TOURGURU : TOUR GUIDE MOBILE APPLICATION FOR TOURISTS

19-018

Software Requirements Specification

M.S.B.W.T.M.P.S.B. Thennakoon IT16160262

Supervisor:
Ms. Asanthika Imbulpitiya
Co-Supervisor:
Mr. Nuwan Kodagoda

B.Sc. (Hons) Degree in Information Technology

Sri Lanka Institute of Information Technology

Sri Lanka

March 2019

TOURGURU : TOUR GUIDE MOBILE APPLICATION

FOR TOURISTS

19-018

Software Requirements Specification

B.Sc. (Hons) Degree in Information Technology

Sri Lanka Institute of Information Technology

Sri Lanka

March 2019

DECLARATION

We declare that this is our own work and this SRS does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Name	Student ID	Signature
M.S.B.W.T.M.P.S.B. Thennakoon	IT16160262	

The supervisor/s should certify the proposal report with the following declaration.

The above candidate is carrying out research for the undergraduate Dissertation under my supervision.

Signature of the Supervisor: Date

……...   ....

Signature of the Co-Supervisor: Date

……...   ....

Table of Contents

TABLE OF TABLES

TABLE OF FIGURES

1 Introduction

1.1 Purpose

This document composed for to give an understanding of the scope, functional and non-functional requirements, a product perspective, constraints and dependencies relates to Narrated Tour Guidance component on the TourGuru mobile app. Also, constraints, assumptions, software system attributes and its design will be covered in this document. The whole document is intended primarily for customers of the application, but will be interest to Software Engineers, QA Engineers, testers and all the parties who are interested in implementing this product.

Intended audiences for this SRS are members of research group, project supervisor (Ms. Asanthika Imbulpitiya), project co-supervisor (Mr. Nuwan Kodagoda) and all the parties and individuals interested in this product with good computer literacy.

1.2 Scope

This document covers the requirements for release of module Narrated Tour Guidance of TourGuru system. Component intends to guide the tourist by Second-Person Narration with an audio output from crowdsourced and queried information. This document scope for the explanation of tools and technologies to be used, concepts and techniques to achieve implementation on the research objective and the flow of the system through use case diagram and use case scenarios.

Planned objectives and goals will be achieved by utilizing cloud computing and deep learning techniques to crowdsource the location information from the user, prepare a set of queried text for the narration and then, guiding the traveler to nearby identified tourist attractions with the generated narration. Mention will be made throughout this document of selected probable features of future releases. The purpose of this is to guide developers in selecting a design that will be able to accommodate the full-scale application.

1.3 Definitions, Acronyms, and Abbreviations

Table 1 – Glossary for definitions of the terms used in SRS

Term	Definition
TourGuru	Name of the proposed mobile application
VB	Visual Basic a IDE
VG	Visual Gaming
NTG	Narrative Tour Guidance

Table 2 – Glossary for Acronym/ Abbreviation

Acronym/ Abbreviation	Definition
SRS	Software Requirement Specification
GPS	Global Positioning system
POI	Point Of Interest
MSDLC	Mobile Software Development Life-Cycle

1.4 Overview

Narrated Tour Guidance is one of four major components of the end-product TourGuru. Operations that will be of identifying and monitoring user's location-based information and then narrate/alert user of the generated contents or queried audio contents. Generated are text content that is speech capable information, on the nearby attractions.

The operation on generating the narrative content will be done using deep learning methodologies. For efficiency and scalability, cloud platform technologies used for datastore and processing operations. For correct delivery of information at appropriate times mobile platform is intended platform this application is to be implemented in.

1.4.1 Main Goals

The main goal is, guiding the traveler to nearby attractions or interests through audio content and help them identify locations and travel effortlessly while gaining travel experiences.

1. Querying the nearby attraction information
2. Generating narrative content for queried information
3. Storytelling like narrated tour guidance and proximity alerts

1.4.2 Specific Goals

One of specific goal is to crowdsourcing location information from users and use validated information to generate narrative content on various attractions that are important but missed by travelers.

1.4.3 Users

System's commonly intended for travelers, that included into criterion that is English understandable and have general capability to use mobile devices. But as presently every person travelling may part in this criterion. As a specially intended user, foreign traveler may be stated as the main user. Traveler may be a driver or a walking person traveling to a destination who gains the advantages of the system.

1.4.4 Reading Suggestions

The start of this SRS document is with the Introduction. This topic delivers the purpose of documentation, intended audiences, scope and finally the overview of the software. Overview consists with system users, goals and reading suggestions.

Next topic Overall Description has sections Product Perspective, Product Functions, User Characteristics, Constraints, Assumptions and Dependencies that are related to this system. Product Perspective section delivers system interfaces, user interfaces, hardware interfaces, software interfaces and communication interfaces that will be intended for the system to function.

After the overall description of software, the topic Specific Requirement is discussed. It is indeed of need to discuss further on these introduced product perspectives further in this section. Requirements concerns with each of these user interface, hardware interface, software interface, Communication interface will be discussed in External Interface Requirements section. Here non-functional requirements like availability, reliability and maintainability of the proposed system is discussed in the Software System Attributes section and requirements that will be implemented in future version of software is in the Other Requirements sections.

At the end of the document Supporting Information topic reader can see all supportive information like additional diagrams, appendices etc.

