AirportWayFinder – A voice based smartphone application

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Abstract—The US Transportation Research Board's Airport Cooperative Research Program did a study on the issues impacting the elderly passengers at American airports [1] and concluded that airports still have a long way to go to accommodate the fast-growing group of aging travelers in United States. One of the important summaries derived from this study was: the number of persons over 65 years of age is projected to increase from 40 million in 2010 to 70 million—from 13% to 19% of the population—by 2030.

Combine this huge population with old-age diseases, and the toll it puts on your mind and body along with complicated airport procedures, process becomes gruesome and wanting.

Wheelchair support provided by airports for the handicapped comes in aid for people not able to walk, but then elders started misusing them as reports surfaced of **elders opting for wheelchair support even though they were perfectly fit**. [2] This can cause a difficulty during emergencies as during evacuations wheelchair bound passengers should evacuate last and since they're healthy they might run off first causing chaos.

Solving this problem over large scale covering the globe will need either a collaboration by airports or support for navigation at all airports worldwide. Since, major hurdle we faced was the indoor navigation at airports. For our Proof of Concept(POC), we've used Google Indoor Maps.

Our application tries to focus on the core of this problem, **improper guidance through airport procedures. ""** offers an voice enabled smartphone application that reads data from airport databases, and using navigation and maps guides users to his flight.

Keywords— *Smart Devices, Mobile Application, NavigationAPI, Firebase, Natural Language Processing(NLP), Google Dialog Flow, Smart Voice Navigation, API.AI, Google Indoor Maps ,Conversational Design, Design Thinking, NodeJS webhook, Empathy Map, Airport Navigation, Conversation Design, Design Thinking, Invision*

I. INTRODUCTION

AirportWayFinder is a Mobile Assistant which can be used by elders at airports. It can be sold to airports or used as an independent application on marketplace. Users are offered an android-based app which allows them to navigate securely through various checkpoints from airport gate to the flight seat using guided voiced instructions. These instructions are provided by Dialog Flow. Users can enter flight number and the application does the rest from giving flight details to making sure user catches the flight on time.

II. DESIGN

A. Design Methodology

In this paper, we followed Design Thinking, which is an approach to develop solutions by focusing on human needs. As this paper is intended for the elderly people, this approach helped us ensure that the needs of our target audience was kept in mind at each stage of the design and development process.

In this regard, we first created an empathy map focusing on how our user would react, what he'll be able perceive and understand looking at signage in the given situations. This was followed by persona definition of the ideal consumers of our system. The next stage involved development of a scenario map which served as the basis for the Conversation Design of our voice assistant. Finally, a prototype of the User Interface was designed using InVision Studio.

Figure 1: Empathy Map

Figure 2: Sample User Persona

B. Navigation API

One of the essential functionalities of our android app, is to help the users navigate to various points in the airport such as the flight check-in counter, airport security check and the boarding gate. Based on user voice communication, the android app picks up specific navigation action items, e.g. "Navigate to the security check counter". These actions further make the necessary calls to change the route of the user on the map. We made use of Google Direction APIs and Google Maps Intent to implement the navigation feature. Direction APIs was utilized to embed the map in our android app and to display the route from the current location of the user to the specific destination point. Google Maps Intent was used to launch a turn-by-turn navigation in the Google Maps app.

C. Dialog Flow

Dialog flow is used in our app for user communication, where in a user communicates with the API, regarding his queries at the airport or answering questions to help the app navigate him/her. We built an agent named "Airport Navigation Assistant". It is supported with a webhook (Nodejs) that helps the agent make decisions on the course to be taken based on user responses.

It provides an API.AI Android SDK makes it possible to integrate speech recognition with API.AI natural language processing API on Android devices. API.AI allows using voice commands and integration with dialog scenarios defined for a particular agent in API.AI [1].

D. Aviation-Edge API

To facilitate navigation specific for the flight, we fetch the live status of the airport timetable and filter out the table for our flight. With this information we have the terminal, gate number, and scheduled departure time for our flight. In our app we are using the Airport timetable API provided by aviation-edge.com.

This also triggers an in-app timer, that checks the amount of time left before flight departure.

E. Authentication

Each dialog flow request requires an authentication key to identify the agent responsible for handling the request.

There are two access tokens as a part of the authentication, one is the client access token that is stored within the app and the developer access token which is used to modify entities and intents. The client access token is sent along with the request as a part of the request header information.

III. IMPLEMENTATION

We are using Android Studio as our Android SDK to communicate to create app. The System Architecture is given below:
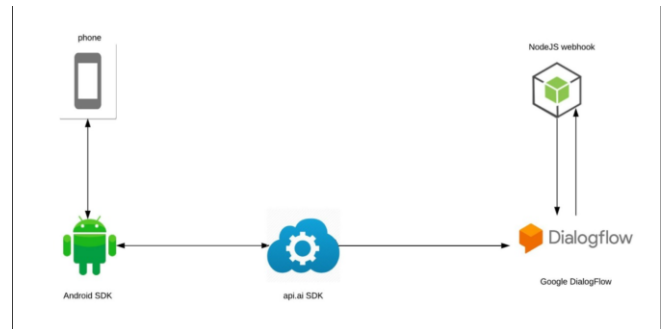

Figure 3: System Architecture

The Android SDK is used by the phone to run its application. The apk then communicates with dialogflow to get results. Dialogflow keeps communication with a NodeJS server to synchronize Training data, giving better NLP performance.

