

# User Requirement and Use Case Diagram for Traveler Tracking Application in Tourist Destination

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**Abstract:** Traveller Tracking Application is useful for controlling the movement of tourists. Besides that, it is also useful to look back at the history of tourist trips in tourist attractions. The application built is intended for tourists who vacation in groups. The history of tourist movements can be used to detect tourist attractions that are frequently visited. Also, you can see the position or path of tourists again if an accident occurs. This article discusses the stages of developing a mobile tourist tracking application that starts from the requirements system, analysis, and until the system design stage. The data of tourist movements at tourist attractions will be recorded in real-time and stored in the cloud. Position data obtained from the traveler's GPS smartphone is stored in the firebase realtime database. The system design includes an architecture system, use case diagram, and a flowchart for draw trajectory on the map. The results of this research stage are some data requirements, namely real-time position data, the history of the track that tour leaders and tourists have traveled, personal data of tour leaders, and travelers. Actors involved are guides as tour leaders, members of tourist groups, and tour travel management. Tour leaders and tour group members carry GPS-equipped smartphones, while management uses desktops to track tour leader track. This aims to ascertain whether the tour leader trajectory is following that determined by the management of the tour travel company. Management can also see the Interest of a certain nationality of a tourist attraction.

## 1 INTRODUCTION

Tracking systems are very popular these days. Tracking systems are widely applied in the fields of transportation, logistics, security systems, inventory, and other fields, including tourism.

Tracking systems require the latitude and longitude coordinates of an object on earth. These coordinates are obtained from Satellite GPS. To locate and track two-dimensional (longitude and latitude) movement, the receiver requires a signal from at least three satellites. However, several factors affect its accuracy such as an environment with tall buildings or dense trees which can obstruct the satellite signal reception.

The tourism sector uses latitude and longitude coordinates for several purposes, including monitoring the position in real-time and looking back at the traveler's trajectory. Sometimes Tour travel management needs certainty, whether the employees are working according to the route rules issued by the

company, or violating the rules of the route that has been set. Group travelers usually choose tour packages offered by travel companies. Each group is accompanied by a tour leader to lead the tour. Lost contacts often occur when a traveler leaves the group too far. To make it easier to monitor and review the position of the tour group members, the tour leader can be equipped with a car application. This mobile application uses GPS data as the main data. The position data of the traveler and tour leader is combined with the google map to get a more interactive visualization.

## 2 RELATED WORKS

Savchuk said that GPS technology plays an important role in building information systems for the tourism sector. Data from GPS is the main data to build Good quality mobile travel information. Mobile travel

applications such as navigators, route planners, travel computer guides, augmented reality systems.

Beaco Hallo[9] researched by combining GPS Visitor Tracking (GVT) and Recreational Suitability Mapping (RSM) to show that social data can be incorporated into planning at various scales. The result of combining GVT and RSM contributes to current recreational patterns and areas suitable for specific recreational activities. This combination is especially important because the areas studied have a small area, high spatial demands, and the potential for conflict between user groups.

Karpilo researched collecting route GPS data from tourists visiting the Keskusuisto tourist area (Central Park), Helsinki, Finland. This data is used to determine the movement patterns of tourists at tourist attractions. This study collects useful, low-cost, up-to-date information that provides city planners and managers with a better input on the spatial distribution and intensity of tourist movements.

Several other studies that use GPS for human tracking are research conducted by Rein Ahas, Harari, and Tatjana. They use tourist position data to detect tourist habits when visiting tourist objects. In this case, the detected tourist habits are limited to the tourists' habits in determining which areas are their favorite places to visit.

### 3 METHODOLOGY

#### 3.1 Unified Software Development Process (USDP)

USDP is a methodology regarding software development, especially object-oriented software. USDP is a continuous system development process, where each part is carried out iteratively. USDP adopts an iterative approach with 4 main phases so that it does not follow the traditional software development life cycle (waterfall model). Every phase of activity which is important in system development is emphasized. The Rational Team is the team that first introduced this methodology. Various applications can be created with a framework due to the concept of coding reuse, where the need for similar applications can use the same coding. In one phase there can be more than one iteration. The characteristics of the USDP are as follows:

- Use-case Driven, The resulting software should serve its users and match the needs and expectations of the users.

- Architecture Centric/ System architecture, where user needs and expectations are reflected and seen in use case definitions, such as the computer architecture used, database management systems (DBMS), operating systems, communication protocols, and non-functional requirements (performance, reliability).
- Iterative and Incremental, commercial software development usually continues for several months or even years, this makes software development project work done iteratively so that in the end the resulting large integrated software is formed incrementally.