Each portion numbered according to reading conventions and written in Times New Roman Font style. Headings to content text font size 13.5(Headings), 13(Secondary headings), 12(Content) and content is justified.

2 Overall Descriptions

Rather than visual assistance for guidance, audio assistance is recommended when unattended interaction with the guide is present. Even if person who need to be guided is driving, walking or any situation it is imperative that they keep their eyes on the road or the path. Even if audio assistance is troublesome when driving. So, very short, correct and narrative content should be spoken for the user to be guided easily.

Nowadays in Sri Lanka there are many tourist attractions that are missed by travelers or misled by tour guides that have their own preference in guidance. So, it is better to get the overall information form most of travelers and local people to identify each tourist attraction for the preference. There are map based solutions that are capable to guide user with the destinations. But most them are not focusing on tourist attractions found through as they guided to the destination.

The component Narrative Tour Guidance of TourGuru system focusses on above mentioned storytelling like tour guidance on nearby attractions. System will use this component to alert user on the oncoming attraction as the user guided to a destination. Travelers will be able to provide their information on nearby important places. If the given information is validated, it will be used on the system. During driving traveler is engaged with the mobile passively but should not be disturbed occasionally so the narrative content should be summarized and then narrated without losing the base of information.

2.1 Product perspective

This research on NTG component influenced from the reasons on the travelers should have effortless, passively engaged and smart travel while gaining experience for that traveler is not troubled while traveling. The solution provided will indefinitely fill the gap in existing products in the current markets.

Features	TourGuru	Roadtrippers	Toureazy	Tour Buddy	සිංහලංකා AR
Intelligent Trip routing (automatic route creation)	✓	✓			
Trip editor (Add or update custom places)	✓	✓			
Categorize locations (monuments places, restaurant etc)	✓	✓			
Map Filters	✓	✓			✓

Shared user activity	✓	✓		✓	
Traffic management	✓			✓	
POI alerts	✓	✓	✓		
Waypoint management	✓	✓			✓
Collaborator management	✓	✓			
Distance slider for radius adjusting (proximity alert and activation)	✓	✓			
Identification location(using AR, historical places, ruins, etc)	✓				✓
Question and answer.	✓				

2.1.1 System interfaces

- Flutter Framework for building the cross-platform mobile application
- Google Cloud Platform or any other compatible cloud platform (Firebase ML Kit etc.) for Deep Learning functions and cloud storage.
- SQLite database for mobile app's internal database.
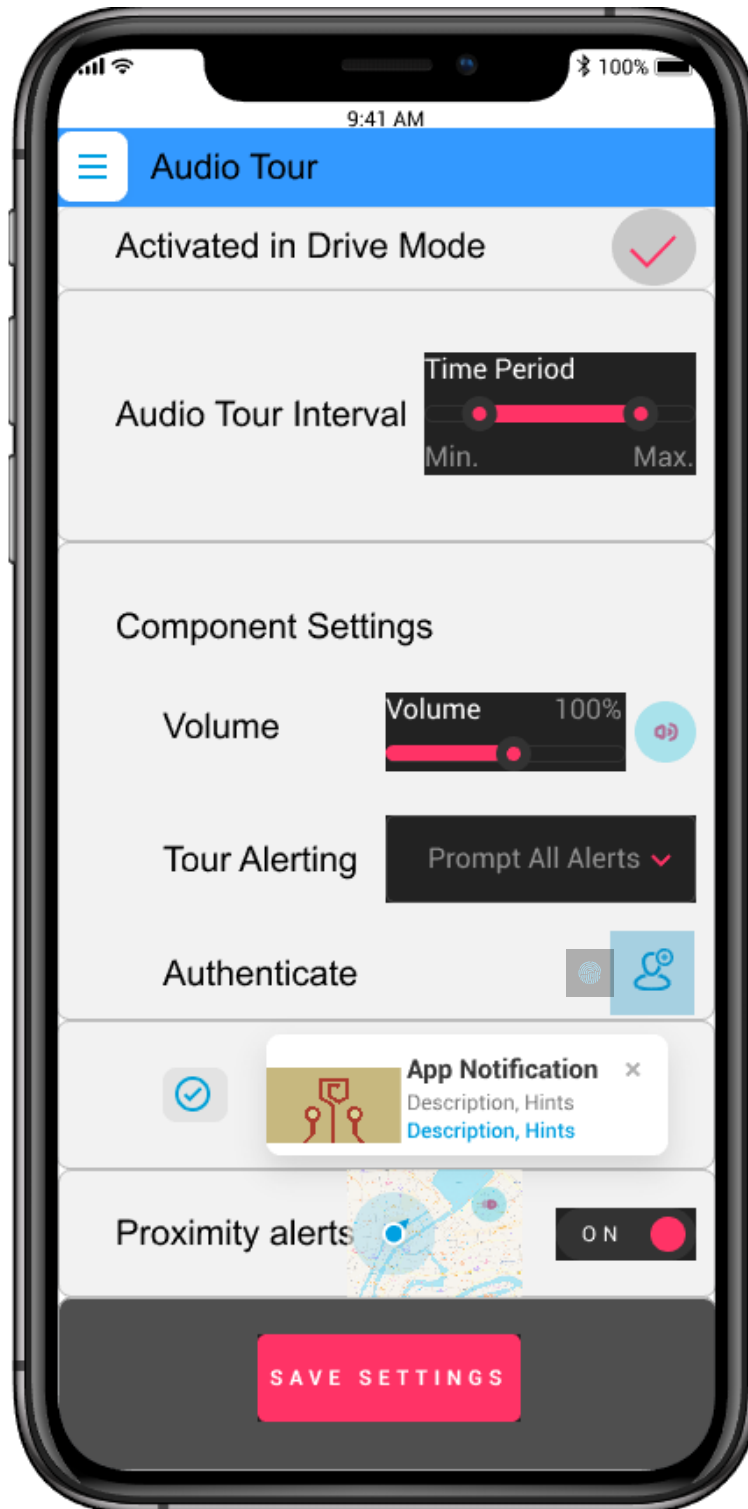- NodeJS backend for function invocation.

