Droney: A Mobile App to Connect the Drone Community

Shuishi Fang
Rochester Institute of Technology
Rochester, NY, USA
sf8859@rit.edu

Vinita Tibdewal
Rochester Institute of Technology
Rochester, NY, USA
vt2173@rit.edu

Vaishnavi Mande
Rochester Institute of Technology
Rochester, NY, USA
vm7801@rit.edu

Pritish Sai Kannan
Rochester Institute of Technology
Rochester, NY, USA
pxk7620@rit.edu

Ruiwen Fan
Rochester Institute of Technology
Rochester, NY, USA
rxf6723@rit.edu

ABSTRACT

In recent years, the usage of personal drones (quadcopters) has expanded rapidly. Drones are being used for many purposes including videography, photography, and racing. Drone enthusiasts have formed demographically concentrated groups to share their knowledge and experience. These groups

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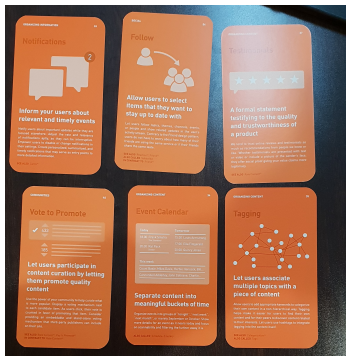
KEYWORDS:Drone; Mobile App

	Drones owned	Experience in years	Drones	Drone usage	Professional?
P1	1	1	DJI	Photography	No
P2	2	2	Bought 1 and build 1 drone	Racing	Works in drone related company
P3	8	3	DJI	Photography and videography	Owns drone related company
P4	4	4	Built 4 drones	Racing	Hobbyist
P5	2	2	Bought 2 drones	Photography	No
P6	3	3	Built 1 and bought 2 drones	Land Surveillance	Worked with drone related startup
P7	0	0.5	Borrowed DJI	Videography	No
P8	1	1	DJI Mavic	Hobby	No
P9	0	None	No drones	NA	Skeptical about drones
P10	0	1	Planning to buy a drone	Hobby	No

Sidebar 1: Participant information



Sidebar 2: Use of UI Cards for the design

focus on a few specific topics of interest and act mutually exclusively of one another. Also, many times, individual drone enthusiasts find communication with these groups difficult for various reasons.

The proposed mobile application, Droney, aims at bridging this gap between the drone enthusiasts and the drone communities. It also aims at strengthening the bonds between various drone communities by acting as a communication medium between them. Droney provides location-based features for identifying flying and no-flying zones. It acts as a question-answering platform for the drone community issues to be solved. The application also provides capabilities for residents to adhere to their rights to claim public safety and privacy.

INTRODUCTION

In the last few years, the quadcopter, a new class of Unmanned Aerial Vehicles, has proliferated. The quadcopters present user-friendly control system, high reliability, and hovering abilities. These features ease the pilots' work and allow certain maneuvers not possible in fixed wings aerial vehicles. The FAA projects the small model hobbyist Unmanned Aircraft Systems (UAS) fleet to more than double from an estimated 1.1 million vehicles in 2017 to 2.4 million units by 2022. https://www.faa.gov/news/updates/?newsId=89870

Common usage of civil (non-military) drones, according to [1], includes photography, video recording, racing, search and rescue. For each purpose, there are specific drone models and maneuver skills. Drone controls vary among various drones. Because of these variations, self-learning about the drones depending on own experience becomes time and effort consuming.

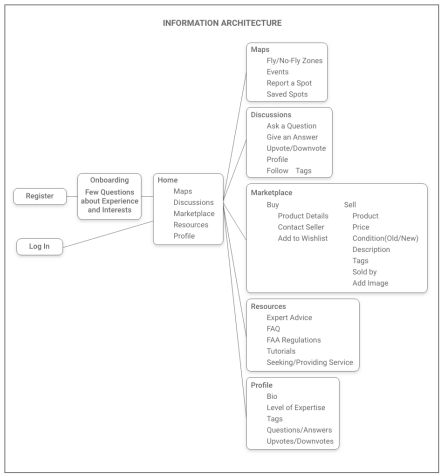
When flying drones in the United States, the flight should abide by a certain set of rules defined by the FAA. These rules are considered as pre-flight checklists to fly safe which can be found on the official FAA website: https://www.faa.gov/uas/getting_started/

Other than purchasing ready to fly models, some drone enthusiasts build their own drones. Some of them do this for the passion of DIY (do it yourself) while some are exploring special usage of drones that are not covered by the industry yet. For example, guiding drones for the visually impaired [2] [6], "street eyes" [5], dancing accessory [4], companion device [3], etc. When faced with problems, they check out these issues online via forums and discussions. If the problem is not resolved, they initiate a new discussion. This process is time consuming and does not guarantee solution. The community plays an important role in this case.

