



Bilkent University

Department of Computer Engineering

Senior Design Project

Project short-name: LodeStar

Project Specifications Report

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Progress Report

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1. Introduction

In today's world, what is the most valuable currency? American Dollars? Gold? Airline or credit card points? Even though they all offer value in their own ways, unarguably the most important currency for everyone is time. So, saving time should offer the greatest profit. Especially where people are forced to waste time due to unavoidable circumstances. One such circumstance is waiting at the airport, possibly for hours at a time.

Imagine booking a flight to a foreign country. The day of the exciting getaway comes knocking on the door. As the punctual person you are, you go to the airport hours before the departure time. You check-in, hand over your luggage, go through passport control and sit next to your gate, waiting for the flight. You check your watch, and then monitor the expected departure time of your flight. Which is two hours away... To make matters worse, it has also been delayed for another hour and a half. The thrill of the holiday hides behind the curtains of a dreaded airport wait. Sounds familiar?

LodeStar aims to help such passengers to utilize this otherwise wasted time efficiently. Thanks to the development of technology, it is now possible to obtain information about most countries. Favorite places to visit, must-see events, historic restaurants and so forth. While such information is already presented in many popular applications already, LodeStar diverges from such applications with one unique feature. With the help of Google Street View, LodeStar will offer users the 360° views of the airport they will be traveling to. Hours before reaching their destinations, the users will be able to see where they can buy a SIM card, rent a car, get on the train, or claim their luggage. LodeStar will show them how to go from the landing site to the mentioned places with directions, and the 360° pictures will etch the path into their minds. If the user possesses virtual reality glasses, these images will also be displayed in virtual reality for an immersive experience.

This report's departure point is the description of Project LodeStar. Then insight about the constraints surrounding economic, environmental, social, ethical, political, health, safety and sustainability issues regarding LodeStar will be given. Afterwards, the professional and ethical responsibilities LodeStar brings along will be listed. Finally, The functional and non-functional requirements of LodeStar will be provided.

1.1. Description

When traveling by plane, especially internationally, customers must go to the airports early in order to check-in, register their luggage, go through customs etc. Since any or all of these things could potentially demand a lot of time due to queues or poor management, most people go to the airport very early, and have to wait a long time before boarding the plane. With LodeStar, we aim to help people value their time which would otherwise be wasted at the gates of airports by giving them a glance of the destination airport and city. This should also help alleviate some stress as the passengers will have a clearer idea of what to expect upon arrival.

Some of LodeStar's features are available in other apps. Many, many other apps... One must use Foursquare to check the places of interest, TripAdvisor to mark a route, Google Maps to follow, a weather app to check the forecast, a currency app to see the current transaction rates, and search through many webpages or blogs to find whether public transport or taxi should be their preferred choice.

LodeStar uniquely combines all of these features, and then adds some. With the API's of the mentioned applications, which are free and ready for use, LodeStar merges their capabilities. To build upon that, LodeStar shows how to navigate through the destination airport, where to get a SIM card, rent a car, buy a train ticket or find a taxi and even suggests which one to pick depending on your time and money constraints. All of these functionalities are offered in one app, all from the comfort (or discomfort) of your seat at the gate.

In addition to airports, these features can also be used in favour of tourism companies. When customers who want to make an international trip and go to the offices of such companies, they can be shown, in virtual reality, the cities of their interest. The places to visit, major attractions, or staff-picked videos can be showcased. This will allow the customers to make a better decision for themselves, and increase the likelihood of them booking a ticket.

The dreaded long waits at the airport will be history. Journey into the chaotic unknown of a foreign city will be unknown to the users of LodeStar. A picture is worth a thousand words, and the 360° guides of LodeStar will outmatch any written or verbal description.

