

DESIGN DOCUMENTATION

Trekr

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Change History

Change	J	R	E	D	Date
Preliminary research	X	X	X	X	2/5/15
Introduction (Motivation, Scope, Key Definitions)	X	X	X	X	2/8/15
Project Description	X	X	X	X	2/8/15
Functional/Nonfunctional Requirements	X	X		X	2/12/15
Use Case Diagram	X	X	X	X	2/12/15
Class Diagram	X	X	X	X	2/15/15
Activity Diagrams	X	X	X		2/15/15
Activity Diagram Summaries	X	X	X	X	2/16/15
High-level Review	X	X	X	X	2/17/15
Sequence Diagrams	X	X	X	X	3/10/15
Requirements Documents Revision	X	X	X	X	3/10/15
Class Diagram Revision	X	X	X	X	3/10/15

Introduction

Motivation

Trekr is a geolocation-based Android application designed to assist users in the navigation of trails as well as allow users to edit and maintain a local database of trails and points of interest. The motivation for this project stemmed from a mutual interest in outdoor recreation. From previous experience, hikers, mountain bikers, and the like, traditionally rely on printed maps or some other type of navigation application in order to navigate the various trails and routes at local parks and national forests. In comparison, printed maps provide a general overview of a trail, but they are difficult to maintain. In addition to this, a user has a very limited knowledge of their current geographic location in relation to the printed map. Digital maps have been created to mitigate the issues presented by printed maps; however, with our experience of other trail navigation applications, a user is not able to locate the trail nearest to them, nor are they able to locate points of interest within trails.

Scope

In reference to the project scope, our target users include hikers, mountain bikers, geocachers, and outdoor enthusiasts. To add a sense of security, family and friends of the target users benefit from the emergency feature of our application. Trekr provides a dynamic system for trails and points of interest which cannot be replicated with physical maps. Users do not have to wait for trail updates from a park association or volunteer group. In addition, users are able to precisely determine their geographical location as well as relation to other trails and points of interest.

Key Definitions

Point of Interest (POI) – a specific geographic location on or near a trail that a user may find useful or interesting.

Trail – a set of waypoints that allow a user can follow.

Backtrack – a set of GPS coordinates collected when a user goes off track. These coordinates are used to navigate a user back to their origin trail.

Emergency mode - displays their precise latitude and longitude on the screen as well as methods to notify an emergency contact. A notable interface change will occur to signify that the user has activated emergency mode.

Project Description

Trekr will provide a number of features to its end users in an effort to maintain a simple and elegant environment. Some of these features include the utilization of a two-dimensional map supplemented with various trails and points of interest. Users will be provided with a preinstalled, curated set of trails that can be viewed on a map. Users are also able to add and edit personal trails as well as points of interest. If users are unaware of the name of a trail or point of interest, they are able to utilize a search feature. In order for a user to make their way to a point of interest, they can use the integrated navigational features. If they become lost, Trekr will alert the user and provide a way to backtrack. In addition, the user can activate an “emergency mode” which can be used to notify an emergency contact with the latitude and longitude of the user. Finally, if a user would like assistance back to the nearest trail, Trekr can guide them to the nearest trail.

Functional Requirements

Name	Priority
View Trails	Required
View Points of Interest	Required
Emergency Mode	Required
Add/Edit Trails	Required
Add/Edit Points of Interest	Required
Point to Nearest Trail	Possible
Backtrack	Possible
Search	Possible
Navigate Trails	Future Work
Weather Integration	Future Work
User Accounts	Future Work
Google Play Services API	Required
Google Maps API	Required
SQLite	Required
Weather API	Future Work

Nonfunctional Requirements

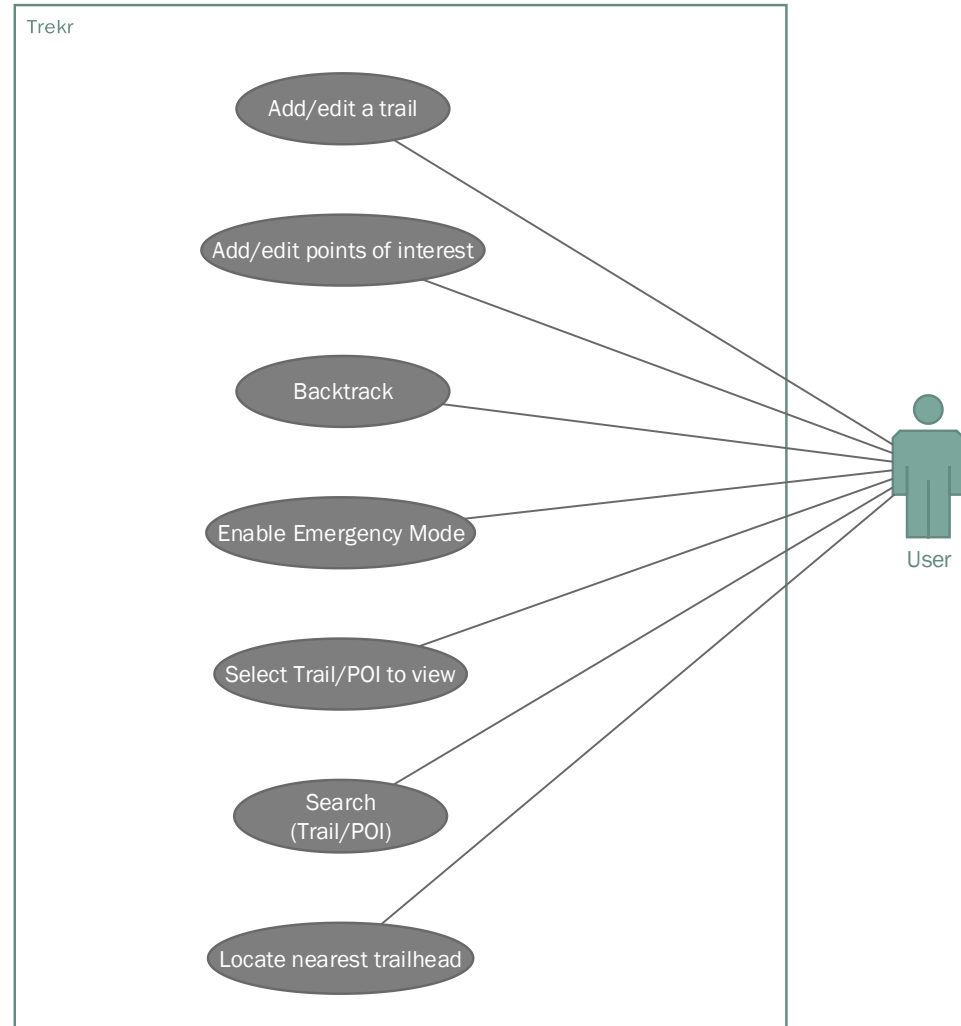
Name	Priority
Fault Tolerance	Required
Reliability	Required
Open Source	Required
Documentation	Required
Security	Possible
Scalability	Future Work
Performance	Future Work
Extensibility	Future Work

