SafePath
CSE 535: Mobile Computing

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Abstract

Given the number of crimes that occur around us, it is important to travel safely. It is non trivial for users to understand which areas to avoid if they are new to a region. This is the motivation of the application that we have developed. We present an application that finds the safest path to a given location from the current location of the person, by mining through data of crime logs. This app is designed specifically for the Tempe Area. The application also facilitates reporting a crime and reporting a suspect, in addition to showing the statistics of criminal activity of the Tempe area. Another interesting feature of the application is that the user can view the heat map of criminal data of the Tempe region. The application requires logging into it to avail the above facilities. **Keywords**: Crime heat map, safest path,

Google Maps, Map application

1. Introduction

Our user-friendly application is very light weight and handy making it an essential for anyone new to the Tempe area. Although some of the functionalities are available as separate applications and web pages, we came up with this novel idea so that this application becomes a go to place for the travelling needs of the people. The target users of our application are any people new to the Tempe region. The app can be extended to any region of the world if the crime logs of that region are available.

2. Project Setup and Permissions

The architecture consists of 2 systems. The configurations and functions are described below: 1. Android device

Make & Model: Google Pixel 3XL OS: Android 10 2. Fog Server (Local Server) Make and Model: Lenovo L380 Yoga OS: Ubuntu 18.0.4.1 LTS Processor: Intel i5 8th generation RAM: 8gb DDR5

For this project, the user needs to provide the following permissions for proper functioning of the app:

- Location

- Storage

3. Implementation

We organised the implementation of the project by dividing the tasks and assigning them amongst ourselves, equally. A summary of each of the tasks specified in the initial Project Proposal Report can be found below:

- Creating a Github repository: Since we had divided the tasks, we needed a version control system to integrate and maintain our code, for which we used github.

- Create a sign-in and sign-up option: We made use of Google Firebase for handling the sign-in and sign-up functionality. User authentication takes place through this. Refer to Figure 1

- Getting location using GPS: If the user enables location permissions, we can access the location of the user which is used for other functionalities throughout the application. Refer to Figure 2. The blue dot refers to the current location of the user.

- Marking of ASU Campus Regions: We have implemented the heat map for the entire Tempe region and
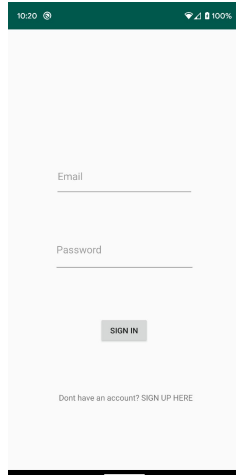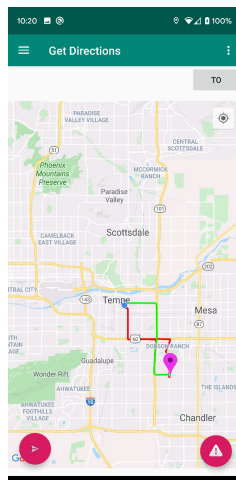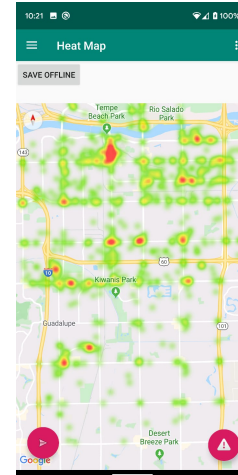
Figure 1. Sign In

Figure 2. Get Directions

Figure 3. Tempe Heat Map

to the desired destination. Refer to Figure 2. Current location of the user is the starting point and the final position of the purple marker which the user placed by dragging and dropping is the destination.

- Creating and displaying paths using a shortest path algorithm: Clicking on the "To" button will show the safest path (which may not always be the shortest path) in green color and other paths in red. Refer to Figure 2. The green path is the safest path among the paths provided by the google api. If the api returns only one path, then we display that path.

- Calculating crime rate for each path found. Refer to Figure 2. The green path is the safest path. There are multiple routes provided by the Google api. For each of this route, we find the paths which are far from the crime locations. If each of the paths provided by the api have some locations where crime is reported, then we choose the path which has minimum number of reported crimes.

- Filtering the paths and showing only the safe paths which are below the high crime threshold. Refer to Figure 2.

- Filter option - Seasons, Time and Date, Type of crime: The filter operation is for heat map. We currently give three options. One to show crime that happened in last year, which is the default setting. The other two options are to view the heat map for crimes that took place in last six months or the last month.

