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| **Senior Design: Adio** |
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Abstract

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This document serves to describe the work done by Group 19 on Adio, an application for Uber and Lyft drivers to play their music during their shifts interspersed with location-based advertisements at a frequency they set.

Motivation & Goal

Advertisers, especially small businesses, want and need cost-effective ways to reach high-potential consumers. Additionally, there are currently cost-barriers for entry into advertising mediums such as radio for smaller businesses. Moreover, consumers want and need more relevant and effective methods to discover and connect with businesses that are easily accessible to them.

Most Uber and Lyft drivers play music on the radio, through which ads earning revenue for radio stations, play every few minutes. Thus, our team wanted to take this advertising opportunity and improve upon it while also providing another source of income for these drivers.

No formal survey was conducted, but each team member spoke to Uber/Lyft drivers to gauge interest from their end. Specifically, we gave a one-minute pitch of our idea and asked for their feedback on the following points: (1) if they play any music while they’re driving their riders to see if most drivers would play ads during each trip, (2) if they would use the product, given the existence of products with similar goals, (3) if drivers would be interested in beta-testing our service. We received positive feedback from the drivers, as the use of this service requires little effort on their end, besides downloading the application. The only concern on their end was that the user experience could be reduced because of ads. However, drivers can set the frequency of the ads, and given the existence of Uber/Lyft ratings, the driver will be incentivized to balance the number of ads playing during each ride with the user experience.

We also spoke to our networks of family and friends to both hear their thoughts on our idea and explore any possible concerns they would have. The feedback we received was generally positive, especially amongst college students. Given that students on campus call rides to Center City Philadelphia for downtown events, it gives them an idea of activities in the area. Adults also expressed an interest in this idea, for example, when they are traveling on business trips and want to explore the area around them during their free time.

Add M&T stuff here

Below, we provide specific details on the stakeholders and value proposition of our product.

Related Work

To determine how to best differentiate ourselves, we did a great deal of market research to identify several competitors, listed below. We categorized competitors as follows.

**Tablet-based Rideshare Advertising:**

1. Octopus (<https://www.playoctopus.com/)>: provides free tablets to rideshare drivers that play trivia games and location-based video advertisements.
2. Vugo (<https://govugo.com)>: provides in-car entertainment in the form of video games, apps, film shorts, sports, and news.
3. Surf (<https://ridewithsurf.com/)>: provides interactive tablet-based entertainment for rideshare, such as videos, music, podcasts, and live radio.

**Rideshare Billboard Advertising:**

1. Firefly (<https://fireflyon.com/)>: provides lighted billboards for the top of cars that cycle through different targeted advertisements in the area. Firefly pays drivers about $300 per month.
2. Halo Cars (<https://www.halocars.co/)>: provides LED billboards for the top of rideshare vehicles. Halo Cars pays drivers about $400 per month.

**Music Advertising Phone Application:**

1. Steereo (<https://steero.com/)>: creates playlists for drivers with sponsored music from independent artists paying to promote their songs. Steereo pays drivers once they have reached a minimum of $100 in earnings.

Given the current competition in our target market, we decided to differentiate our product in several ways that we feel are most beneficial to businesses, drivers, and riders. Firstly, our product is purely software-based and thus eliminates any hassle that may come with hardware solutions (such as billboards). Secondly, we integrated with the Spotify API to deliver ads that are interspersed with predetermined playlists set by drivers, which makes the experience more personalized. Thirdly, our solution allows for a passive way of making income for drivers, adding to the profit they make from just driving. Finally, our product will specifically be geared towards smaller businesses who typically do not get the exposure that larger and more well-established franchises receive.

We believe that these points make our product much more seamless and individualized than other solutions currently in the market. By catering to all stakeholders involved (small businesses, drivers, and riders), our product enhances the user experience on all ends.

Add M&T stuff here - Market research & Competition

Components (Completed and In Progress)

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There are two main components to the application: a web component, developed with JavaScript, EJS, CSS, and AWS, and a mobile component, developed with Swift, SceneUI, and several relevant APIs. At a high level, the mobile app allows drivers to sign in and set various parameters regarding the advertisements and music that they play, such as volume and frequency. In addition, drivers can navigate to a dashboard that details the amount of money made by drivers over specified timeframes, such as the past month or the past year. The web app is meant for advertisers and allows them to sign in, upload audio advertisements, and set the center and radius of the area their advertisements will be targeted towards (usually centered on physical locations of businesses).

