

Summary Report

Computer Science Capstone Project: CSE 486

Student Proposal: Arizona Roadmaps

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(Arizona Roadmaps dreams of detailing difficult off-road routes for amateur campers.)

Contents

| | |
|--|-----------|
| <i>Description of Overall Project</i> | 3 |
| <i>Personal Contributions</i> | 6 |
| <i>Reflection</i> | 7 |
| <i>Value</i> | 8 |
| <i>Team Reflection</i> | 9 |
| <i>Conclusion</i> | 10 |

Description of Overall Project

Main Motivation

Camping is not the easiest recreational activity to be casually introduced to. Many are thrown into the venture by someone with prior experience. Obstacles such as challenging roads, proper gear and equipment, food, etc. can all hinder anyone trying to journey into the wilderness. Arizona Roadmaps was developed as the idea to provide the minimum vehicular requirements an automotive should pass if making the trek onto a specific road. The goal was to detail each road with difficulties groups would encounter; with Arizona Roadmaps, anyone that would go camping could guarantee their vehicle would make the drive there and back. Often, amateur campers and even experienced campers are not aware of the damage a road can have on their automotive. Arizona Roadmaps sought to provide a list of hazards for the user to be aware if trekking on forest and dirt roads.

Requirements

Any app released for mobile needs to be developed for iOS or android based platforms. Arizona Roadmaps wants to provide a map functionality with sophisticated routing. This would require the use of a map API or digitally creating a map of the state Arizona. The routing procedure will ask for an algorithm that creates polylines on the map to direct the user to their destination. The app should have a search feature and a campsite page that can direct the user to the desired destination. Operating the UI of the campsite page should be easy and appealing to the user. A user can view the campsites and even be able to add in their own. A proper application of Arizona Roadmaps will input dirt road distance, tire requirements, suspension (Ride Height) analysis, gravel conditions, and permit requirements. Each campsite will have to be certified by Arizona Roadmaps, and then added to the Campsite Page. The page should have a filter for the user to sort through the campsites. Mobile apps should also have a database to store campsite related information. Arizona Roadmaps should have a settings panel with features to populate it. While heavy with information and support, the app itself most be simple and easy to use for most people unfamiliar with technology. The UI will use the flutter framework and seek to provide beautiful and fast functioning widgets.

Work Completed

Arizona Roadmaps was set to be developed with Flutter. Googles new cross-platform UI kit. It is a first-generation cross-platform technology that still has new documentation circulating it. With Google's Flutter, Dart, was the language to create flexible containers, a bottom nav bar, pages/page navigation, right aligned buttons, and more of the features displayed through the app. Googles Maps SDK for iOS/Android and Directions API were used to display a map on both platforms. The search page was created using the Places API from google, with an enabled autocomplete and autocorrect casing. Searching a location from the page, will pop the page to reveal the map with a marker at the input destination. The user can press the navigation button to generate a route to the destination. With many more on the way, eight campsites have been certified and added to the Arizona Roadmaps campsite page. Each Campsite has a tappable gesture that will open and close when used. All the above listed parameters in "Requirements" will be displayed with a tooltip under the campsite. Extra parameters such as location and spare tire necessity will be documented here. Individuals are instructed to take a spare to all campsites they venture to. Again, Arizona Roadmaps looks to ensure the safety of fellow campers and hopes to make sure everyone will return home safely. With the campsite page, there is no bottom navigation bar, and a separate "back button" is used to exit back to the home page. A second button is at the top right of the campsite page allowing users to add new campsites to the database. New campsites will be put under review and wait to get officially certified by Arizona Roadmaps. There is no filter function for the campsite page. The final testament completed was the settings panel. It opens and closes when clicked to reveal a drawer that extends with the settings options. There is included a logo and a description of the "About Us" page.

Defining the Best of the Work

Flutter is relatively new software just like most API's. The best of the work came from connecting a multitude of different APIs across all their versions to display a route on a map of Arizona from point A to point B. This was then topped when the app had to retrieve information from googles relatively new database "Firestore", display that information for the campsite page, and send it to the routing algorithm to generate a route for said campsite from point A. There were issues getting the database to display on the iOS platform; however, Android functioned great. Sometimes, devices can be limiting, and Xcode was needed for iOS.

System Diagram and User Story

Arizona Roadmaps is great for amateurs that are unfamiliar with dirt roads.

