PUNE INSTITUTE OF COMPUTER TECHNOLOGY,
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A MINI-PROJECT REPORT ON
THE ANDROID APP SMARTREK

PREPARED BY :-
JATIN UNECHA (31464)
SHIVANG RAINA (31459)
TANAY SHIRODKAR (31458)
ANIKET VELHANKAR (31466)

GUIDED BY :-
PROF. RANJEET BIDWE

DEPARTMENT OF COMPUTER ENGINEERING
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ABSTRACT

Smartrek is an android application designed to revolutionize the traditional trekking approach with a smarter and efficient solution to make the experience more memorable.

Most of the trekkers follow the traditional trekking approach of following the trek route that looks the best at the time, there is very little or no planning involved in the trek route. This may cause the trekker to follow a wrong route thereby taking more time to complete the trek. If a trekker follows the best possible route, there is no way to share this route with other trekkers. These problems form the motive behind this app.

Smartrek is an app for trekkers that enables users to share their trekking experiences and view other users' experiences as well. Smartrek provides its users with different features: path tracking, music player motivation to keep going, socializing, and even education on the topic. It's like having your own trek guide in your pocket.

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1 Introduction

1.1 Motivation

Trekking is one of the most followed activities by a lot of users as a hobby or a refresher. Professional trekkers are well trained and can estimate the approximate route to be followed for a successful trek. This is supplemented with a good study of the trek destination, including the maps and exploring various possible routes.

Layman users going for trekking as a refresher don't spend much time in planning and directly start the trek. This is due to a lack of resources such as maps. This causes the users to take more time in completing the trek.

1.2 Purpose

We make trekking experience more memorable, by providing a smart solution to trekkers and making the trek easier. The route of the trek is one of the most important aspects of a successful trek. We provide a means to trace this route and give an idea of the path that was followed by the user for a successful trek.

1.3 Document Conventions

Abbreviation	Meaning
GPS	Global Positioning System
DBMS	Data Base Management System
API	Application Programming Interface

1.4 Project Scope

The scope of the project is truly unlimited. It can be used by trekkers at any place, anytime and as required.

1.5 Intended Audience

The app is useful to anyone and everyone who wishes to go for a trek to track their path or follow a recorded path, whether they are a casual trekker or professional.

2 Overall Description

2.1 Product Perspective

The users can start tracking their path by clicking on the Start Trek button, after which the app will start storing the locations in the database until the user hits the stop button.
The app also features a music player which enables the user to play audio and music stored on the phone.
The Explore page can be used to view the trekking experiences and paths recorded by other users.
The path is recorded in real-time and stored in the database, which is then retrieved to make an analysis of the user's route. This recorded path can be used by others to guide themselves for the trek.

In order to make the trek interesting the user can listen to music simultaneously. In order to build a vast community of nature lovers and trekkers, we provide the option to share your trekking experiences with other trekkers. This will increasingly help the trekkers to plan their route by seeing the experiences of fellow trekkers. It will save their time and energy thereby enhancing their experience of the trek.

2.2 User Classes and Characteristics

The users of the app are:

General Trekker - the user who is going to follow a recorded path for completing a trek successfully.

Professionals – A user who wants to record his path and share it with others.

2.3 Operating Environment

User Authentication - Google Firebase
User Information Storage Database - Google Firebase Realtime Database
Map Data - Google Maps
Location Data - GPS as well as entered by the user
Operating System - Android
Platform - Java, XML

2.4 Assumptions and Dependencies

A constant and consistent internet connection is required for the app to work properly to ensure there is no data mismatch between the general user and database.

If GPS functionality is to be used, the phone must have a GPS radio and the app should have permission to use the phone’s GPS.

The app requires at least 100 megabytes of free RAM space to work properly.