Below, we list out the specific sub-components that comprise the mobile app and the web app, descriptions of their functionality, as well as their current status (**completed** or **in progress**).

**Mobile App**

(1)  Initial driver interface. This is essentially the home screen that allows the user (driver) to open the app and begin use of our product. **Completed.**

(2)  Settings interface. This view allows drivers to calibrate the settings that dictate how ads are played e.g. frequency of ads, volume of audio, allowing location sharing, etc). **Completed.**

(3)  Profit dashboard. This view renders a gridded histogram detailing the amount of profit (passive income) made by a driver using our app specifically. In addition, it allows a driver to calibrate the time period over which profits are calculated and displayed eg. the previous year or the previous month. **Completed**.

(4)  Stopping/resuming a song with ads. This feature allows the driver to pause a song that is currently playing from Spotify, play an ad, and then resume the song. The ad is played through a music player created using Apple’s AVFoundation library. This particular feature is located on the driver interface described above. **Completed.**

(5)  Integration with Spotify. As referenced above, our product integrates with the Spotify API to authenticate drivers with their personal accounts and play playlists that are actually curated by them, as opposed to being created by any third party. **Completed - see appendix for details.**

(6)  Playing of ads after a set number of songs. This feature allows the driver to connect to Spotify and only play an ad once a set number of songs have been played, creating seamless transitions between music and ads. **In progress - see appendix for details.**

(7)  Integration with database. This component allows for the pulling of specific songs our of our database. **In progress - see appendix for details.**

(8)  Driver statistics computation. This feature will provide specific calculations of statistics for drivers regarding profit/the actual rides driven and will then render the statistics to drivers. **In progress.**

(9)  Terms and conditions. These will detail terms of use on our app as well as what qualifications a user must have to join. **In progress.**

(10)  Geolocation algorithm for ad-selection. This will search through the entire database of ads that have targeting regions that encompass the current location of the driver and then selects these ads and queues them up. **In progress - see appendix for details.**

**Web app**

1. Account creation. This allows a new user to sign up and create an account with an email, company name, first name, last name, and password. **Completed.**

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1. Password encryption. This feature uses sha 256 to create an expectedly unique 256 bit signature for a user’s password, which enforces security for our users. **Completed.**
2. Verification of login credentials. This ties in with the above to verify that an email/password pairing does indeed exist in our database when a user is trying to login. **Completed.**
3. Map window for geo-location. This allows a user to click on a point of their choosing on a Google Maps API driven map. This click-point serves as the center of their ads’ targeting. Additionally, users can specify a targeting radius here. **Completed.**
4. Upload of audio files. This feature allows users to upload audio files (likely .mp3) that contain individual advertisements. This uploads the advertisement to S3 for later access and stores the ads’ metadata in dynamo db. **In progress.**
5. Evaluation of Completed Components

Below, we list out the various completed subcomponents of our product as well as the methodologies we used to evaluate them.

**Mobile App**

In general, we used a similar protocol to test every feature we implemented on the mobile application. We first tested it on different devices on the local XCode iOS simulator including an IPhone 11 Pro, IPhone XR, IPhone 8 and an IPhone 6. Then we tested the interface on our devices with different versions of iOS (iOS 9.3, iOS 12.4, iOS 13.2.3). Our final step of evaluation was to show the application on our phones to possible users and have them interact with the specific feature we were evaluating. Below we talk about specific evaluation points we were looking for.

**(1)  Initial driver interface.** We wanted our initial driver interface to be both user friendly and intuitive. Additionally, we did not drivers to feel overwhelmed by a cluttered home screen. After a couple of changes to our initial design, we found that potential drivers were happy with an easy to use and obvious homepage that wasn’t too cluttered with extraneous features.