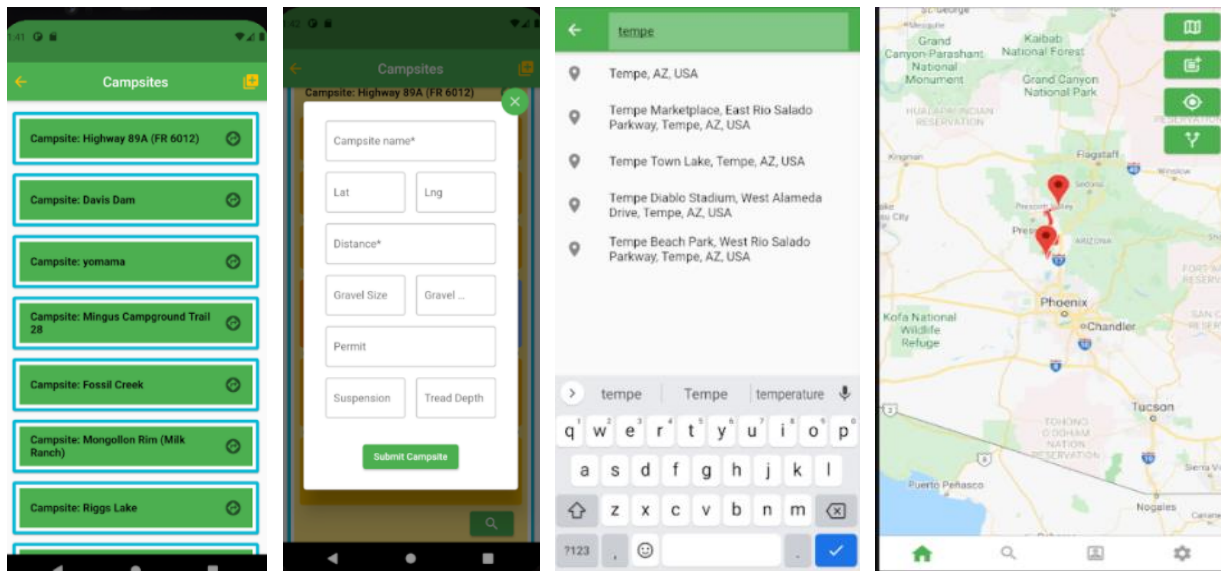
Adam (22 Years Male):

Adam recently moved to Arizona from Manhattan, New York. He is tired of the city life and just wants to get in tune with nature. He has heard Sedona is beautiful and he found a job in Flagstaff to get closer. He wants to explore new places, but he only drives a Toyota Tacoma. While this may be a great vehicle, he still needs to be aware of permit requirements, and whether his tires are equipped for the ordeal.

Sabrina (19 Years Female)

Sabrina goes to ASU and drove a car over from California for her Sophomore year. She is excited to take it out and camp with her friends, but her Subaru Forester is 2001. She is not sure whether her older vehicle can make the drive. Arizona Roadmaps will provide her a tire tread depth recommendation and the distance traveled on the dirt road.

Multimedia



Personal Contributions

Presentations

As the “product owner” of Arizona Roadmaps and main designer of the idea, I tried to lead off most presentations. I took it upon myself to describe our current progress and hand off to other Dev members to allow them to detail their work. If needed I would share screen and display app functionality, documents, etc. While questions were always directed to the group, if there were any open questions, I would take it upon myself to answer them.

Reports

With all relation to the Sprints Retros, being the designated product owner, I created Stories on the taiga and assigned them to individuals. I submit each report when I was scrum master and made sure every Dev Team member was scrum master at least once. For all other reports I took the initiative to make sure each one got completed correctly and submit on time. A group chat on WhatsApp helped us coordinate who would do what; and then the team got good at filling out reports in sync. Everyone always found something they wanted to do, and reports were always on time.

Product

A general idea was pitched by me, as the product owner, at the beginning of the sprint. Throughout the first month and sprint 0, we researched, and the team came up with ideas for development. Everyone would draw designs on paper and submit them to taiga. We would analyze the features/functionality and decide on which were the best. The general idea was improved and built upon after the first few sprints. As the developments progressed, I helped pitch design ideas for easy-to-use UI applicability and ways to keep the app simple.

Team Management

I started the first Zoom meeting and first sprint. I organized the Zoom meetings and created a WhatsApp for everyone to communicate in. Being the product owner, it was my responsibility to get a sponsor, and communicate between Dev team and sponsor. We got a second sponsor for additional support with back-end development. I hosted meetings solely for the Dev Team and the sprint sessions, as well as meetings for the sponsors and the Dev Team.