3 Literature Review

3.1 DBMS

A database management system (DBMS) is a software package designed to define, manipulate, retrieve and manage data in a database. A DBMS generally manipulates the data itself, the data format, field names, record structure and file structure. It also defines rules to validate and manipulate this data. A DBMS relieves users from framing programs for data maintenance. Fourth-generation query languages, such as SQL, are used along with the DBMS package to interact with a database. Some other DBMS examples include: • MySQL • SQL Server • Oracle • dBASE • FoxPro A DBMS always provides data independence. Any change in storage mechanism and formats are performed without modifying the entire application. There are four main types of database organization: • Relational Database: Data is organized as logically independent tables. Relationships among tables are shown through shared data. The data in one table may reference similar data in other tables, which maintains the integrity of the links among them. This feature is referred to as referential integrity – an important concept in a relational database system. Operations such as "select" and "join" can be performed on these tables. This is the most widely used system of database organization. • Flat Database: Data is organized in a single kind of record with a fixed number of fields. This database type encounters more errors due to the repetitive nature of data. • Object-Oriented Database: Data is organized with similarity to object-oriented programming concepts. An object consists of data and methods, while classes group objects having similar data and methods. • Hierarchical Database: Data is organized with hierarchical relationships. It becomes a complex network if the one-to-many relationship is violated. In our application, we have used Google Firebase Database, which is a free DBMS framework by Google.

3.2 Google Maps API

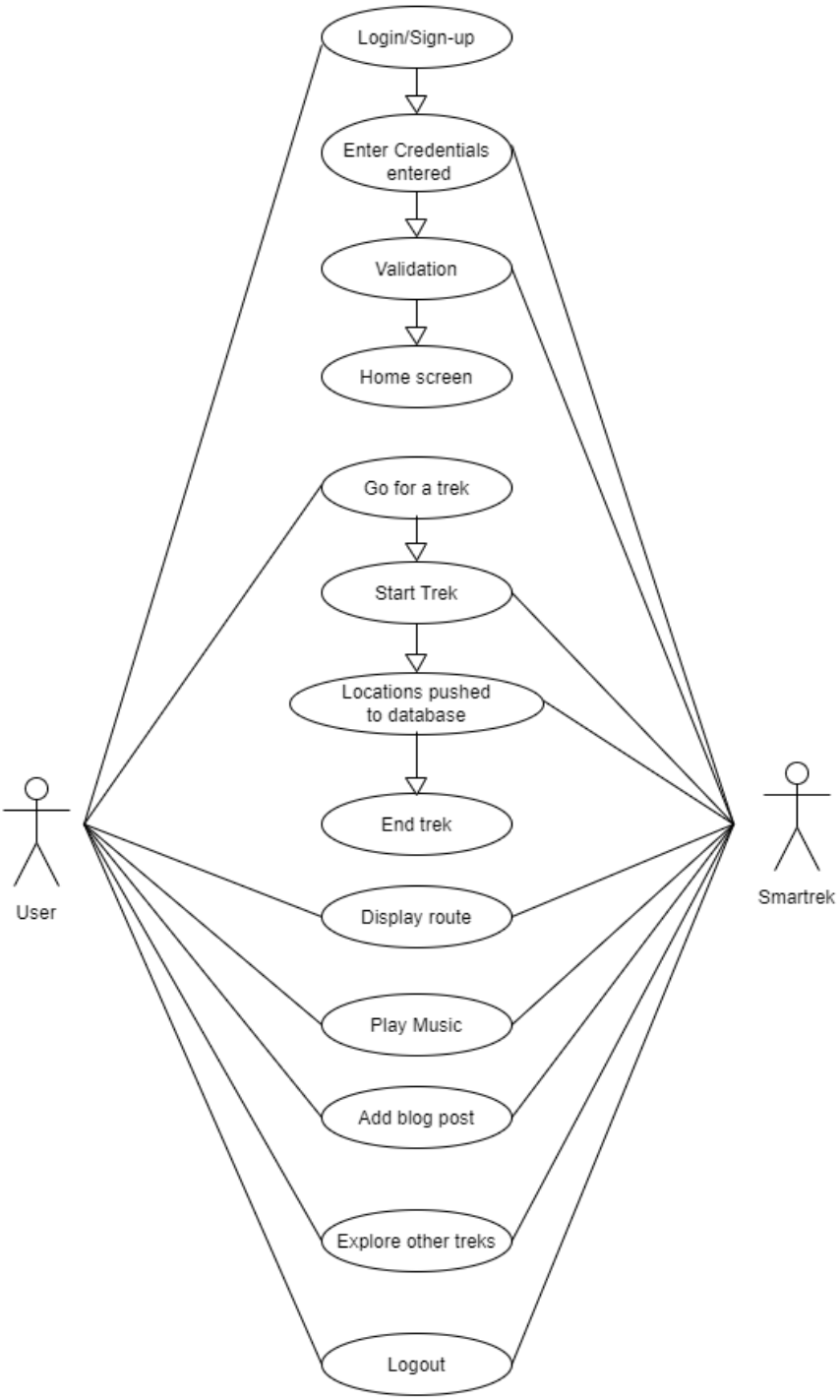
An application programming interface (API) is an interface or communication protocol between a client and a server intended to simplify the building of client-side software. It has been described as a “contract” between the client and the server, such that if the client makes a request in a specific format, it will always get a response in a specific format or initiate a defined action. An API may be for a web-based system, operating system, database system, computer hardware, or software library. An API specification can take many forms, but often includes specifications for routines, data structures, object classes, variables, or remote calls. POSIX, Windows API and ASPI are examples of different forms of APIs. Documentation for the API usually is provided to facilitate usage and implementation. In building applications, an API simplifies programming by abstracting the underlying implementation and only exposing objects or actions the developer needs. While a graphical interface for an email client might provide a user with a button that performs all the steps for fetching and highlighting new emails, an API for file input/output might give the developer a function that copies a file from one location to another without requiring that the developer understand the file system operations occurring behind the scenes. The Maps Static API lets you embed a Google Maps image on your web page without requiring JavaScript or any dynamic page loading. The Maps Static API service creates your map based on URL parameters sent through a standard HTTP request and returns the map as an image you can display on your web page.