2.1.2 User interfaces

Figure 1 : Narrated Guidance Configuration UI

2.1.3 Hardware interfaces

Smart mobile device's sensors, audio output and other device components.

No need for special dedicated devices for the operations.

2.1.4 Software interfaces

To run this product the mobile platform should be

Android 5.0 or higher version

IOS 10.0 or higher version

API's, plugins, services and other software interfaces may integrate into the product as need for achieving full functionality.

2.1.5 Communication interfaces

Modem will provide access to Internet when necessary.

GPS module for querying location-based information.

2.1.6 Memory constraints

NTG component is expected to use no more than 256 MB of Ram and 256 MB of external storage. But recommended RAM for using this application is 512 MB or higher specification in the mobile device.

2.1.7 Operations

Considering intended scenario this module is expected to perform, there are few operations that will be done for user interaction or some other functions that achieve some goal.

As module topic express the narrated it will do basic narrations on some types of information in tour alerting.

Component is capable in push notifications as interactive operation for the user to listen narration. Also, customizable periods for unattended narration operations can be given when proximity alerting is turned on.

An operation is there to gather location information from the user and a configuration for easy management off the module.

<u>2.1.8 Site adaptation requirements</u>

Considering application usage from foreign users, the UI exists in English language. For the full access and full experiences all permissions should be provided. When the application should minimalize interactions with the user it needed to choose alerting type or any needed configuration as user intentions. Capability for toggling on-off the component within the app is given for user for further assistance and consistency.

2.2 Product functions

Features on this product focusses to deliver location-based information in more effective and provide alerts accurately from mobile devices that a traveler won't miss details on nearby attractions. If the user is a traveler and a driver it is expected user will configure the component from user interface and give appropriate notification permissions. This default component can be toggled on-off as the user's needs.

Summary of the product function is by initiates the application and sets a destination from the map interface that is integrated from another component and using generated route to request from cloud server on GPS markers for the nearby attractions and narrating on details from the response for delivering alerts to the user. The default filtering of nearby attractions radius up to 100m from the route's current location but the value can be changed from the audio tour interval that responds to this distance for filtering the nearby attractions.
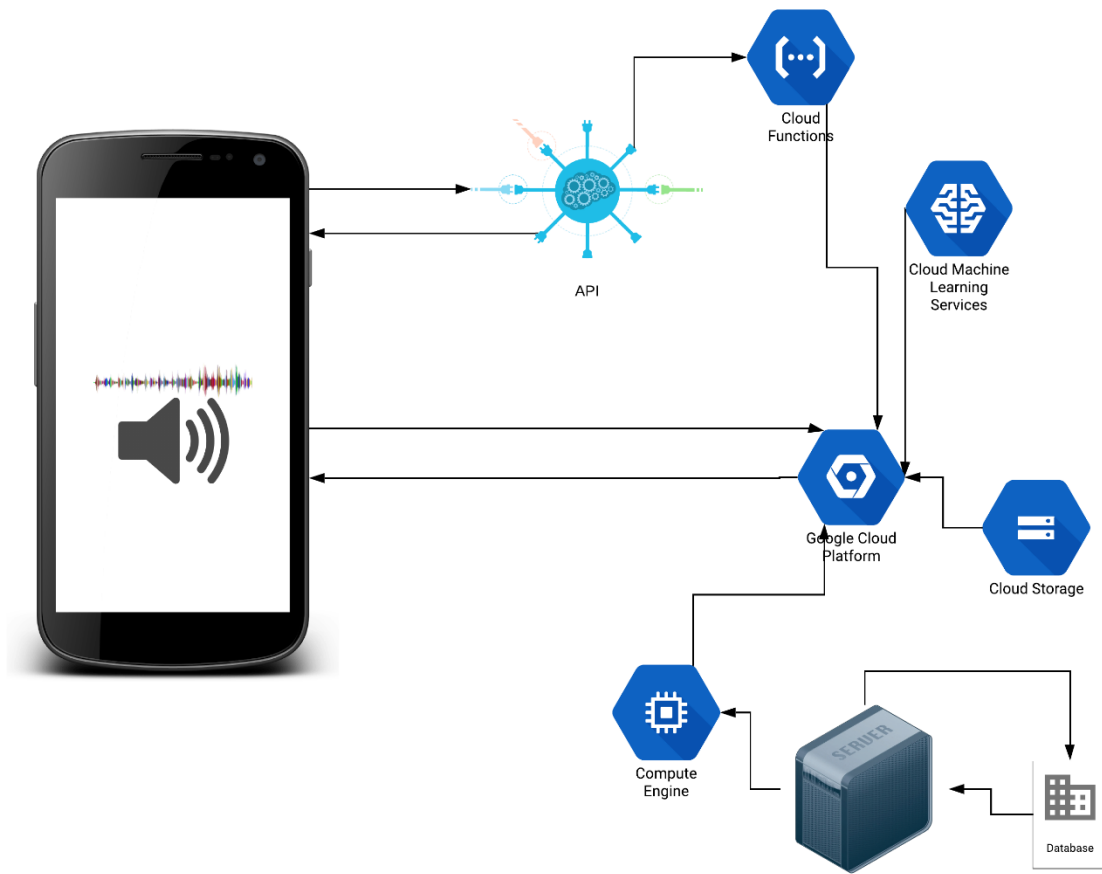
2.2.1 High-Level Diagram