The stages in USDP are the Inception, Elaboration, Construction, and Transition stages. The Inception phase is the software development phase to interact with application users. The Inception phase is used to identify the needs of the application being built. Equalizing perceptions about system input and output desired from users, between software development and application users is done in this phase. In the Elaboration phase, system design is carried out and refines the concepts that have been identified in the Inception phase. The design stage can use an object-based system approach, namely UML. Construction phase, where the programmer phase translates the design into programming language coding. Transition Phase, at this stage software testing, is carried out on the user side. Program codes that are still wrong, are corrected to suit user needs.

### 4 DESIGN SYSTEM

#### 4.1 Raw Data Requirement

This tourist tracking application involves several actors who are involved in it. Each actor has a role in this system. From the survey conducted, this application involved 3 main actors. The first actor is a tourist as a member of a tour group, the second is a tour leader, and the third is the management of a tour and travel company. Travelers traveling in groups at tourist attractions have passport number, traveler name, traveler address, nationality. The tour leader has tour leader identification, tour leader name, tour leader email, handphone number, and tour leader address. Tour travel management has tour travel identification, name, address, and handphone number. We need data on the position of each object being monitored to visualize the path on the map. The position object has attributes for id, date position, longitude, latitude, user id, and timestamp. The

timestamp is needed to sort object position data based on the sequence of events.

### 4.2 Architecture System

In fig 1, The GPS satellite will provide position data from each traveler which is given to the GPS receiver device of the traveler and tour leader smartphone. Position data in the form of latitude and longitude from traveler and tour leader will be sent to the cellular network. From this cellular network, go to the internet network to the web server address that has been specified in the application.

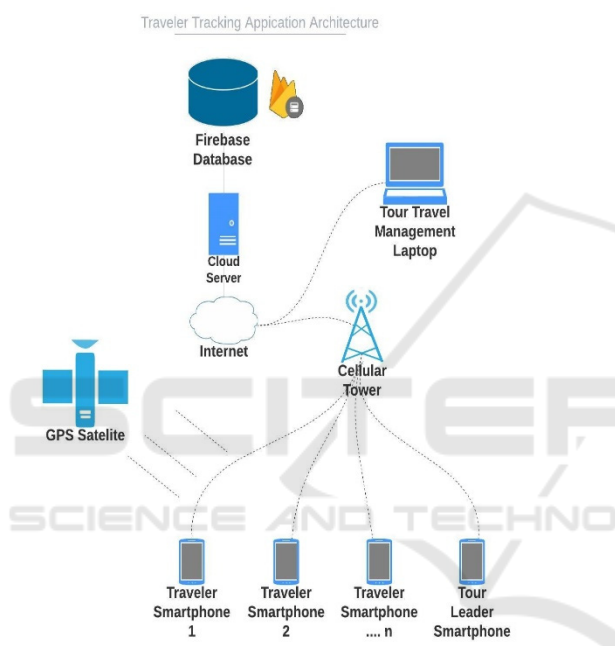


Figure 1: Traveler Tracking Application Architecture.

The Web Server will store application data to the Firebase database. Both tour leaders and tour travel management are used data together that have been stored in firebase. Tour leaders use this data to determine the position of group members making it easier to monitor the movements of their group members. Likewise, tour travel management uses data stored in Firebase to display the trajectories of the tour leader and group members from the laptop. The application is used by web-based tour travel management.

### 4.3 Use Case Diagram System

A use case describes an interaction between the user (actor) and the system. Use Case diagrams are a sequence of interrelated interactions between systems and actors. Use cases are executed by describing the type of interaction between the user of a program (system) and the system itself. Use case diagrams are

diagrams that can describe the facilities in the system. This application is designed to be 2 base systems, namely mobile base and web base. Tracking Traveler This application was designed with three actors, namely traveler, tour leader, and tour travel management. Use case designed on mobile base, include sent position, see own position on map, see group member, tour member registration, see all member positions on the map, and traveler trajectory tracking. On the web base, case maintenance group members are designed, web base all members on google map, web base traveler trajectory, tracking and view reports.

Use case sent positions are carried out by traveler actors and tour leaders. Traveler and tour leader send their position via android mobile phones. Position data in the form of latitude and longitude are obtained from GPS satellites. The latitudes and longitudes of traveler and tour leaders are stored in the firebase database. Use case see own position on map can be done by traveler actor and tour leader. This case allows travelers and tour leaders to see their respective positions on the google map that is displayed on the screen of the android mobile phone. Case see group members is performed by tour leader actors. The tour leader actor can see all the names of his tour members on a list. This list contains the traveler's name, gender, and contact number. Case tour member registration, this case functions to register the names of members who are participating in the tour group in the tourist destination. The tour leader actor can resist the name of the member, the address of the member, and the cellphone number of the traveler into the mobile-based system. Case see all position members can be done by the tour leader. This case allows the tour leader to see all the positions of his tour group members in google map. The position of each tour group member is displayed in real-time. This position will be marked with a tag, which changes according to the movement of the tour group members. Case traveler trajectory tracking is used to review the trajectory traversed by a traveler. Tour leaders can look back at the area traveled by a traveler on a certain date and display it on the screen of a mobile device.

