain additional visuals.

3.1 Previous work/literature

A previous senior design team worked on the first iteration of this project. We have access to all of their code base, such as their autopilot functions. Vermeer's summer intern also improved on the project by taking the PC solution and making it an Android application.

3.2 Proposed System Block diagram

[For most groups you can include a flowchart of how the system will work. In case your project is not about putting together some sort of a system, you may describe the process that you will follow to achieve your deliverables.]



3.3 Assessment of Proposed methods

Currently we are researching various methods of creating the map, our main approach is to on use a single picture at each waypoint to stitch together a map of the desired area. Displaying the map will involve using a form of GIS and the results being displayed with a GIS application, preferably OpenLayers.

3.4 Validation

The first step to validate our solution is if we can load our map onto something like a website and see if it is viewable. Once it is viewable, we will have to check the accuracy of the resulting map if it's correctly stitched together into a mostly uniform image. Files of the map stored on the Android device should be as compressed as they can be without compromisation.

4 Project Requirements/Specifications

4.1 functional

- The drone must take clear pictures
- The drone must be fully autonomous after launch
- The application should take in a set of coordinates or use the Google map to generate waypoints in a selected area
- The drone will only need to take 1 picture per waypoint
- The system must use the pictures to create a 2D map

4.2 Non-functional

- User interaction with the system should be easy to use and respond quickly.
- Application should not crash or have any errors.
- The drone should be able to work in fair weather consistently, fly to waypoints, and take picture accurately.
- The model will be available in a platform using a GIS application, preferably` OpenLayers.
- Drone and application combination will be safe and have faulty measures taken care of automatically and/or manually.
- The 2D map should be an accurate representation of the surveyed area.
- The map should have an offline mode available

5 Challenges

Lacking previous knowledge in several areas including:

- GIS
- OpenLayers
- DJI API
- Previous ALIS Project codebase

Communications with members and developing a schedule.

Testing iterations of software with the drone (inclement weather).

Accuracy of 2D map cannot be quantitatively determined or measured.

6 Timeline

6.1 First Semester

[Breakdown your timeline into detail of what needs to be done by the end of the first semester. You may want to include division of work amongst the team.]

Middle of October: Turn in various forms and paperwork

3rd week of November: Converting pictures into a map

End of November: Autopilot with drone to take pictures

Start of December: Working prototype and polish website

6.2 Second Semester

End of March: Quality assurance

End of April: Addition of extra features

End of Semester: Finalize website and project board

7 Conclusions

The final goal of this project is to develop a system that will use a quadcopter to stitch taken pictures together to create a 2D map. We plan to reuse the previous ALIS project code for autonomous surveying, but allow users to set coordinates on a mobile platform. We plan to rework the code for taking pictures to a single overhead picture. By creating a 2D map we can create a high definition map that will allow the user(s) to remotely survey land and plan out piping systems.

8 References

[List all the sources you used in understanding your project statement, defining your goals and your system design. This report will help you collect all the useful sources together so you can go back and use them when you need them.]

Quinn Murphy

Vermeer

OpenLayers

9 Appendices