Diagrams

Use Case

This diagram provides an abstract overview of the various use cases available to the user.

- Add/edit a trail
 - Users are able to log new trails as well as remap existing trails.
- Add/edit POIs
 - Users are able to log new points of interest as well as change existing points of interest.
- Backtrack
 - This feature will automatically track a user's coordinates and provide the same route back to the parent trail
- Enable Emergency Mode
 - Once enabled, emergency mode presents the user's latitude and longitude while offering a way to notify an emergency contact
- Select Trail/POI to view
 - Users can select multiple trails or POIs to display on the MapView
- Search (Trail/POI)
 - Users can search for a trail or POI by name or reference
- Locate Nearest Trailhead
 - Users are presented with a list of trails sorted by shortest distance for current location



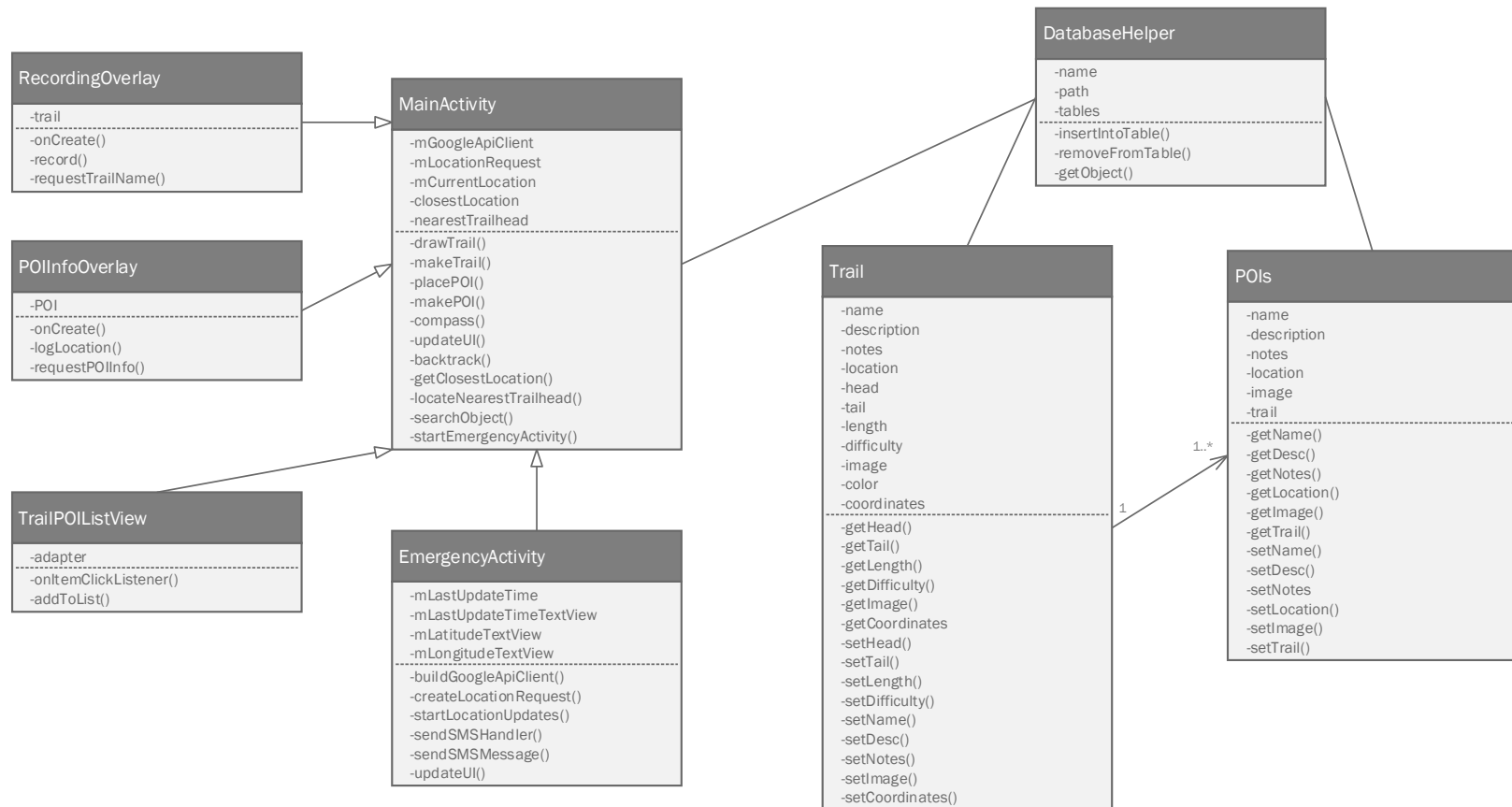
Class Diagram