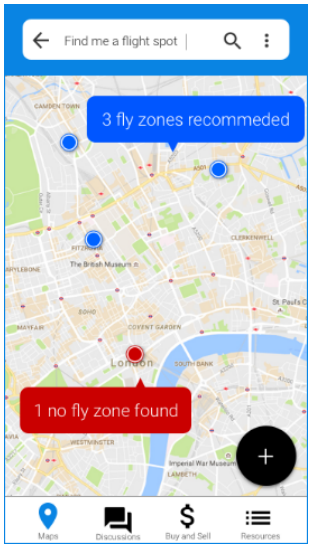
In this paper, we discuss the design process, the research observations and Droney, the mobile app designed for drone pilots as primary stakeholder.

INITIAL RESEARCH

We conducted ten semi-structured interviews. One participant belongs to a worldwide organization aiming to connect people in the field of drone photography. Two participants belong to drone racing



Sidebar 3: Information Architecture



Sidebar 4: Prototype: Maps in action

groups and build their own drones. Six participants are drone pilots and their details are displayed in the participant information table, Sidebar 1, along with those of a neighborhood association representative who was skeptical about drones. The interviews lasted for about an hour, and the questionnaire covered the participant's purchase and flying experience, special skills regarding different usage of drones, rules and regulations knowledge, user experience, and impact on other people.

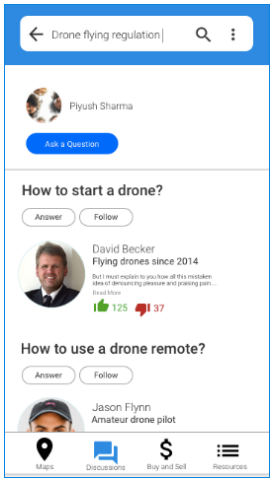
We also attended a drone racing event on the invitation of one of our participants.

On coding the interviews, we identified 2 major drone communities, the racer group and the photography group. The significant observations are mentioned in the following list:

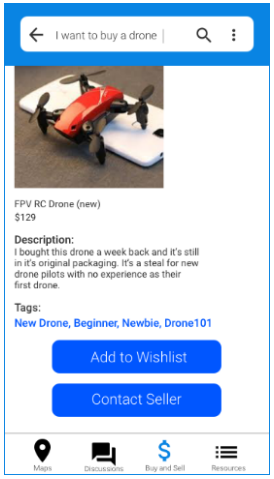
- Access to technical knowledge: Five participants mentioned that they struggled to decide which drone to buy due to the lack of technical knowledge and sources to gain the knowledge.
- Learning to fly a drone: All the drone pilots claimed to have experienced a learning curve with their first drone flight. The drone community members mentioned that virtual training for beginners is a better way to learn.
- Resources to identify flying areas: Individual pilots would rely on personal experience to look for a spot to fly their drone. As different purposes of flying require different terrains, pilots said that they end up spending hours and hours looking around for spots to fly.
- Consideration about surroundings when flying: All drone pilots we interviewed showed great care of safety. They avoid people, complex terrain, open water-bodies, and traffic while flying.
- Regulations: All the participants are well aware of the rules and regulations for flying drones, and they use different sources to check their flight compatibility with FAA regulations. Some of these sources were not reliable compared with the FAA provided app, B4UFly.
- Drone race broadcast: Drone races are exciting to watch with the help of AR glasses to keep track of the drones. Without AR glasses, it is difficult for the spectators to follow what is happening as the drones are quite small in size and fly fast.
- Drone building: Three participants have experience building drones. They all faced the problems of troubleshooting through the crafting. They had to sort through a lot of online discussions to find the exact solutions.
- Cost of the drones: Drones are expensive. Amateurs prefer to buy cheap drones to practice flying. Some prefer building their own drones which is cheap and easy for part replacement.

PROTOTYPE

To remedy the problems faced by the drone community we propose Droney, an application aimed to ease sharing information and experiences within the drone community. The decision making for the prototype was done with the help of UI pattern cards (see Sidebar 2) and follows Material deisgn principles. The information architecture for the app can be seen in Sidebar 3.



Sidebar 5: Prototype: Discussions in action



Sidebar 6: Prototype: Marketplace feature in action

Droney is an assistant and contains four major components, Maps, Discussions, Resources, and Marketplace. We design the application to serve as a mediator between an individual and the drone community. The application will ensure a seamless flow of knowledge possessed by experts in diverse drone-related fields to the information seekers.

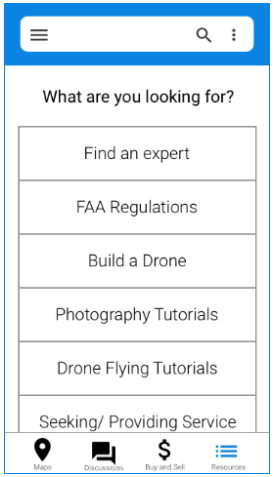
As an assistant, Droney will help the user sort the requested information based on the most relevant data sorting technique and help the user to navigate to the corresponding functionality.