**(2)  Settings interface.** There are a few crucial points we wanted to touch on here, given that the settings interface is one of the most important views for a driver. First of all, we wanted the settings page to be easy for drivers to navigate to. Secondly, we wanted the settings to encompass all those that potential drivers may deem necessary. Finally, we wanted the settings controls to of course be easy to understand. The drivers we spoke to appreciated having the ad frequency and volume controls easily accessible so we moved those to the home page. Beyond that, we added a couple more settings like the options to edit account info and change location preferences to make sure drivers were happy with our settings interface.

**(3)  Profit dashboard.** Similar to the above, we wanted the profit dashboard to be easy to navigate to and easy to understand in terms of the numbers and figures displayed. Here, we got feedback that just a table of numbers was hard to interpret so we opted to put a chart of earnings over a month by day. Further we made the figures for monthly and yearly earnings large, to make it more attention drawing to drivers.

**(4)  Stopping/resuming song with ads.** Functionality here should follow three main points: (1) background music stops when an advertisement is played (2) advertisements play to completion and do not cut off before termination (3) background music starts back up where it was paused when an interrupting advertisement completes. These points were tested by ensuring the feature worked as it should through extensive stress testing. 

**(5)  Integration with Spotify.** Technical functionality and the user experience here should follow three main points: (1) a driver can connect to his or her Spotify account to play music (2) it is ensured that a driver does not need to keep logging into Spotify after the first time they do so (3) the entire experience should be seamless for a driver and should not halt unexpectedly at any given point in time.

Feedback from drivers told us they would prefer it automatically connected to Spotify when opening the application and they wouldn’t want to keep logging in, so we only have the user log into Spotify the first time they use the app. Thus we made sure our application does this and feedback of this approach told us it was the way to go.

**Web App**

**(1)  Account Creation.** We wanted this feature to be as streamlined as possible, given that it is the first thing a user interacts with when he or she uses our app. Thus, we wanted our UI to be intuitive and simple. We asked several friends to look at our home screen and subjectively rate how easy it is to navigate and understand. We received overwhelming feedback stating that the UI was aesthetically pleasing and that signing up was easy to follow. Objectively, we evaluated this component by ensuring that once a user creates an account, our account database is correctly populated. This did indeed happen.

**(2)  Password encryption.** Using sha-256, passwords are hashed, but if a malicious entity figures out this hashing scheme, then every user’s privacy is essentially compromised. To add an extra layer of protection, we created a 16 byte salt that is also hashed in combination with a user’s password, ensuring that figuring out the password hash function is not enough to infiltrate our database. To ensure the correctness of this approach, we observed our databases for consistency. Furthermore, we tried several adverse techniques, posing as malicious entities, to see if we could break our protection scheme, which we could not.

**(3)  Verification of login credentials.** Here, we wanted to make sure that our app would correctly check that a user’s login credentials exist in our database. If they do, then the desired functionality is that a user can successfully login. If they do not, then our app simply rejects the user. Thus, we evaluated this by testing login with existing credentials (of an already created account) and non-existent credentials. Using existing credentials, we were able to sign in. Using non-existent credentials, we were denied login, as desired.

**(4)  Map window for geo-location.** Our map right now correctly loads on the advertiser/business side within the web application. To fully evaluate its current functionality, we wanted to make sure that interacting with it successfully selects the latitude and longitude points that the advertiser chooses. To this end, we tested several selections on the map (just clicks) to see if the selected latitude and longitude pairs are populated. We tested throughout the map’s viewable area, including points that are within near proximity to each other. Through this, we were able to see that interaction worked correctly.

1. Demo

In the appendix are several screenshots displaying functionality of our mobile app. Below is a link to a video demo of both our mobile app and web app.

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1. Conclusions and Future Work

On the mobile side of our product, we found that the current foundation that we are using only works on iOS 13.0.0+, which is quite limiting for potential users who do not have updated version of iOS. Thus, we plan to see if we can use lower-level versions of iOS software.

On the web application side of our product, TO DO.

Acknowledgments

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References

<https://www.playoctopus.com/>

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<https://govugo.com>

<https://ridewithsurf.com/>

<https://fireflyon.com/>

<https://www.halocars.co/>

https://steero.com/

Appendix

A screenshot of a cell phone

Description automatically generated