Our application makes use of numerous classes noted by the class diagram to the right.

The main classes the user will interact with are the MainActivity and EmergencyActivity. These classes feature numerous attributes and methods that are used to update the application interface using stored data and new data recorded from sensors on the device.

The MainActivity will make use of a RecordingOverlay as well as a TrailPOIListView to facilitate interaction with the user. Users interface with the RecordingOverlay to make new trails or when Backtrack is engaged. The TrailPOIListView is used to allow the user to select various trails or POIs to display on the map.

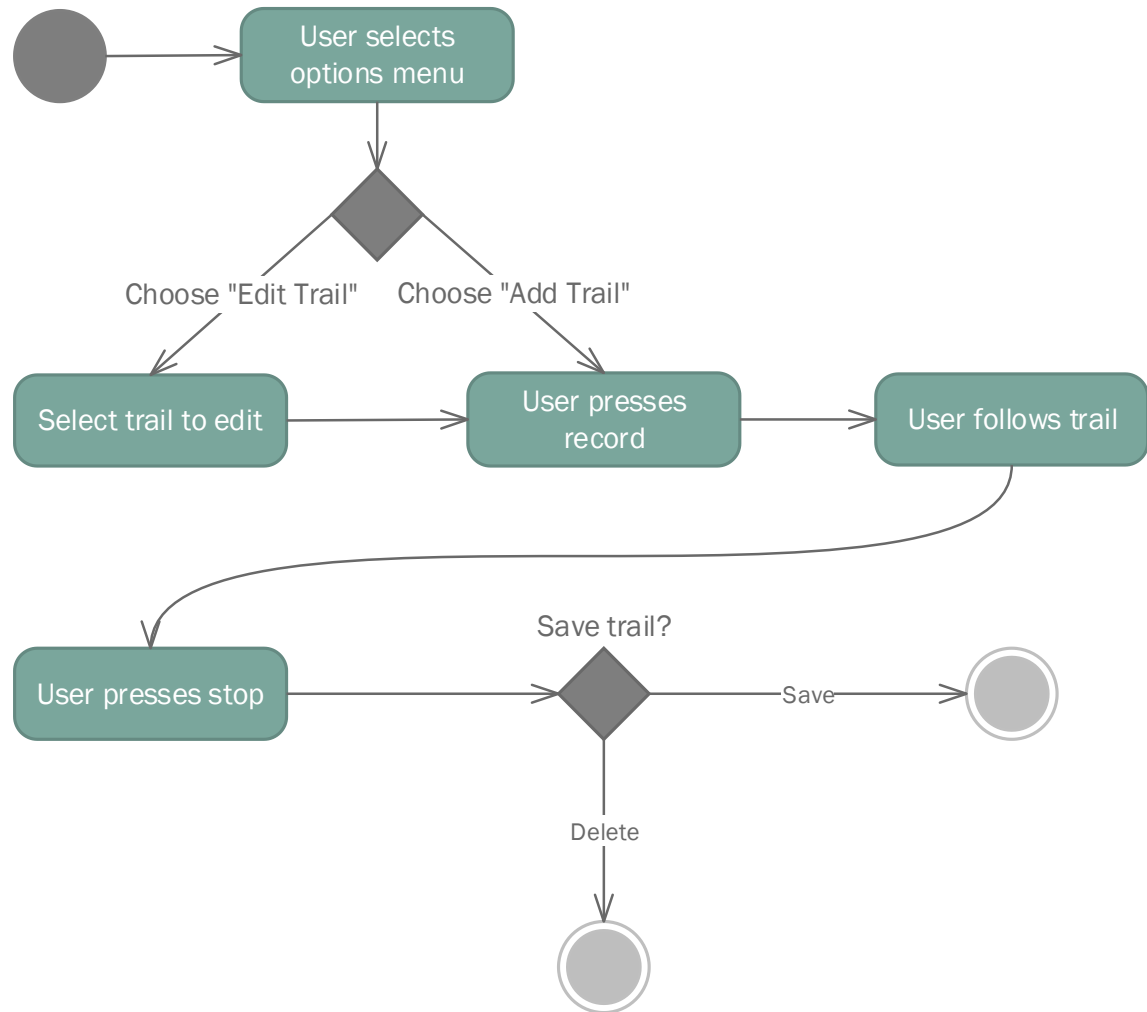
Trekr will make use of a database to store the various trails and points of interest that a user may log. Trails and points of interest need to be stored as objects to allow metadata to be tagged as well as to facilitate easy storage and retrieval from the database.