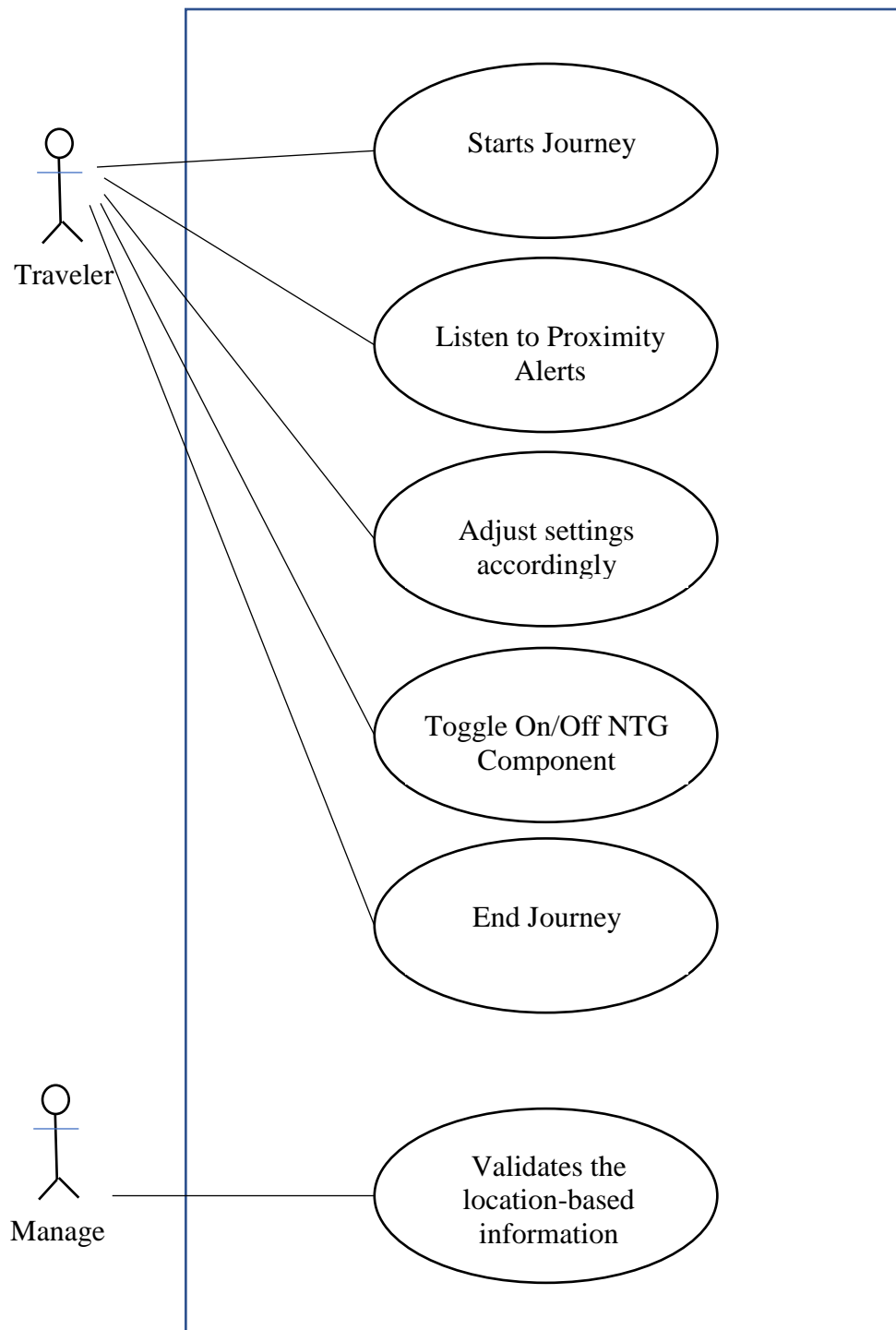Figure 2 : High level diagram

2.2.2 Use-Case Diagram

Figure 3 : Use-Case Diagram of NTG component

2.2.3 Use-Case Scenarios

Table 3 : Use-Case scenario 1

Use-Case ID	NTG_UC1
Use Case name	Starts Journey
Goal in context	To get guidance on a tour route
Primary actors	Traveler
Pre-Conditions	i. User mobile is connected to internet ii. Mobile GPS is turned on
Main Flow	1. App gets current GPS coordinates 2. User selects a destination location 3. App shows feasible routes through map interface 4. App requests and processes nearby attractions 5. User starts a journey through a route 6. Proximity alerts will be provided to user
Post-Conditions	Travel and location information will be tracked on occasions