4 Design/Implementation

The Smartrek android app was implemented using the Android studio app. Android Studio is the official integrated development environment for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems. It has a strong editor tool for developing creative UI and emulators for different versions to test and simulate sensors without having actual Android devices.

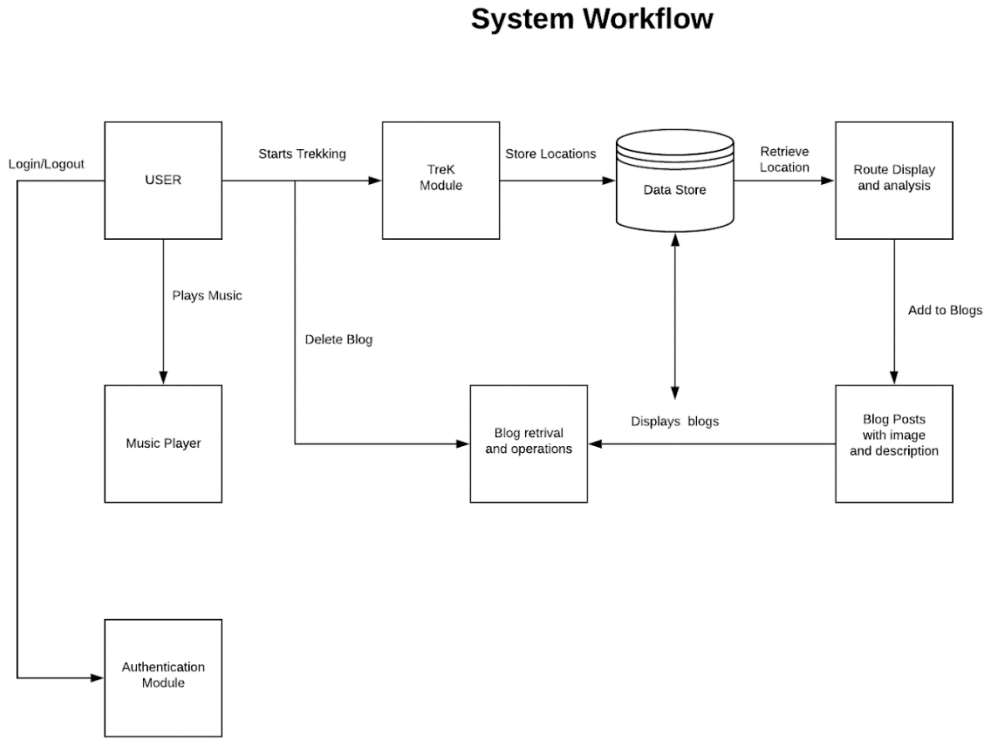
The following use case diagram demonstrate the functionalities of the app -

