NASA – SPACEAPPSCHALLENGE ROSARIO

#Aeronautics #DroneHome

DON'T CRASH MY DRONE

Team Members:

- Hofer German
- Banchio Leone Emiliano
- Grosso Renzo
- Sánchez Joaquín
- Ibañez Juan
- Cicetti Joaquín
- Geretto Franco

INDEX

CHALLENGE 3
DESCRIPTION 3
PRECEDENTS 3
CONSIDERATIONS 3
TEAM 3
OUR SOLUTION 4
RESOURCES EMPLOYED 4
IMPROVEMENT 5
ADVANTAGES 5
DISADVANTAGES 5
POSSIBLE APPLICATION 6
EXTERNAL REFERENCE 6

CHALLENGE

DESCRIPTION

To create an app that allows small drones' operators know more about specific parameters related to the weather, the local area and "no-fly" zones within a 5-mile radius with respect to their GPS location.

PRECEDENTS

Thousands of owners of small drones crash their vehicles due to wind, water, ice or other objects in the air. These vehicles often undergo such a damage that are impossible to repair.
Sometimes, the drones accidentally fly to no-fly zones or restricted airspace. Currently, small UAS (Unmanned Aircraft System) owners can consult their local meteorological data sources and can visually check the airspace looking for air traffic and objects. However, their visual line may not extend enough to prevent accidents. Unless they know the FAA regulations regarding the restricted airspace, they cannot know if there are restricted spaces in the surroundings.

CONSIDERATIONS

The new app should be developed in an easy-to-learn format and it may potentially be integrated to control systems of a variety of air vehicles so that the operator can get warnings before and during the flight regarding if the flight parameters of their vehicle can be exceeded. The app needs to reflect the current conditions within a 5-mile radius with respect to the operator's location:

- Weather parameters such as the wind speed and direction, potential wind gust speed, dew point, temperature and visibility.
- Representations with zoom capability of vegetation, buildings, posts, wires, communication towers and water bodies.
- Identification of no-fly zones or restricted airspace within a 5-mile radius.

TEAM

We are a group of friends who study Systems Engineering at UTN and Electronics Engineering at UNR. We were encouraged by the idea of facing such a challenge together.

We learned about the challenge in a meeting delivered at UTN and we started preparing and organizing ourselves to be able to provide a solution to some of the issues raised.

After some back-and-forth, we decided that we were going to choose the "Don't Crash My Drone" challenge and herein we introduce our solution.

OUR SOLUTION

We designed a web app (with future application in Android and iOS) which provides information to operators of small and medium-sized drones regarding inclement weather conditions, restricted airspace, potential objects to which it may collide and real-time geolocation.

An Arduino device with GPS and proximity sensors that sends data to a server connected in real time which processes the data and generates information regarding the area based on the parameters preset by the user. Therefore, the users get a report as regards the previously-mentioned parameters in a simple and user-friendly web design, which allow any novice user to handle it confortably.

After meeting with several experienced users of drones, we decided to add more features to the system according to the needs raised us. Being aware that many models of drones already have their own software, we aim to an independent system of trademarks and models , and paying attention to the user.

Users of the application can now register and add their drones to the system, with all its specifications (weight, size, frame video link used, channel , etc.) or choose from the list of pre-loaded models.

Once registered , the user has the option to choose between "Drone Mode" and "Pilot Mode", depending on whether you want to put your phone on the drone or not. The "Drone Mode" provides more information as it receives the exact location of the device and all alerts for the approaching danger zones. The "Pilot Mode" allows the pilot to leave the location in the reference system for other users.

Another feature is the possibility that each user can add restricted or danger areas, which are recorded in the system. The aim is to put together a collaborative map that alerts users made by all and for all

In addition, we added the option to schedule flights for future days, which allow not only to receive weather data from flight planned at the site of the selected map, but also as information for other users of the system to avoid the area in the selected time period, and thus avoid frequent, such as interference in the transmission channels of video / image or RF problems.

RESOURCES EMPLOYED

- PHP
- Java-Android
- JS (JavaScript)
- HTML - CSS
- Google Maps API
- WebSocket
- Azure
- https://www.aviationweather.gov/
- Material Design
- Arduino
- MySQL

IMPROVEMENT

The following step in the project would be about replacing the phone with a device that has GPS and a way to send data directly to the owner. This way, the size and space it occupies would be minimized and, in turn, the data transfer speed as well as the specific accuracy of the variable altitudes would increase. (In addition to avoid the user having to mount your cell to drone).

It is also in our plans to incorporate more features to users that allows them to share photos and information about their flights, and make "GeoDrone " in the social network for drivers drones.

In the future, it could be possible to incorporate an automatization that anticipates a possible collision and, given this situation, takes action and changes direction, rotates or fully stops the drone.

Moreover, it could integrate other APIs about restricted airspace in a way that they are automatically updated in the server apart from the already implemented manual load.

ADVANTAGES

- Thanks to using OpenSource code, it provides an easy adaptability and support to most of the existing platforms.
- Due to its simple, user-friendly and adaptable interface, it can be used by any person without issues, even if they don't have technical knowledge.
- It is really cheap and it involves little implementation work. We only need to mount a phone to the drone and then we will be able to use the service.
- Data related to the weather and restricted airspace can be easily obtained across the globe, making it possible to apply the app anywhere in the world.
- Most important cities already have three-dimensional maps loaded in Google Maps, enabling the calculation over structures for a better forecast of collisions.

DISADVANTAGES

- Since it depends on Wi-Fi network or mobile telephony, it's not possible to use it in place without these conditions.
- The GPS system which is currently applied introduces an error of +/- 10 meters over the Z axis (altitude), which may cause erroneous interpretation (solution suggested in "Improvements" section).
- The information obtained regarding the weather is loaded by external sites. Therefore, if they deliver a bad service, the app may not work right.
- Currently, there are not many legislations related to the restricted airspace in our country which makes it difficult to acquire these data.

POSSIBLE APPLICATION

During an interview with an aircraft pilot, we came out with the proposal to integrate the information with the current control systems for air traffic, which will also help control traffic of other drones flying within the zone.

Possible future implementation of our application would be to function as a system of air traffic control drones (which does not exist so far), which can be very useful for government agencies and other agencies. It is available to the latter use the information we collect our application.

Currently, the APM (Arduino AutoPilot) system integrates similar technology with the objective to infer over the drone's controls. The application in conjunction with our solution would not only work as an alert but also act over the drone in order to prevent accidents or issues not foreseen by the drone's user.

EXTERNAL REFERENCE

- https://developers.google.com/maps/documentation/javascript/?hl=es
- https://espanol.wunderground.com/weather/api/
- http://www.websocket.org/
- https://www.aviationweather.gov/
- https://design.google.com/