Table 4 : Use-Case scenario 2

Use-Case ID	NTG_UC2
Use-Case name	Adjust settings accordingly
Goal in context	To adjust audio alert, notification settings as preferred
Primary actors	Traveler
Pre-Conditions	i. Notification privacy settings are allowed ii. Location privacy settings are allowed
Main Flow	1. Traveler navigates the app to Audio Tour interface 2. Traveler checks Activated in drive mode 3. Adjusts Audio Alert Interval as preferred 4. Adjusts audio volume 5. Sets Alert Type 6. Toggle In-App Notifications 7. Toggle proximity alerts (NTG component) 8. User selects Save Settings at the end

Extensions	5a. Prompt all alerts option is already selected
	    5a1. Selects App alerts only option
	    5a2. Selects Proximity Alerts only
	    5a.3.Selects Nearby place detail notification only

Post-Conditions	Current preferences will be saved

Table 5 : Use-Case scenario 3

Use-Case ID	NTG_UC3
Use-Case name	Listen to proximity alerts
Goal in context	To alert nearby attractions
Primary actors	Traveler
Pre-Condition	i. Traveler's mobile internet connected ii. Already started journey
Main flow	1. Include :: (Start Journey) 2. Include :: (Adjust settings accordingly) 3. Include :: (Toggle on NTG component) 4. System fetches user's location-based information 5. System alert the traveler on nearby attraction by selected alert type
Post-Conditions	System tracks location-based information

Table 6 : Use-Case scenario 4

Use-Case ID	NTG_UC4
Use-case name	Toggle on NTG component
Goal in Context	To invoke the NTG component if turned-off
Primary actors	Traveler
Pre-Condition	i. Traveler's mobile connected to internet ii. Already started journey
Main flow	1. Include :: (Start Journey) 2. Traveler navigates the app to Audio Tour interface 3. Toggle proximity alerts (NTG component) 4. User selects Save Settings
Post-Condition	System saves current settings and starts the NTG component

Table 7 : Use-Case scenario 5

Use-Case ID	NTG_UC5
Use-Case name	Validates the location-based information
Primary actors	App manager/ dedicated team member
Pre-Condition	i. Team member has crowdsourced and validated location-based information ii. App is connected to internet
Main flow	1. Dedicated member authenticates from application 2. Adds location-based information one by one in to system through the UI
Post-Conditions	i. System saves each location-based information ii. System notify success the user on each update

2.3 User characteristics

As the build is cross-platform application, for its operations user should have an smart mobile phone (Android or IOS mobile platform) with the installed application. The end-product TourGuru is intended for any tourist/traveler in Sri Lanka. Even though the following characteristics can be found from the user.

- User should not be a deaf person who cannot perceives only from vision to use this Narrated Tour Guidance module.
- Should be able to understand English language.
- Capability and gained common traits to handle either android or IOS application.
- If user is a driver, he should be experienced and essential in following basic rules and regulations on the road.

2.4 Constraints

- Considering device's internal GPS module accuracy, the location may identified. Whole NTG component will be affected if GPS module malfunctions.
- A solid internet connection is required for the functionality.
- Considering internet service provider's bandwidth may affect the accuracy on the GPS location information.
- Application user interface and audio output from narration is only from English language.
- System failure may occur due to network failures, power failures and device failures.
- Bad raw data for narration preparation will only output wrong information.
- The whole end-product will perform with four major components but with all features running may result slow down performance.

2.5 Assumptions and dependencies

Some assumptions are made upon for the development of the application,

- Application is handled in normal conditions and involving drivers are aware of the application disturbance and has accepted the level is safe.
- User can handle the application to performing the application in safe environments.
- Device consists of minimum 1 GB of RAM memory.
- Application permissions are given for each feature usage.

Dependencies for the module as follows.

- User information is validated from a third party,

- Third party sources information is acknowledged by the user.
- Deep Learning module is performing normally and provides sentences that are capable in narration.
- All third-party plugins, API's and services are updated, validated and present for the execution of separate tasks. (speech, login and authentication etc.)

2.6 Apportioning of requirements

As this document specifies major requirements in this NTG module, the target objective won't change as the module completes. But methodologies or technologies mentioned in this document as the need of the better feasible product with compatibility with them.

The requirements described in sections 1 and 2 are referred as primary specifications; those in section 3 are referred to as requirements (or functional) specifications. The two levels of requirements are intended to be consistent. Inconsistencies are to be logged as defects. If a requirement is stated within both primary and functional specifications, the application will be built from functional specification since it is more detailed.

'Essential requirements' (referred to in section 3) are to be implemented for this version of NTG module. 'Desirable requirements' are to be implemented in this release if possible but are not committed to by the developers. It is anticipated that they will be part of future release. 'Optional requirements' will be implemented at the discretion of developers.