1.2.Constraints

1.2.1.Economic Constraints

- Virtual Reality Glasses will be needed for the virtual reality function of the application. The cheapest one (Google Cardboard™ VR platform^[1]) costs around 1-2\$ on various websites on the internet.
- For Android™ platform , a fee of 25\$ needs to be paid so that our application can be published on Google Play™. This payment will be done only once.
- For iOS, a fee of 100\$ will need to be paid. This payment has to be done every year so our application can remain published on App Store®.
- All the APIs, frameworks and libraries used will be free. (For example, Google Street View™ mapping service API will be used for virtual reality functionality)
- There will be no in-app purchases. App will be free to download. Business model is described in the 1.2.8 Sustainability Constraints.
- Flight Tracker API^[2] will be used. This API is free for use for 50 times a day. For the scope of this project, this number is more than enough.
- Domain of the website of LodeStar will be purchased. This costs 8.88\$^[3] per year.
- A server is required to contain necessary data. Examples of these data include: personal profile information and guides.

1.2.2.Environmental Constraints

- Our application may use virtual reality glasses (if the user wishes to use Virtual Reality functionality). Google Cardboard's environmental impact^[4] is almost nonexistent.
- A smartphone will be required. Which contains a Li-ion battery which may need to be properly disposed^[5] once the smartphone is out of order.

1.2.3.Social Constraints

- Our application will enable the users to interact with each other via Facebook integration. For example, while user A is virtually traveling the Atatürk Airport, he will be able to see the comments made by his friend user B about certain places in the virtual environment. This could be exploited where a Facebook user may follow advertisement company accounts.
- The application will not have any sort of mechanism that enables negativism while posting comments or likes.

1.2.4.Political Constraints

- Although the application will be able to show the surroundings of almost all airports around the world in virtual reality, there had been political conflicts with Google and some governments[6]. Thus, some parts inside the airport cannot be photographed due to security concerns.

1.2.5.Ethical Constraints

- We will abide by the Code of Ethics^[8].
- The application will not distribute any personal user information to the third parties.
- The user will only be able to access their information after a successful authentication.
- User data on our servers will be encrypted.

1.2.6.Health & Safety Constraints

- Some people will feel a little bit sick after wearing VR glasses. Ten minutes of exposure can result in dizziness^[7] for some people. On the flip side, many people don't have any issues.

1.2.7. Manufacturing Constraints

- One manufacturing constraint to fully utilize our application will be the Google Cardboard (if the user wishes to use the VR functionalities). Other than this material, the users will not need additional material and be able to download the application to their phones.
- There are several boarding pass scanning API's that free for use. These API's enable us to retrieve info about the user's flight number, the destination city, flight time and flight captain. Instead of manually typing some of the information to the application, the user will have the convenience of scanning the boarding pass. For this to happen, the user must possess a boarding pass.

1.2.8. Sustainability Constraints

- The application will receive user feedback from AppStore and PlayStore. The team will consider the comments from these source to be very valuable.
- We will also gather anonymous user statistics in order to understand user behavior. These statistics can be used to enhance the user experience.
- Our business model is to use indirect advertisements in our app. For example, when the user wants to learn how to get a SIM card from the airport, we can direct him to Vodafone instead of Turkcell.
- Agreements with airlines companies (i.e. Turkish Airlines^[9]) can result in beneficial outcomes for both parties. For example, a tour company may utilize our application to show off the country of destination. A person wishing to travel in Europe can observe certain parts of the cities from our application's VR function and can plan his travel accordingly.

1.2.9.Implementation Constraints

- The application will be for both Android and iOS platforms. Java will be used for Android. Swift and Objective-C will be used for the iOS application.
- For git collaboration GitHub^[10] will be used.
- Object Oriented Programming paradigm will be used while in development.
- The application will utilize third party data such as Google Maps and Facebook.
- The application will use third-party data obtained by the APIs provided by Google, Facebook and LinkedIn.

1.3.Professional and Ethical Issues

In terms of our application, we can divide the professional and ethical issues into six pieces. These are using the user's location data, using third-party sources to provide suggestions, using login API's, encrypting and protecting private data, and agreements with other companies.

Firstly, our application is going to access user's location if only the user is willing to give the data. An option will be given to the user for that purpose. This data will be used to generate routes from that specific location to a destination location. In case that the user does not want to give their data, this data will be asked as an input. In a scenario, where a route begins in an airport and ends in a destination, the source location can be either taken from the user input or from the information in QR code which user might have scanned.