Tour travel management actors perform more system functions in the web-based application. Case maintenance group members permit to travel management tours to add, change and delete member data from the tour group. Web base case all member position on google map, used by travel tours to see the position of all travelers on the google map. The position data used on the web base is the same as the position data on the mobile base. Both are equipped

with position tags and traveler name. The web-based case traveler trajectory tracking provides facilities for travel management to review the trajectory of the traveler on the web base. Case view reports are used by tour travel management actors to view reports needed by management. Report the most frequently visited destination tours, Report the number of tourist visits by nationality, and the average number of tourist visits per month, per year handled by the travel tour company.

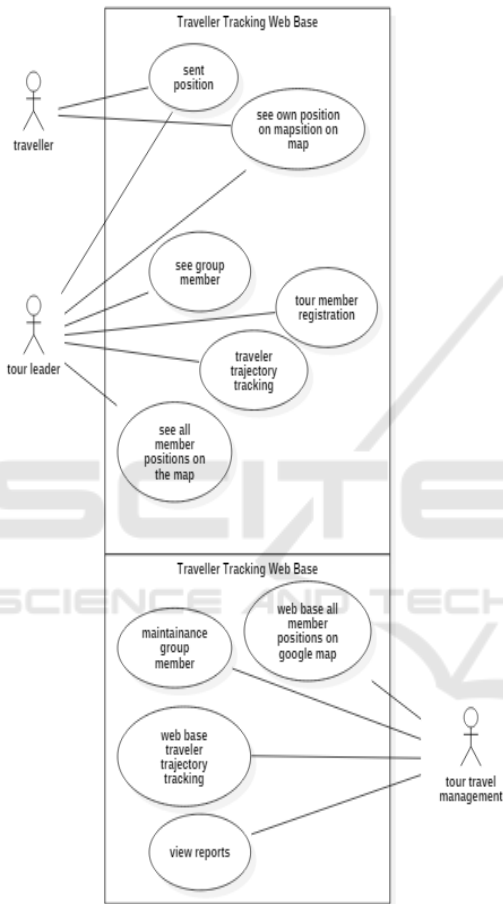


Figure 2: Use Case Diagram System.

#### 4.4 Draw Trajectory Mapping Algorithm

The traveler trajectory is the main facility in this application, which is visualized by the track on the google map. Before using the google map in the application, we must first activate the API (Application Programmable Interface) key for our android project. Google map key activation can be done by going to the Google Cloud Platform Console and creating a project. Then choose the Create

Credential menu to get the API key for our project. Then select the Maps SDK for Android for mobile applications and the Maps JavaScript API for web-based applications.

The traveler trajectory is drawn by first preparing the input data used as criteria. The criteria used are the identity of the traveler and traveled date. This criterion is the basis for calling data from Firebase. Position data selected from the Firebase database, sorted by timestamp. Position data in the form of latitude and longitude are entered into a coordinate data object that matches the data in the polyline command. This coordinate object will contain as many pairs of latitude and longitude coordinates as the selected data. The coordinate data object is then drawn on google with the `googleMap.addPolyline()` command.

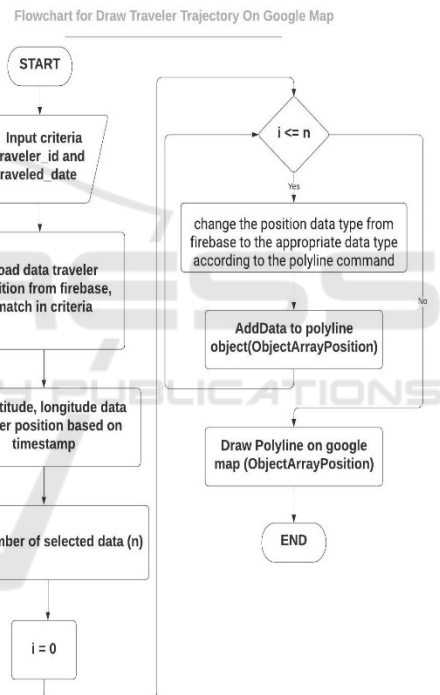


Figure 3: flowchart for Draw Traveler Trajectory on Google Map.

### 5 CONCLUSIONS

The design of traveler tracking application, divide into two base systems, they are mobile base system and web-based system. This application requires several actors who interact with the system, namely travelers, tour leaders, and tour travel management. Traveler data position and data tour leader, are the main data for this system. Use case design involves

several main cases, namely case sent position, case see all position on the map, and case traveler trajectory tracking. The application is designed to use the google map as a visualization medium of the position of the traveler and guide. Also to display trajectory history from the traveler.

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