Activity Diagrams

Add/Edit Trail

The user will select the option menu from the main activity. From there, they will choose to either add or edit a trail's path. If the user chose to edit a trail's path, they will also need to select a trail to edit. In either case, they will press record and begin following a new trail. Once a user has completed logging a trail, they will press stop. As this point, the user is asked if they would like to save or discard their new log.



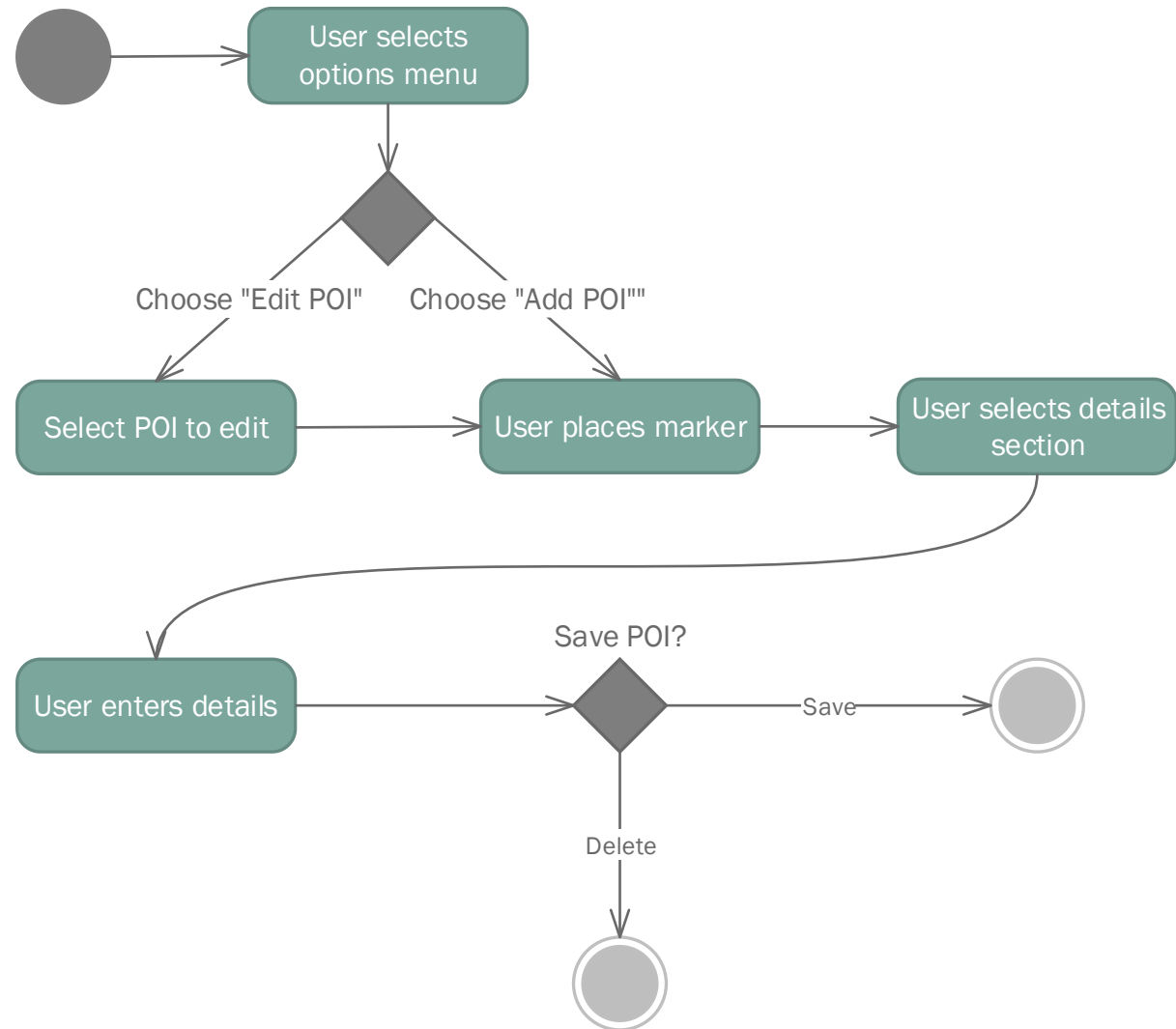
Select Trail/POI

From the main MapView, the user presses the trail/POI list button in the bottom left of the activity. A list of logged trails and POIs will slide up from the bottom of the screen and be presented to the user. Using checkboxes, the user is able to select any combination of trails and POIs to display on the main map.