- Plotting the specific crime heat map: In our implementation, we specifically plot the heat map of Tempe area. If we are at some other location and report crime, then the data about our current location is stored in the json data that we are referring to create the heat map.

it is not restricted to the Arizona State University campus. The code for plotting the heat map from the Crime data manages division of areas. Refer to Figure 3

- Mining crime data from website, Create and maintain the database: We have used the website ¡PLACE-HOLDER¿ for plotting the heat map. Using the latitudes and longitudes provided in the data set, the marking of heat map was enabled. Our crime data was maintained in the form of a json file. We opted for a simplistic approach for the data storage in accordance with its usage for the functionalities in our application.

- Designing the UI component. Setting the threshold of criminal activity.

- Creation and designing of the page for users to enter start and end destination: The start location in the context of our application is the current location of the user. The user can drag and drop the location marker
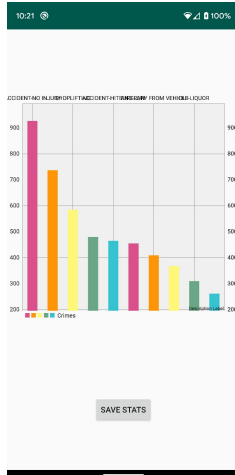
2

Figure 4. Statistics
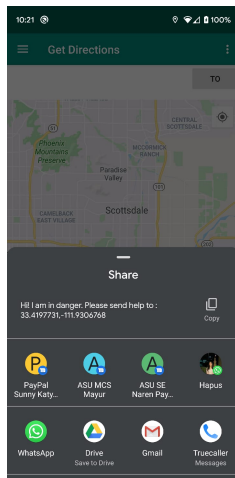

Figure 6. Report Crime

Figure 5. Share Details

Figure 7. Report Suspect

- Downloading crime heat map and statistics: For both the functionalities we provided a button to store the screenshot of the heat map and statistics. Refer to Figure 3 for saving heat map and Figure 4 for saving the statistics.

- Option to share heat map with friends: Since all the users of this application will have access to the same heat map, sharing the heat map will be redundant and hence we have enabled to share the current location of the user in the form of latitude and longitude, with the friends using the application.

- Notify users: The user will receive a push notification on logging in. The notification will consist of details of crimes in the locality of the user. Refer to Figure 5

- Integrate live data: For integrating live data, if a user reports crime, we save that crime.

- Re-plotting crime heat map based on new observations: After saving the data in the previous step, when users refresh the heat map page, the new location can be seen.

- Report crime: The option to report a crime can be found on the left navigation panel. User can enter the details of the crime. These details will get updated in our database. Refer to Figure 6

- Report a suspect: The option to report a suspect can be found on the left navigation panel. User can enter the details of the suspect. These details will get updated in our database. Refer to Figure 7

- Option to log out: The log out option on the navigation panel takes the user back to the landing page, i.e. the sign-in / sign-up page.

4. Completion of Tasks

Serial No.	Task	Assignee
1	Creating a Github repository	Ajinkya
2	Create a sign-in and sign-up option	Siddhesh
3	Getting location using GPS	Abantika
4	Marking of ASU Campus Regions	Apurva
5	Mining crime data from website, Create and maintain the database	Abantika
6	Designing the UI component. Setting the threshold of criminal activity	Ajinkya
7	Creation and designing of the page for users to enter start and end destination	Ajinkya
8	Creating and displaying paths using a shortest path algorithm	Apurva
9	Calculating crime rate for each path found	Siddhesh
10	Filtering the paths and showing only the safe paths which are below the high crime threshold	Abantika
11	Filter option - Seasons, Time and Date, Type of crime	Apurva
12	Plotting the specific crime heat map	Abantika
13	Downloading crime heat map and statistics	Ajinkya
14	Option to share heat map with friends	Siddhesh
15	Notify users	Apurva
16	Integrate live data	Siddhesh
17	Re-plotting crime heat map based on new observations	Siddhesh
18	Report crime	Ajinkya
19	Report a suspect	Apurva
20	Option to log out	Abantika

5. Limitations

Although the set of functionalities provided in that application can be useful for people residing in any part of the world, we have only implemented it for the Tempe area. The restriction of the location of the user to the Tempe area can hence said to be a limitation of this application.

6. Conclusion

This application adds a factor of safety to the everyday life of users. It is intuitive to use and hence it is user friendly. It can also be useful for finding criminals and hence can make the work of the police officials with the help of the "Report suspect" feature. The Heat map helps the users visualize the safe areas very easily. We hope to add value to lives with the implementation of this application.

7. Acknowledgements

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