4.1 Use case diagram



Representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved.

4.2 System architecture



This gives a high level view of the new system with the main components of the system and the service they provide and how they communicate. The user logs in to the app to carry out various functions provided. The functions of the app are supported by a backend that uses firebase real-time database. The system is implemented using a two-tier architecture that comprises of our interface modules and DBMS as illustrated above.

4.3 Implementation modules

4.3.1 Path tracking

Path tracking begins right when the user starts the trek. The current location of the user is monitored every 5 seconds in real-time as a background service. As soon as the location of user changes, the same is pushed into the database. Once the trek is completed, the user notifies the app about the same. The stored locations are analysed to find the route followed by the user. This route along with the start and endpoints is displayed to the user.

4.3.2 Blog posts

Any user that has completed the trek may want to share their followed route and any other experiences by posting the same in the blog. The blogs are visible to all the users and only the owner of the blog can delete the blog post.

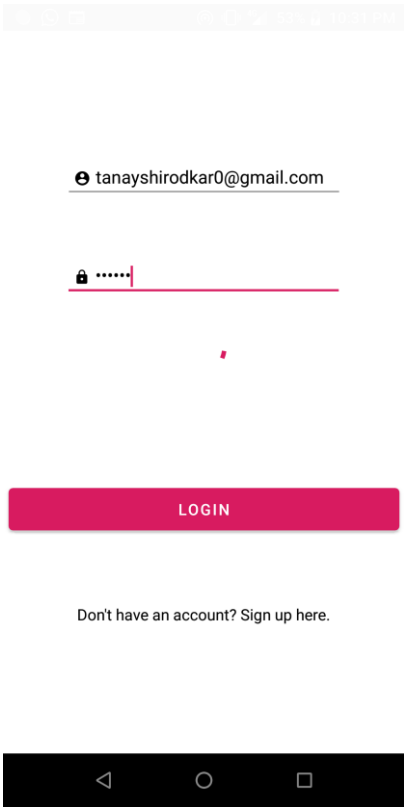
4.3.3 In-app Music

The app provides the support for an in-built music player that scans the music files on the current user’s device and allows them to play the music of their choice in the background.