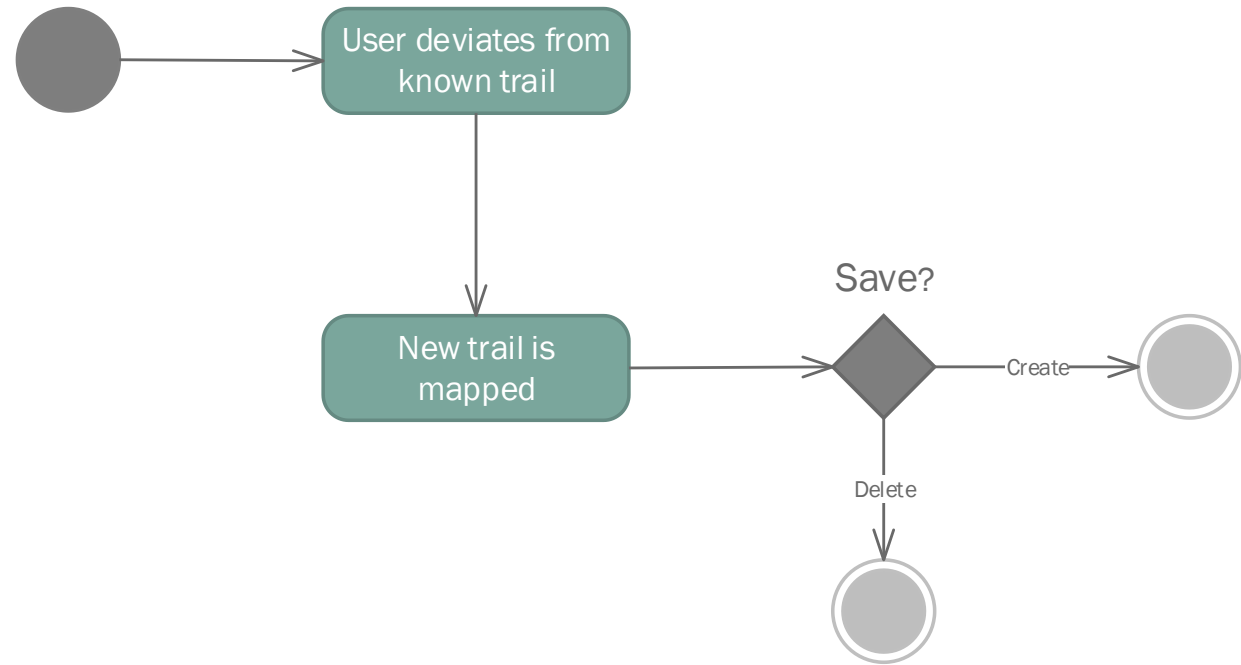
Add/Edit POI

The user will select the option menu from the main activity. From there, they will choose to either add or edit a POI. If the user chose to edit a POI, they will also need to select a POI to edit. In either case, a marker will appear at their current location. This marker may be moved on the MapView to indicate the point of interest. Once the user has successfully placed the marker, they will be given the opportunity to add details or notes about the point of interest. As this point, the user is asked if they would like to save or discard their new POI.



Backtrack

When the user deviates greater than a specified distance from a known trail, the application will alert the user that it has entered Backtrack mode and begin logging their GPS coordinates. When the user is done exploring, they are able to either create a new trail from the deviation or discard the logged data.



Emergency Mode

From the options menu in the main activity, the user selects Emergency Mode. The Emergency Mode activity is then invoked. This allows the user to view their current latitude and longitude as well as providing a way to send an alert to a contact in the event of an emergency.



Search Trail/POI

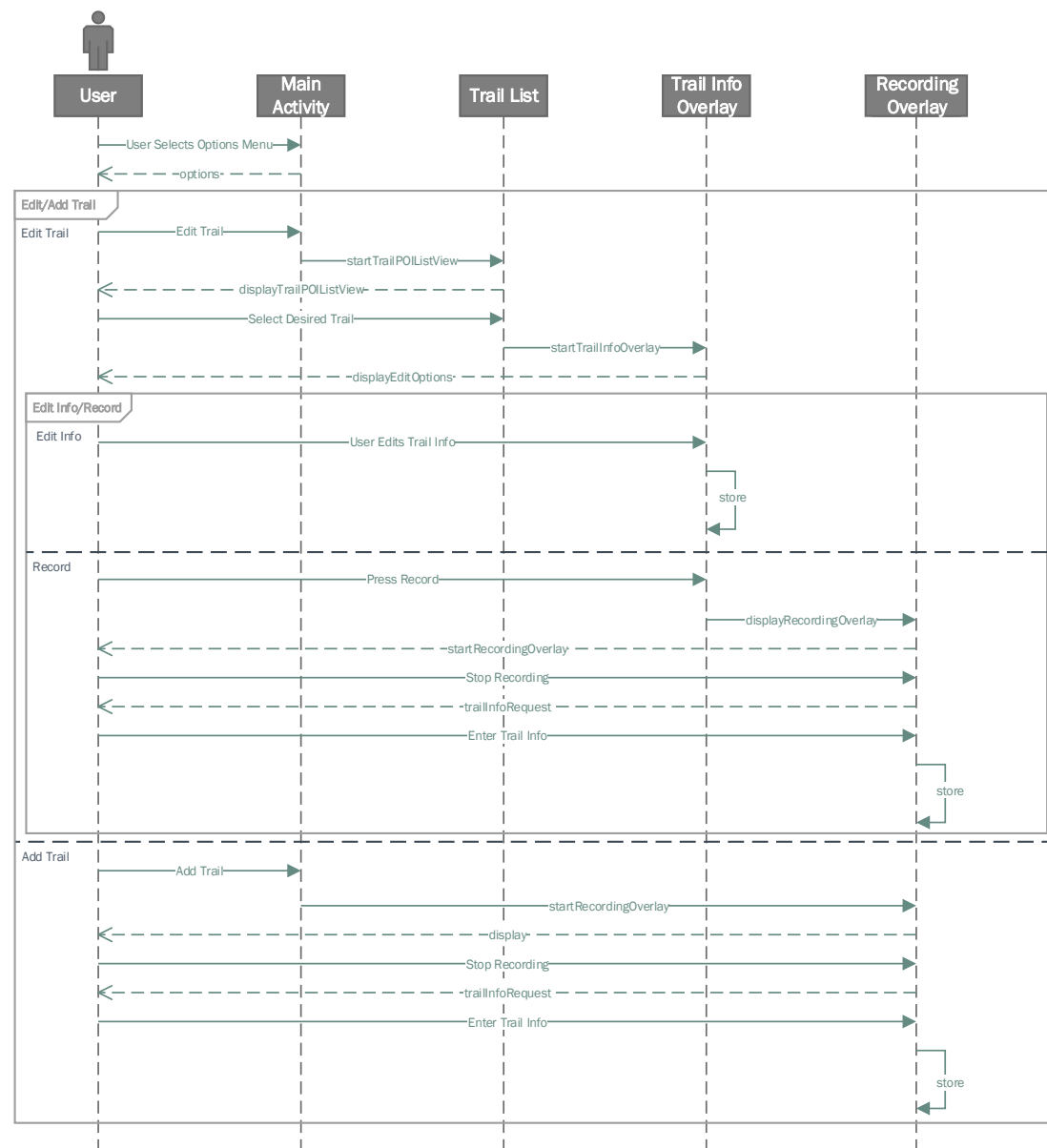
From the main MapView, the user presses the trail/POI list button in the bottom left of the activity. A list of logged trails and POIs will slide up from the bottom of the screen and be presented to the user. At the top of this list, there will be a search bar. The user presses the search bar and enters a keyword that will be used to search the database of known trails and points of interest.