Reflection

Critical Evaluation

My roles in this capstone were uniquely different. I had the experience of being an owner and a Dev Team member. It was my duty to communicate with the sponsors more directly and help ensure the project goals are met. As a leader I believe I helped manage the team well and brought structure to the Dev Team. With my coding capabilities, I helped initiate the Final UI for the project, found the APIs for use, and developed the campsite page. This required back-end development and understanding of a noSQL database, firestore, and how to connect it to the mobile app. As product owner, I was available for help on debugging, and helped diagnose issues related to UI bugs or flutter bugs. However, I had my own share of questions and research to conduct on methods to implement.

Technologies and Skills Learned

Flutter is a multi-platform framework that can be used to display beautiful apps on both iOS and Android platforms. I created a fluid and easy to use app with Flutter's Dart language. I learned how to integrate an API into a project, and which APIs would be the best to choose from. Google provides analytics on their APIs that display key data for API requests/cost projections. For the Database, Firebase was the decision, and both databases were played with until Firestore was the chosen winner. Firestore requests were fast and updated instantly. This was cool to use, and while we cannot do the iOS side, the android view was cool.

Lessons Learned

APIs are great and awesome; they provide a ton of potential for the app when used correctly. However, it gets dangerous to start stacking APIs, plugins, and various resources. When not managed correctly, version properties can clash and crash the code. Everything always comes with an update, and some updates come with bugs. Always be prepared to downgrade back to an older version, and have the code stored safely.

Impact on Future Dev

Everyone has their first app, it could be a great idea or not, but implementation is key. I learned a lot about connectivity and mobile app development in this capstone. I will be more

prepared to set the fundamentals of my next app and build it faster than I did this one. Doing this in a group, people were delegated tasks. However, being the product owner, people reported their bugs to me. Even without the title, everyone on the Dev Team still helped each other out to solve bugs. With this we all developed roughly the same skills as we developed the app. Everyone got to understand and program each section of the app.

Value

Environmental

The app's main concern would be documenting permit requirements and staying consistent on road closures. After serious storms, roads can be closed for weeks or even months. It would be important to document and note this on the application. The environmental impacts of the application exist as the app would seek to bring more individuals out to the wilderness. People could harm and damage the environment, especially if they are novice campers. If any of these campers seriously affect the wild in extreme conditions (e.g., dry-heat Arizona forest fires) some might not know how easily a cigarette can start a fire. Ergo, greater risk of such an occurrence.

Health & Safety

Novice campers, while you can help detail roads, incidents will always occur. With people using our requirements as a guideline, people will try to test their cars on these roads. If requirements are met, more people will be on the roads driving different vehicles. Novice dirt-road drivers can lose traction and crash into walls, cars, and HOPEFULLY rails! Arizona Roadmaps being a reason for people to come out, can affect their health and safety. However, people have good driving sense, and gain experience quick.

Team Reflection

Evaluation of Success

The overall app completed the basic structure of what it was going for. A user can select any location in Arizona, search a location, or select a campsite off the campsite page and route to it. The features were fully implemented and completed; the app worked as intended. However, the base idea of a cross-platform app that would function on both iOS and Android could not be implemented without Xcode. The functionality, while glitchy on an emulated device, runs beautifully on Android devices/phones. The app was built with a flexible design and has a great display of information. The code is well documented and there is good commenting in certain areas. Each sprint was well documented, and the Taiga always showed the stories. The final demonstration was a fully functional GPS app that provided access to the Arizona Roadmaps campsite database.

Suggestions for Improvement

There is a great set of ways to design for iOS devices. Xcode is available on Mac and having a MacBook would allow a user to program in Xcode and release a version for iOS and debug it. Going into the app building procedure with a more dedicated structure, and a solid background plan. Apps should not be afraid to use APIs or databases for advanced features. The sprints were well documented, but the GitHub could have been updated more regularly. People had different versions of the GitHub and did not regularly update/push theirs. A solid GitHub structure with pulls and pushes on the daily would improve code organization and structure. People would develop and implement more specialized features at faster rates. Having teams and organized tasks per team may be more optimal. With individualized work, there can be too many debugging issues and it was difficult to keep the code in sync. When we split into groups, our code was more concise. Whether correlated or not, morning sprints and meetings lead to a healthier work environment. Comparing Fall Semester to Spring Semester, better work was turned in the Fall with morning sprint sessions.

Conclusion

Arizona Roadmaps started on a crazy last-minute idea. I wanted to create something cool that would be fun to develop as the year went by. I did not know what I wanted the app to look like when I first imagined. However, with all the technologies that we have put together; Firebase, Flutter, Android, the app sprung to life. Suddenly, it is looking like everything that I thought it should be. It still has a way to go; our code has broken down many times, but we have been able to fix each time. With new implementations, Arizona Roadmaps will be ready to launch for a Play Store and an AppStore release.