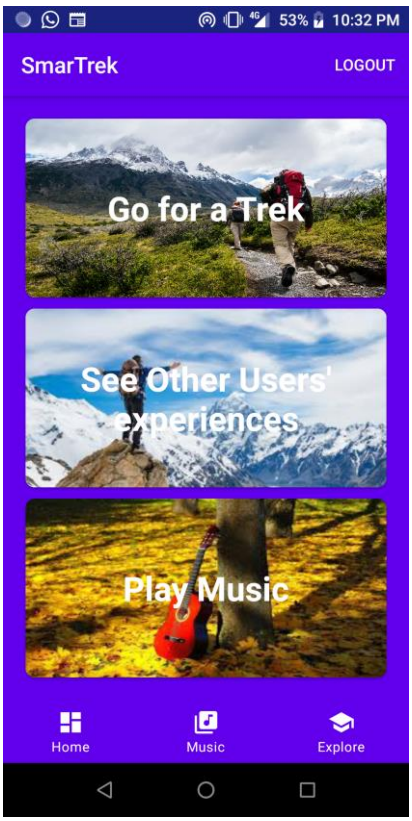
5 TESTING RESULTS AND ANALYSIS

TEST CASE NO.	TEST CASE DESCRIPTION	EXPECTED RESULT	ACTUAL RESULT	STATUS
A. LOGIN PAGE				
1.	User account exists and user enters correct email and password	Login successful	Same as expected	PASS
2.	User account does not exist	Login not done	Same as expected	PASS
3.	User account exists and user enters incorrect email and/or password	Login not done	Same as expected	PASS
B. SIGNUP PAGE				
1.	User enters new email and password	Account created	Same as expected	PASS
2.	User enters email whose account already exists	Account not created	Same as expected	PASS
C. MUSIC PLAYER				
1.	User grants storage permissions to app	List of all music files on internal storage shown in fragment	Same as expected	PASS
2.	User does not grant storage permissions to app	Not able to access internal storage	Same as expected	PASS
D. PHOTO BLOG				
1.	User clicks on a blog post which is posted by some other user	Delete button not shown	Same as expected	PASS
2.	User clicks on a blog post which is posted by him.	Delete button visible	Same as expected	PASS
3.	User clicks on the “EXPLORE POST” button	Map route is visible to the user	Same as expected	PASS
4.	User clicks on the “DELETE POST” button	Post is deleted from the database	Same as expected	PASS
E. NEW TREK				
1.	User starts a new trek by clicking on “START TREK” button	User locations start getting added to Firebase Realtime Database	Same as expected	PASS
2.	User clicks on “STOP TREK” button	Locations stop getting added to database.	Same as expected	PASS
3.	User clicks on “PROCESS” button	The user’s just travelled route is displayed.	Same as expected	PASS
4.	User clicks on “NEXT” Button	User is directed to the new post page.	Same as expected	PASS
5.	User enters post title and description and clicks on “POST” button	New post is added to database.	Same as expected	PASS

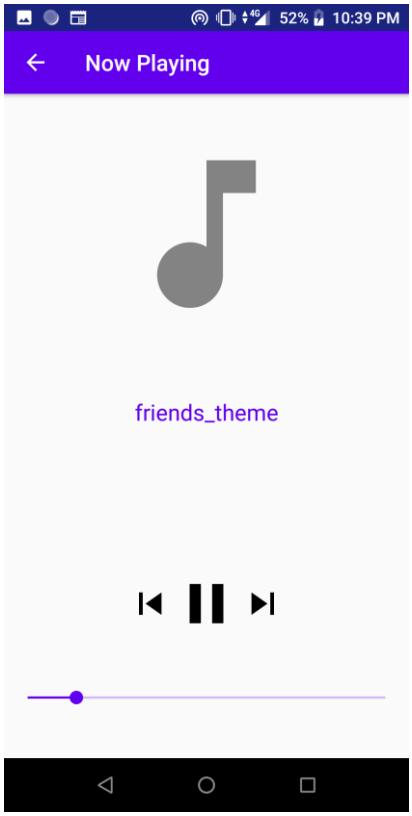
RESULTS (SCREENSHOTS)