Sequence Diagrams

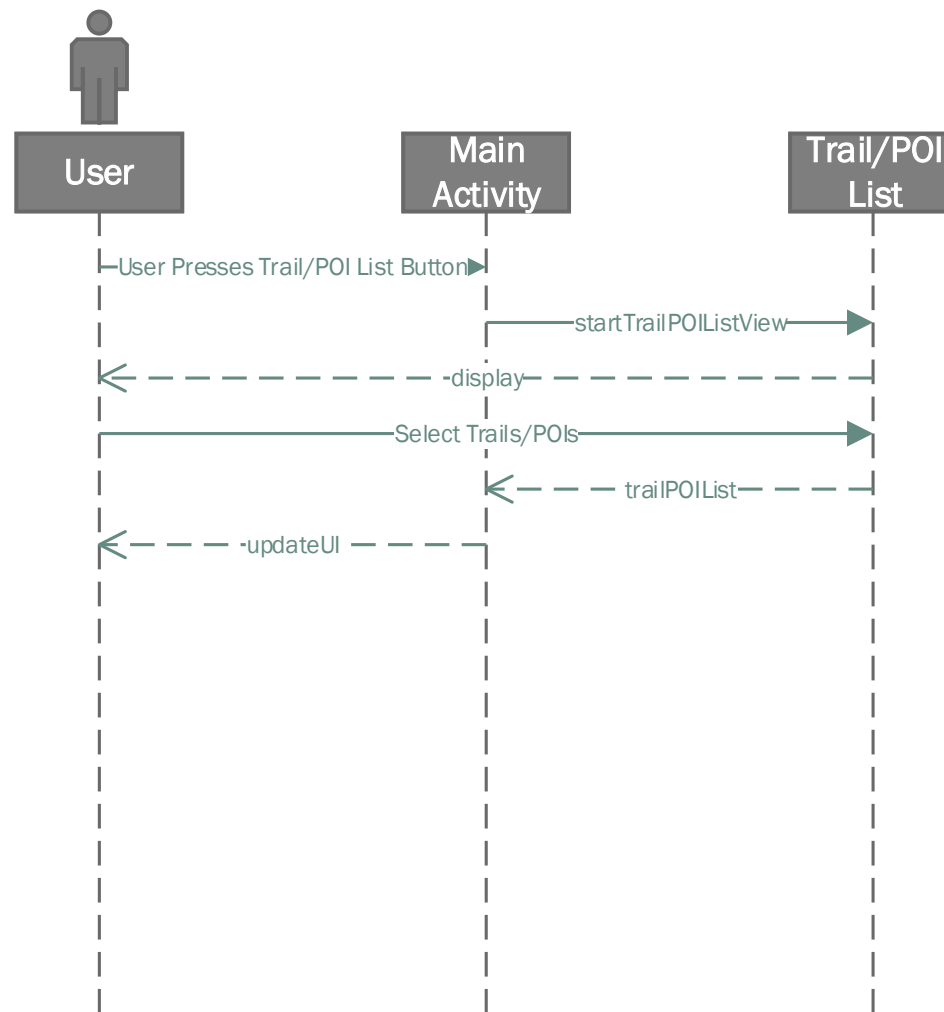
Add/Edit Trail

The edit/add trail sequence diagram describes the user's ability to manage the set of trails that are stored in the database. The add trail functionality allows a user to begin recording a new trail which will be added to the database upon entering metadata. For the edit trail functionality, a user is given the alternative to edit information about a trail such as the trail's name, description, and any notes they may have regarding the trail; or rerecord a trail in the case that the trail has changed.