Based on the reviews and ratings, Foursquare™ generates some top places in order to eat, stay, visit, etc. In our application, these lists will be used to give suggestions to our users. Therefore, we will have to assume objectiveness and integrity of this content. For future work, extra features can be added to enable users to give their feedback on the places they visit.

Additionally, our application will be using login API's of Google and Facebook. In this way, we will be able to manage user information easier and safer, but if user does not want to login by their Google or Facebook accounts, our application will allow users to register

using an email and password. For those users, as a future work, a two way authentication system can be implemented.

User's private data will not be shared among third-parties or otherwise. Moreover, all user data on the server side will be encrypted. In case that we come to an agreement with a third-party in the future, we need to ask for a permission from the user to use and share their data.

On top of that, the codes included in the application will either be our development or free source. If the application includes free source code, this will be indicated. Any additional source relevant to the application development will be properly referenced.

As a future work, if an agreement can be made with an airline such as Turkish Airlines, they may provide some tailored special offers. If we have an agreement for such a case, to provide the data, we need to ask the user for permission.

2. Requirements

2.1. Functional Requirements

2.1.1. Data Resources

- The application will take image data from Google StreetView, flight information from FlightTracker™, maps and road information from Google Maps.
- The application should get travel and flight data by scanning the QR code on the boarding pass.
- The application will provide VR view of destination airport that shows the precise location of airport facilities and important stores for travelers, for example telecommunication shops SIM card purchase.
- Prominent touristic stops and most recommended 20 places from Foursquare at the destination city and, if available, street view of accommodation place will be provided in VR view.
- The application should provide information and prices about different transportation facilities and calculate the optimal routes for different choices.

- The application will gather data for city-wide events, special days and activities.
- The application will show FourSquare comments and recommendations for airport, stores and touristic city locations.
- The application should have up-to-date information about available hours of recommended airport shops and transportation facilities.
- The application should provide actual information about weather conditions of the destination point.
- Currency rates and currency exchange places near airport or staying place will be provided.
- Facebook integration should be able to show users information on their friends' activities on their trips using the application.
- In the case of contracted companies, the application should be able to guide user to those shops in the airport and see the available promotions.

2.1.2. User Specific Requirements

- The user should be able to choose different transportation facilities based on the preferred budget.
- The users will be able to enter their travel information either by scanning the QR code on the boarding pass, or manually entering the destination airport.
- According to their budget, the user will be recommended with different places to visit.
- The user will be seeing the comments made by other users for recommended places and leave comments themselves.
- The users will see the descriptions for reaching their target either on VR view, or on panoramic view of Google Street screen.
- Integrated small games for VR view, like Brick Breaker, will be provided for especially children who will use the application.
- The users will be provided with information on approximate living expenses, and may be able to calculate their own spending during their stay.
- In the future, depending on the contracts between airline companies, users may be able to unlock achievements as they travel more.

2.2.Non-Functional Requirements

2.2.1.Reliability

- The application should precisely display the targets and specify the routes to those targets both in regular view and in VR view.
- To keep the displayed travel information accurate, the application should update the data taken from other services constantly, and present real time information.
- The application should give up-to-date locations for recommended places, if a certain place is closed, recommendations list should be updated.
- The application should give transportation route advice, so application should find and evaluate different alternatives accurately according to the budget.

2.2.2.Usability

- The application should be easy to use for user all types of users and provide a user-friendly and a simple-enough interface.
- Application should provide necessary information on how to put on and use Google Cardboard, for VR view.
- Application should show as much as information it can by taking minimum information from the user.

2.2.3.Accessibility

- Google Cardboards that will be beneficial for the application use should be easy to obtain for airport passengers.

2.2.4.Extensibility

- The application should be able to include new features with ease, so it should be developed in a way that makes it easy to update
- The application should be allow feature additions, such as integration of bus terminals and train stations.

2.2.5.Portability

- The application should be able to run on different hardware and software platforms, in our case on both Android and iOS devices.

2.2.6.Efficiency

- The application should respond to user and gather travel information quickly while using the least possible amount of system resources and internet bandwidth as possible.
- The app should not take a lot of time while switching to Virtual Reality mode.

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