3 Specific requirements

3.1 External interface requirements

3.1.1 User interfaces

Figure 1 in 2.1.2 section introduces the NTG component's settings page. Travelling user can define each setting to preferred settings so that the component is usable. Its first option lets the driving traveler to experience most suitable alerting that restricts longer than 10 seconds. Audio tour interval is very important factor to decide the interval between alerts. But the process of this function is adjusting distance radius that identifies nearby attraction and lets the user experience to adjust according to traveling speed. If user travels in a vehicle audio alert interval should be near max margin, else it should be near min margin in the interval slider. User should adjust Component Settings for better experience on receiving alerts and configuring the component. Preferred actions user can make are audio level to listen to alerts, Tour alerting type and Authentication. This authentication is used when a dedicated team member approaches to update external database with validated location-based information. Authentication is a single sing in and form submission for a selected location. This form submission interface is shown on Figure 4. Furthermore the previous settings page has given the user the capability to switch on-off internal app notifications and the component itself.
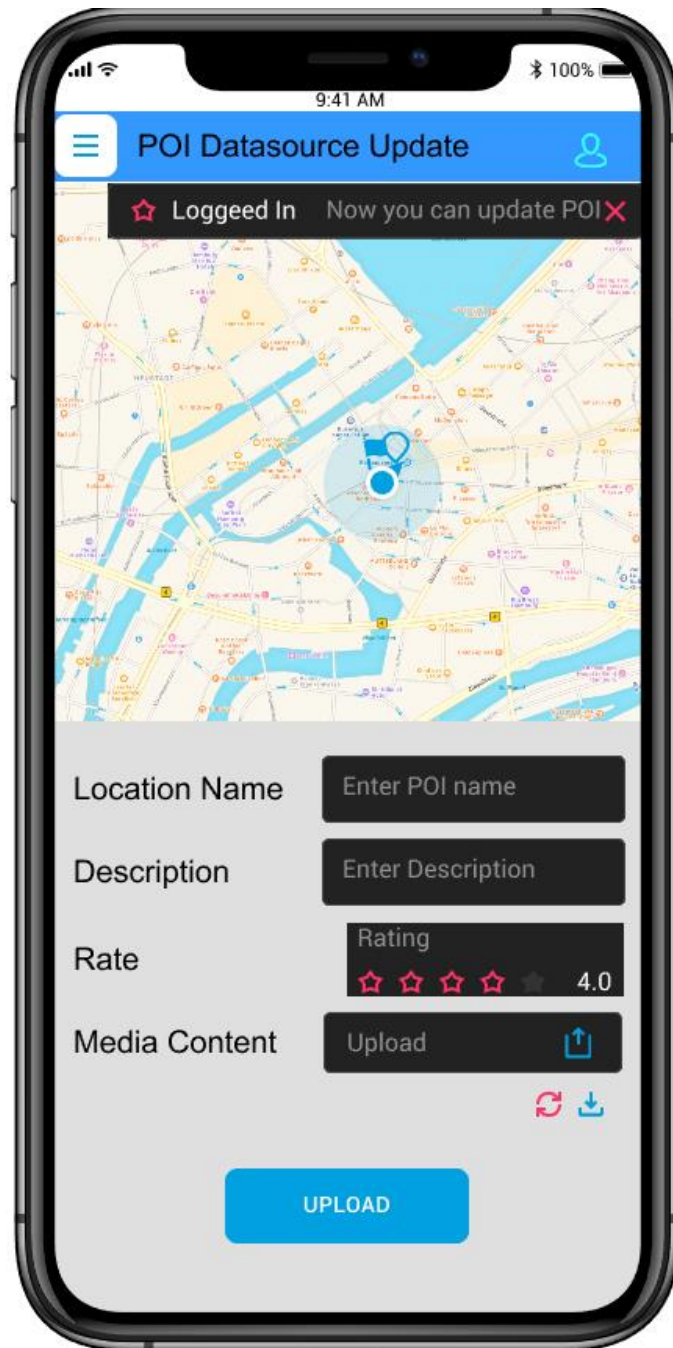
Figure 4 : Updating crowdsourced POI locations

The dedicated team member can user this interface In Figure 4 to update application location database. This database takes location information from travelers which are validated through team member.

3.1.2 Hardware interfaces

Smart mobile device's sensors

- Biometric (Fingerprint) Sensor
  - Authenticate app permissions and privacy settings within the app.
- Accelerometer
  - To get local measurement of device acceleration

GPS receiver - To get the measurement on device's geographical position.

Audio output – Component function on narrated tour guidance is done through device's audio output.

No special devices required for functioning of this module. But special devices can be integrated to improve the accuracy, clarity and efficiency. (GPS extender, Bluetooth audio outputs etc.)

3.1.3 Software interfaces

App is expected to function through Android or IOS operating system.

Google text to speech or some other similar software API or service to perform narration.

Firebase or any other API/ plugin to perform authentication on the server.

Other than these there may be software interfaces integrates for SMS/ email notification or any other to complete secondary functions and non-functional requirements

3.1.4 Communication interfaces

Internet as communication interface to connect with cloud platform/ server.