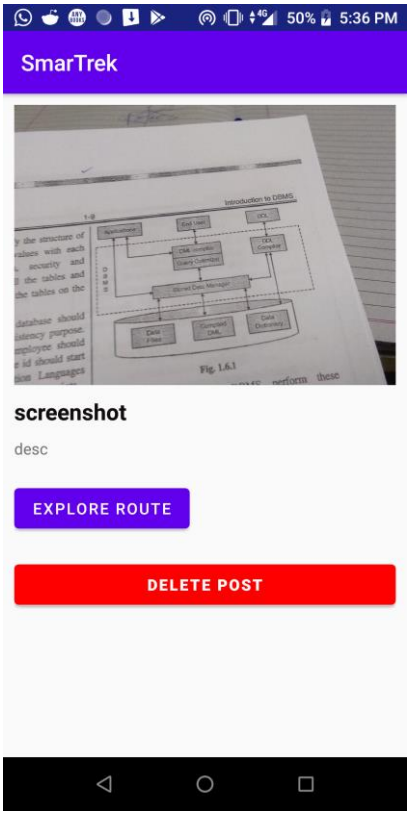
LOGIN



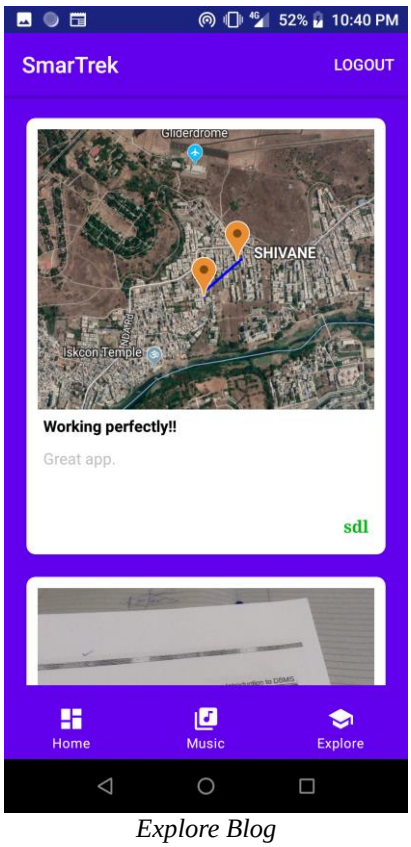
Dashboard



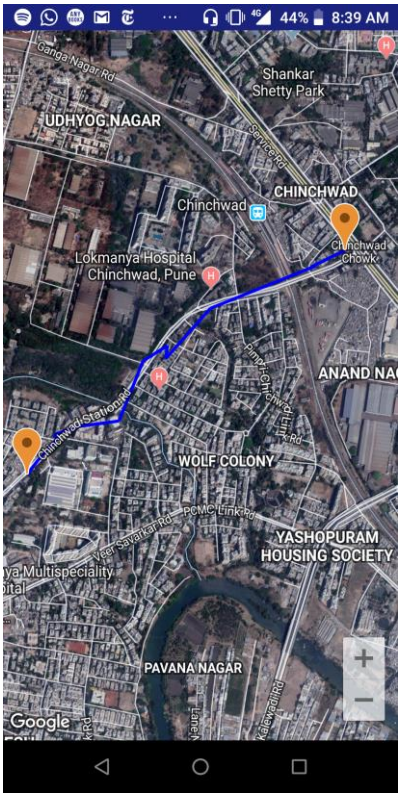
Music Player



Single post



Explore Blog



Route

6 Conclusions and future enhancements

Conclusion:

We have successfully created an android application that can be used by trekkers to view trekking routes uploaded professional trekkers which is helpful for beginners to plan their trek route. The app also has many other features. The built-in music player enables the users to play music and other audio files stored on their phones. The explore page helps the users of the app to view experiences of their friends posted via blog.

Future enhancements:

This app will add various fitness tracking features in the future and will be an all-in-one app for fitness and nature lovers, which is the most perfect combination for the audience as one who is into one is most probably interested in the other as well. The music player which is already in this app will be like icing on the cake.

We will also increase the responsiveness of UI. We will add features to the blog including like and sharing via various social media platforms and this app.

7 References

[1] "Docs - Android Developers." https://developer.android.com/docs.

[2] "Documentation | Firebase." https://firebase.google.com/docs.

[3] "Android Programming: The Big Nerd Ranch Guide (3rd Edition)." https://www.bignerdranch.com/books/android-programming-the-big-nerd-ranch-guide/.