Maps. This feature provides field functions that drone pilots could use when they want to fly. Currently, existing solutions only show no-fly zones (most regulation tools do this right now). In addition to no-fly zones, Droney will also show fly zones based on location. These locations will be marked by drone pilots using the application (see Sidebar 4). This will provide the pilots a recommendation of spots which are already being visited by other pilots. The event finder will notify pilots of events nearby to help keep track of them. This feature will provide the pilots with opportunities to connect with the communities. The "ask help" function will increase internal bonding between the community members. Through Droney, we hope that people who never used drones before or are not familiar with the drone community could also be able to find things they need.

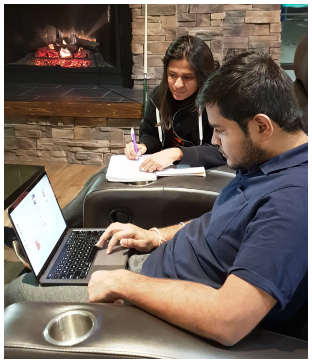
Discussion. The main aim of Droney is solve the issue of guidance faced by many individuals in the drone community. From our research, we found that most of the participants self-learned their experiences with the drones. The process was time consuming and frustrating. The discussion board feature will provide individuals a platform to get their questions answered on a global level (see Sidebar 5). Unlike messaging platforms, the discussion board will be a non-linear platform, customized for every viewer based on their profile and recent searches. The discussion board will also provide links to profiles of the people who answer the questions. Individuals can directly communicate with others via personal messages.

Marketplace. This is a feature where people can put drones or drone parts on sale and the people who are interested in buying them can directly contact the seller through our application (see Sidebar 6). During the interviews, participants mentioned that the drones or drone parts are very costly. Similarly, two of the participants mentioned that they have broken drones which still have some working parts on them. Droney aims to connect these stakeholders. So, if a drone is broken and cannot be flown anymore, its parts can be put up on sale using Marketplace. It is not necessary that the drone/drone parts are always old, verified sellers can also put up their drone kits on sale.

Resources. This feature provides external links to resources useful for drone enthusiasts. During our research we found that participants used various sources for regulations to be followed while flying the drones. Some of them are verified while some are not. To provide consistency in the knowledge



Sidebar 7: Prototype: Resources feature in action



Sidebar 8: Usability Testing

and reliability of the sources to be used, Droney will provide external links to sites such as FAA and links to tutorials and educational media.

Apart from the features mentioned above, Droney features as a networking platform for the drone enthusiasts. The experts have the control to promote and reveal the information they share on the platform.

Droney also provides functions to help residents know if there are any pilots flying drones in vicinity and to mark their property as no-fly zone. Sharing this information between the drone and the non-drone communities would help maintain the privacy of the residents. This would encourage residents to have a positive connect with the drone community.

Another function of Droney is to provide a platform for individuals to ask for help — this can be requesting a drone videographer to broadcast a drone race or request community members to search for a lost drone. The "ask help" function will increase internal bonding between the community members.

Through Droney, we hope that people who never used a drone before or are not familiar with drone community could also be able to find things they need.

USER EVALUATION

We designed a low-fidelity prototype and conducted 7 usability tests and iterated our design 3 times based on the user feedback (see Sidebar 8). Each participant interacted with the prototype exploring the app thinking out loud throughout and asking doubts wherever necessary. And based on decisions we designed the high-fidelity prototype.

We wanted the app to reflect that the platform is open to all levels of expertise and any group of interest. The app is designed to solve overall necessities of the drone community. People appreciated the idea to put real-time alerts if the FAA regulations during the flight were jeopardized as they find it boring to read through them.

Some design changes after the usability tests include changing of hamburger menu to floating action button which increased the engagement with features mentioned under it. Initially, the Map screen was designed to be the start-up screen which confused people. A new screen with homepage was added, a pattern with which people are familiar.

CONCLUSION AND FUTURE WORK

We believe that Droney will provide a platform for the drone community, which is currently scattered, to bond. Droney will enhance connections between the drone community and individuals with different levels of expertise. It will also enhance the relations between various drone communities and provide a platform for the non-drone enthusiasts to reach out to drone community members.

As per the current design, the classification of the app user into level of expertise is controlled solely by the user. The user experience is manipulated based on the level of expertise of the user. To provide a better introduction of Droney we need a better way to categorize its users.

Currently, Droney doesn't highlight solutions for the issues faced by any community elements leery of drone technology. We were able to interview only one person who was skeptical about drone surveillance. In future, we would like to conduct more interviews to understand the issues and if and how they can be solved with the help of Droney.

And finally, we aim to establish Droney as a one-stop app for drone enthusiasts. This can be achieved by making the application equally appealing to every genre of the drone community and as the community of people skeptical with the use of drones. And, hence this would invite a second iteration of the research process and updating of the design.

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