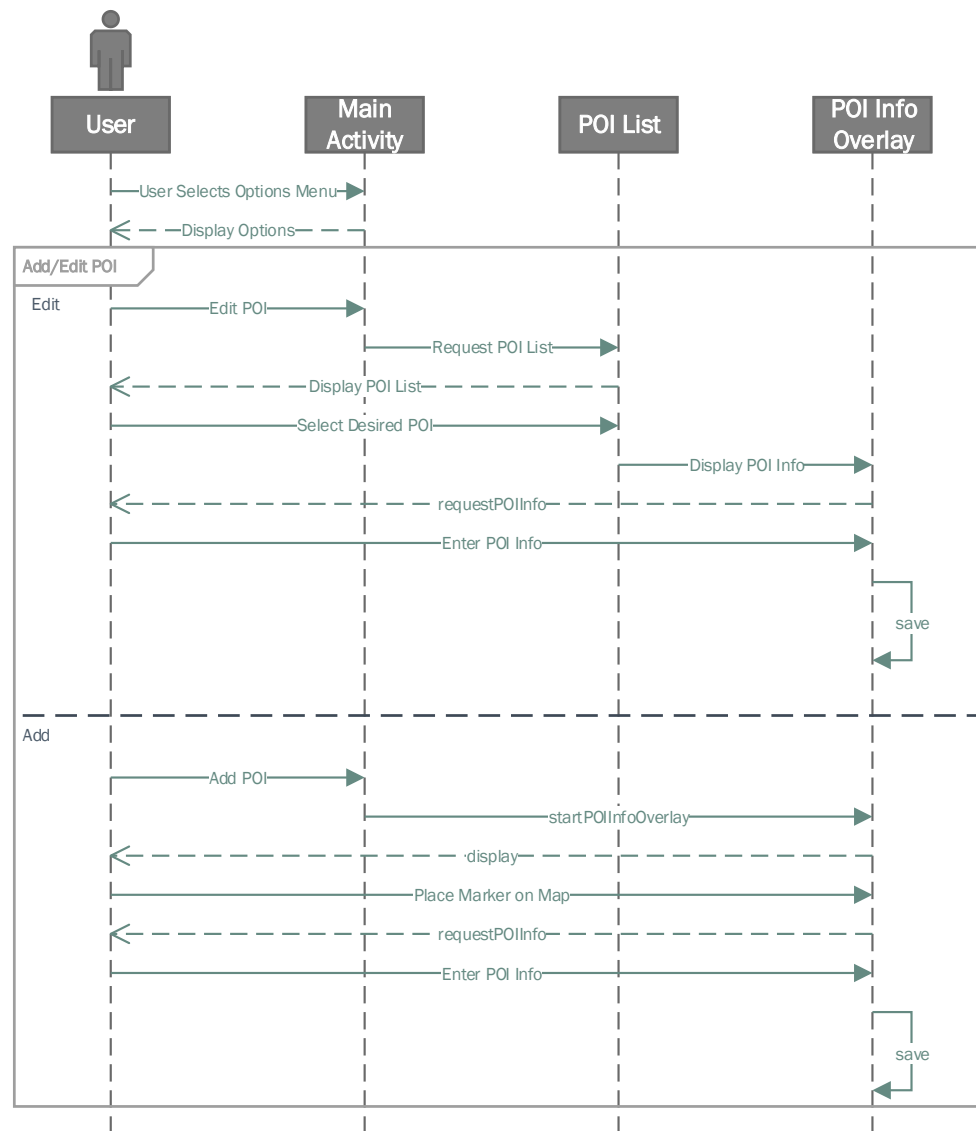
Select Trail/POI

When a user wants to select a trail or a number of points of interest, they will press the Trail/POI List button located in the Main Activity. This will start the TrailPOIListView fragment as an overlay on the Main Activity. At this point, the user will manipulate the TrailPOIListView to indicate which elements should be drawn on the map. These elements are then returned to the Main Activity which updates the UI for the user.