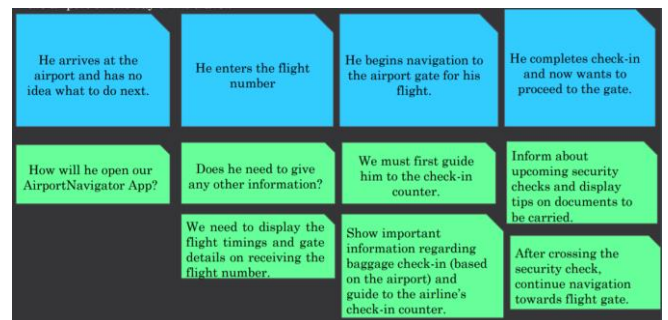Implementation of our application can be explained using a scenario.

Figure 4: Scenario Map

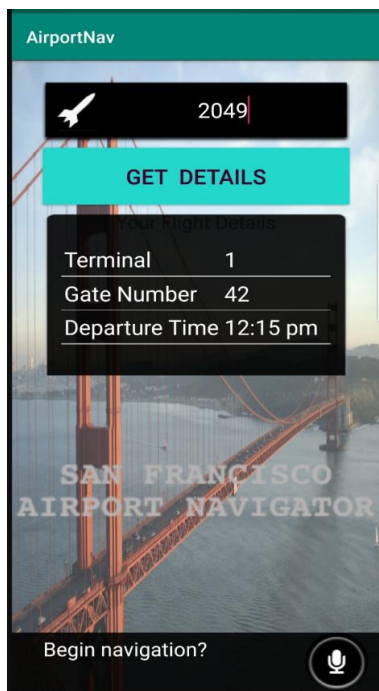An elderly person, after arriving at airport opens his app and sees this

Figure 5: Flight details page

He then enters the flight details, which returns him terminal, gate number and departure time.All this data is fetched from avaition-edge api which provides accurate details.

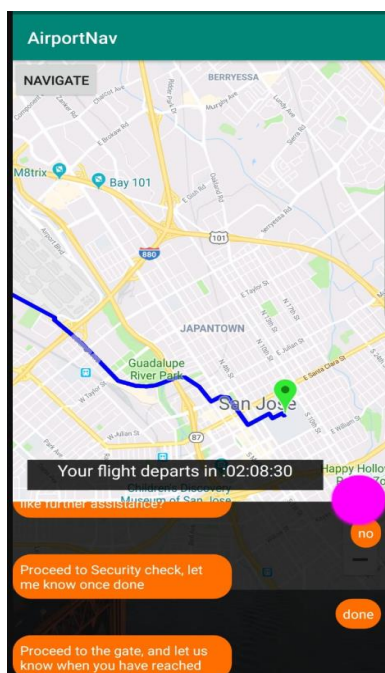User then may click on begin navigation, this redirects user to below screen

Figure 6: The voice assistant interface

The text will be read by voice assistant and will ask questions to help you guide better.It shows you a route to

given terminal of airport with included indoor navigation. You reply by voice once you've reached a certain checkpoint and app moves on to the next one.

If needed, user can also click on pink button which will open navigation tab. Navigation is provided by google maps app.
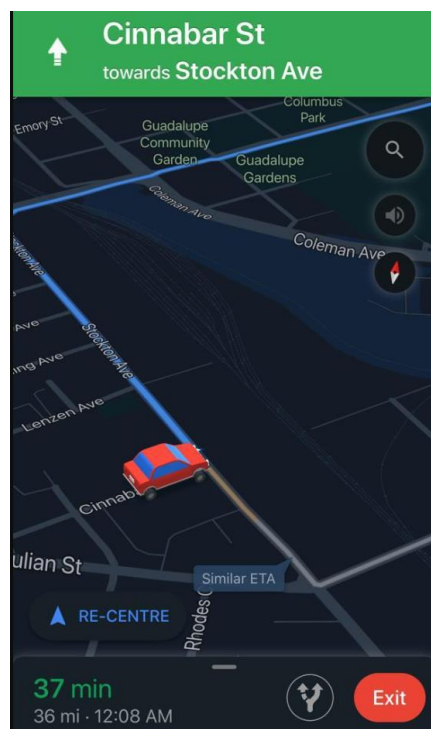

Figure 7: Navigating to my terminal

After successfully navigating to desired location, user can redirect to AirportWayFInder and continue to next step.

IV. CONCLUSION

Due to the evident growth of elders at airport and observing various cases where older generations have misused airport commodities just to get hassle free experience. We decided to design a low-budget Proof of Concept of our application. Since our app uses google api, it is highly consistent but with reduced indoor navigation support. If given a chance, we can sell this to airports to help them manage and orchestrate processes more smoothly for the elder sections of society.

V. APPENDIX

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