GPS module for acquiring location-based information.
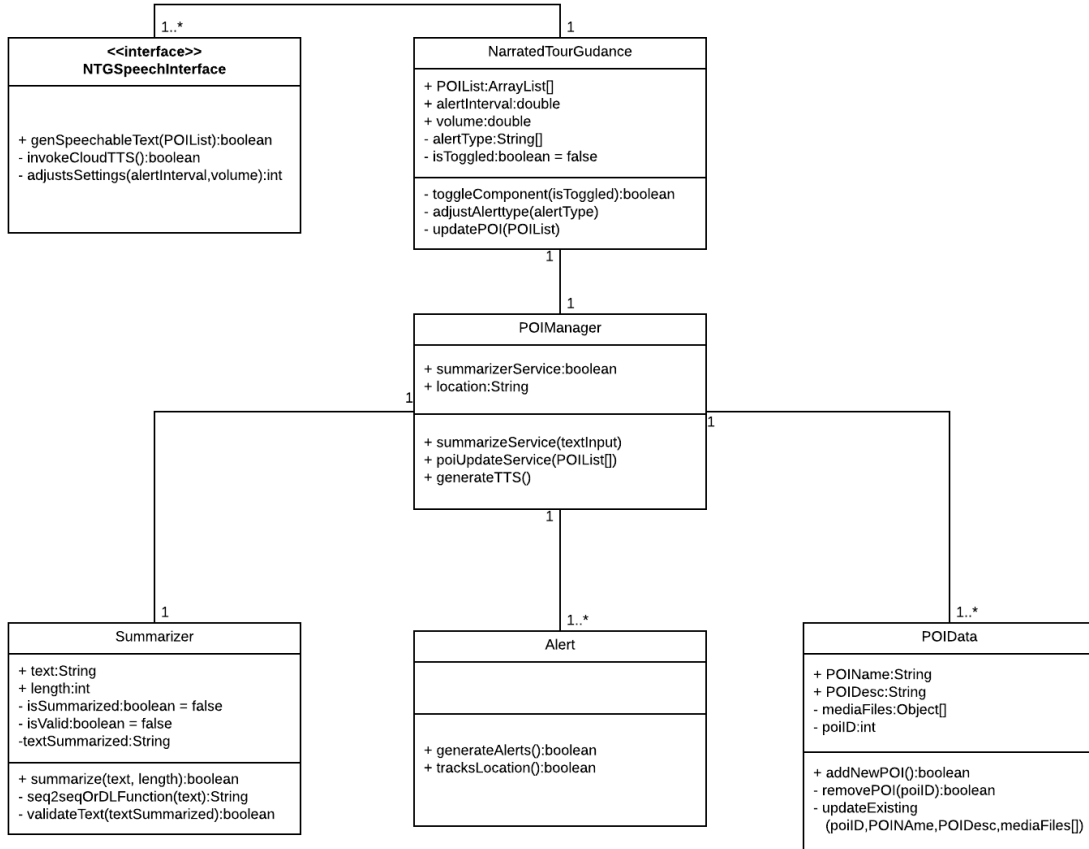
3.2 Classes/Objects

Figure 5 : Class/Object Diagram of NTG compoennt

All classes and objects in above diagram are essential for the current scenario.

3.3 Performance requirements

For evaluating performance distance to activate notification/alert is taken as the measurement. Other capable measurement to evaluate performance is time to activate the notification which is complicated for current environment. Environment that performs application can be identified as driving environment and walking environment. Distance as measurement is taken because measuring time for these volatile environments is complicated for proximity alerting. This component should alert the user within the range of 100-50 m on each detected nearby attraction following the road.

This NTG component requires audio output to alert user regularly in real-time. If more functions like summarization on this module done online, then an internet connection should be present with the app. App will consists of four major components that may take high assumption of processing power and memory. To avoid this situation most of functions are done offline in a deployed server through cloud functions. This will limit usage of device resource and improve the product performance.

Offline processed data will be taken by the app from connecting with its server. Considering location data may gather over-time, it is essential that database is scalable. For the scalability of the server database is important when there is less app internal database to improve performance in memory utilization.

3.4 Design constraints

The design done to improve end user experience and avoid conflicts of four components of the system by analyzing each output and needed resources. This will allow multiple real-time components to operate without affecting the result.

Considering the limitation of infrastructure and monetary constraints design done with most appropriate resources.

There are no other design restrictions to consider for this mobile application.

3.5 Software system attributes

3.5.1 Reliability

This component requires to provide proximity alerts by reducing the data but preserving information that is alerted. The generated alert should be reliable enough to provide accurate information. A high reliable deep learning model should process this data and provide a quality result. From the text input data this model should prepare sentences that can be easily read and spoken.

As well as quality of alert data it is indeed required to manage each alert so that app won't crash or misfunction. So, each alert should be delivered by a priority related to distance of proximity attraction. A reliable system can be published when all important defects are corrected. For this component above strategies are enough to take note and execute these strategies for reliability of the system.

3.5.2 Availability

Information of the system should be available for the end-user to engage with the product. This can be identified most important factor that is required from end user that is quietly engaging the application. So, the availability on uptime should be nearly to 100% and not less than 98%. As the application queries information through cloud services information is 100% if those services correctly managed. One of prerequisite is the need of destination to fetch nearby attractions and alerts to user. This gathered information on route will persist for a period given by user so that memory is well-utilized, and app performs in expected efficiency.

3.5.3 Security

System will be implemented with authentication process and permissions in privacy. Authentication will be needed for authenticating the functions for location information updating and requires for permissions on tracking user location, access to device components and services. Authentication may require a single login and authenticating with device passcode or fingerprint.

3.5.4 Maintainability

Maintainability requires the most effort if the system is not correctly designed. It can be expressed as the success rate for the system to function after fixing an issue within a short period of time. Issues that can be taken for maintenance are introducing new feature, bug-fix and design changes. If design changes done it is taken heavy toll on the resources. So, the system is designed accordingly to adapt maintenance process and least chance for change in system's infrastructure. With this process, after a maintenance it is less likely to affect any performance issues and additional charges.