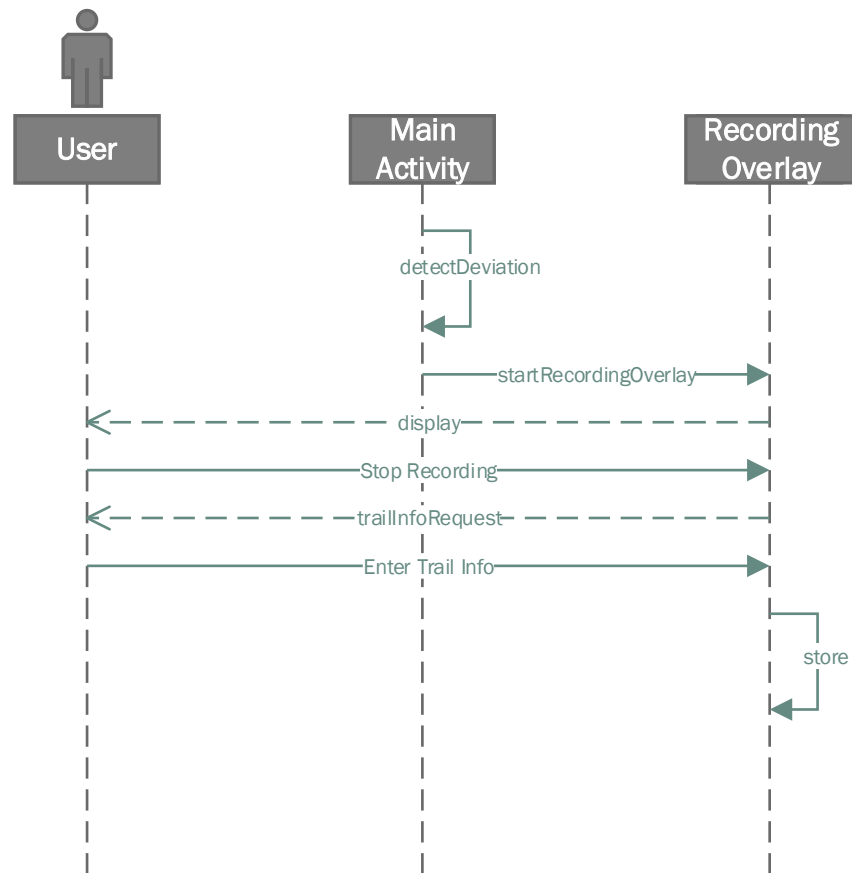
Add/Edit POI

The add/edit POI sequence diagram describes how a user manipulates and creates POIs. From the main activity, the user would select the options menu and choose either “Add POI” or “Edit POI.” If the user chooses “Add POI,” the POI Info Overlay is started which allows the user to position a marker on the map. Once the marker has been positioned, the POI Info Overlay requests metadata about the point of interest. If the user chooses “Edit POI,” they will be presented with a POI list from which they will select a desired POI. The POI Info Overlay is started, and the user is able to edit information regarding the point of interest.



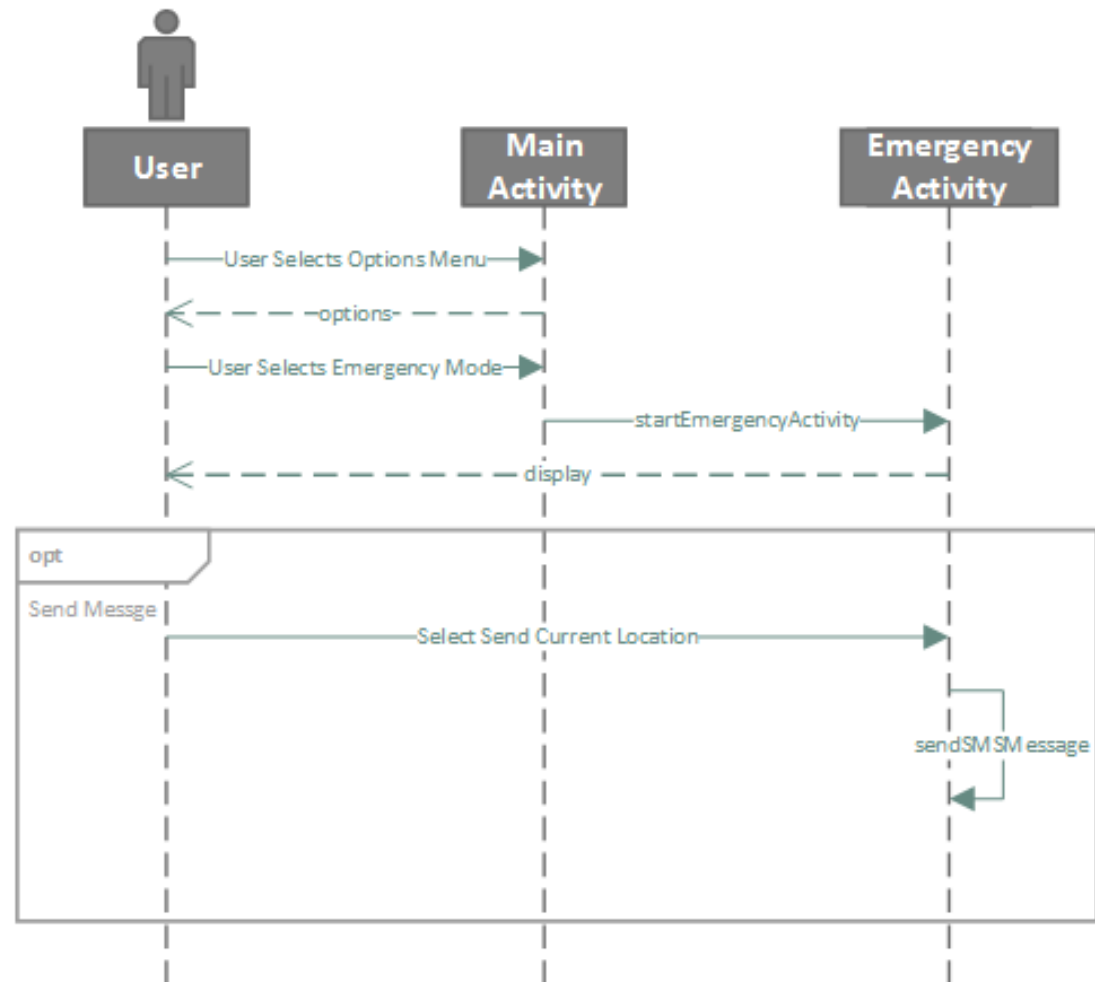
Backtrack

For the Backtrack functionality of Trekr, the Main Activity first detects that the user has deviated from a known trail and starts the recording overlay. The recording overlay is displayed and begins logging the user's location. Once the user has completed the recording activity and wants to save the new trail, a trail info request is performed by the recording overlay which asks for metadata about the new trail.



Emergency Mode

A user can engage the emergency mode functionality by selecting it from the options menu. This will display the emergency activity to the user and allow the user to optionally send a message requesting help.



Search Trail/POI

From the Main Activity, the user selects the Trail/POI List button which starts the Trail/POI ListView. The user then utilizes the search bar to enter a keyword which will be used to query the database. The results from this query will be used to update the Trail/POI ListView.