3.6 Other requirements

In this section all the requirements that are likely to implement in next release of the product are mentioned.

- o In the current version the NTG component alerts information on the validated sources. It will require an automated validation process on the crowdsourced information in a latter release version.
- o The process on location tracking is currently used for prioritizing alerts for user preferences. In a future version this information will be recorded and processed for creating a travel party or location recommendation from a ranking system. Latter recommendation system can be used to improve the real-time alerting process for a future version.
- o NTG component function is to give information on nearby attractions hence the navigation to destination guidance is not considered. In a future release it is feasible to implement navigation guidance system.
- o There are multiple devices that can be incorporated with this NTG component. But due to cost effectiveness they are neglected in this release. In a future release this compatibility with dedicated devices(Bluetooth audio, GPS modules) may be implemented.
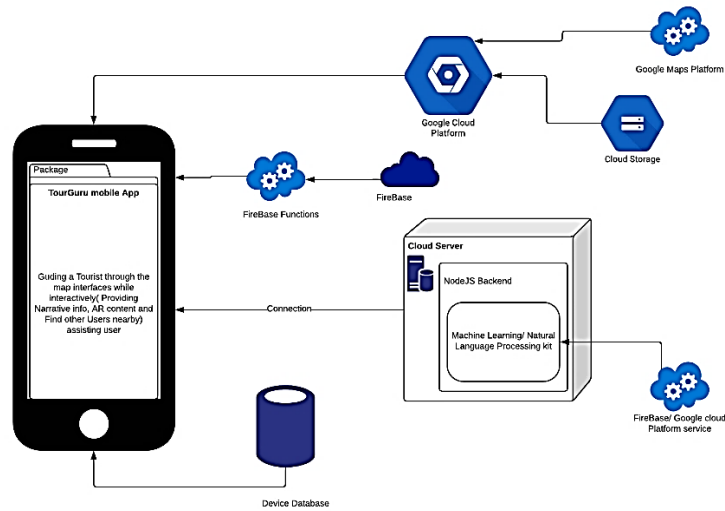
4 Supporting information

4.1 Appendices

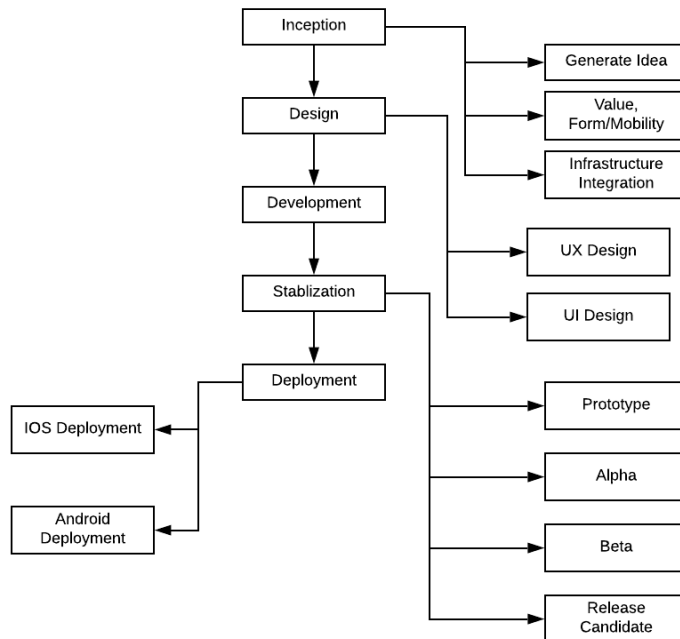Figure 6: High Level Architecture Diagram of End-Product TourGuru

Figure 7 : MSDLC in development process

4.2 References

[1] Fang-Ming Hsu, Yu-Tzeng Lin, Tu-Kuang Ho: Design and implementation of an Intelligent Tourist Attractions System (ITAS) for tourist attractions: The integration of Engel–Blackwell–Miniard (EBM) model, Bayesian network and Google Maps
Available:https://www.researchgate.net/publication/220216082_Design_and_implementation_of_an_intelligent_recommendation_system_for_tourist_attractions_The_integration_of_EBM_model_Bayesian_network_and_Google_Maps
[Accessed 2019-02-26]
[2] Mehrbakhsh Nilashi , Othman Ibrahim, Elaheh Yadegaridehkordi, Sarminah Samad, Elnaz Akbari, Azar Alizadeh : Travelers decision making using online review in social network sites: A case on TripAdvisor
Availabel: https://www.semanticscholar.org/paper/Travelers-decision-making-using-online-review-in-A-Nilashi-Ibrahim/a189633c53322a57144a60a35b4ec95ef25ab49d
[3] N K Nagwani :Summarizing large text collections using topic modeling and clustering based on MapReduce Framework
Available:
https://www.researchgate.net/publication/282547875_Summarizing_large_text_collection_using_topic_modeling_and_clustering_based_on_MapReduce_framework
[Accessed 2019-03-08]
[4] A Quick Introduction to Text Summarisation in Machine Learning [Online]
[Accessed 2019-03-02]
[5] A Trip Reconstruction Tool for GPS-based Personal Travel Surveys
[6] Amit Singhal, Chris Buckley, Mandar Mitra: Automatic Text Summarisation by paragraph Extraction