Department of Informatics, University of Leicester CO7501 Individual Project.

City Tour Planner App

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Thesis Draft

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ABSTRACT

Tourists face different challenges when exploring their destinations of choice. These challenges include planning their tour in order for them to get the best experiences in these destinations, this in turn poses another challenge as to how they can create a personalized tour for themselves that helps them explore their interests in different locations.
The internet hosts a rich and varied platforms, services and applications that promises to help tourists get the best out of their tours in desired destinations.

While these varied set of tools exist online, tourists still consult local and personal tour planners to help them create personalized tour plans, that fits their interests and help them best utilize their time by doing what they enjoy on their tour.

This thesis focuses on using open API's available on the internet and user expressed preferences to create personalized itinerary for their tourists.
The approach employed by this thesis is allowing users to express their interests using an android application, which then creates an editable tour which tourists can further select what they want and then get a final itenary.

This will eliminate the need for tourists to hire personal tour planners thereby eliminating the extra layer of human communication for tourists when creating their tours.

The results obtained from this thesis will enable users to create a personalized tour itenary by themselves while also eliminating the need for offline consultations or the hiring of a personal tour planner which will in turn reduce time spent planning tours themselves.

Keywords: Personalized tour itenary, open APIs, exploring destinations.

DECLARATION

All sentences or passages quoted in this report, or computer code of any form whatsoever used and/or submitted at any stages, which are taken from other people's work have been specifically acknowledged by clear citation of the source, specifying author, work, date and page(s).

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1. Introduction

1.1 Background

The internet has revolutionized the way people experience different locations. There are applications and platforms available that offer various solutions in regards to activities, tours and attractions for different locations.

A Lot of work has been done in the area of tourism and travelling to help people best utilize their time and have meaningful interesting experiences as they travel to different locations.
Travellers are often presented with a curated list activities to perform, sights to see, meals to try out, places to shop while on their tour.

Though a lot has been done in the area of tourism and the internet has rich resources and applications to help users make best use of their time during their explorations of different locations, many users still consult private tour planners to help create personal itinerary for them.
One of the major reasons behind this is that, while there are many platforms, applications and resources online that present users with varied options on how to best utilize their time and enjoy their tours in different locations, itineraries and recommendations these online resources present are not personalized to the needs of the users.

To address this challenge of providing personalized itineraries to users, there are a number of online platforms and applications that connect travellers with specialist tour planners and natives to create itineraries with user expressed preferences so they can better enjoy tours with itinerary planned to meet their needs.

While this solves the problem of providing personalized itinerary to users, it poses another challenge of dependency on the human factor. Having a human tour planner can cause the following challenges:

- Time: Increase in time needed to plan a tour. Many of these platforms work by users expressing their preferences, the tour planner examining these and reverting, which usually takes a few days. Also, due to this turnaround time, a

user cannot quickly and conveniently consult a tour planner on a day and expect to feedback on that same day, this has to be planned and discussed in advance with the tour planner.
- Misunderstanding between the tour planner and the user, which might come up due to difference in language of communication, and also misuse of words.
- Increased cost. The rates charged by these tour planners differ between destinations, and that cost overhead can sometimes be the deciding factor as to if the user gets this customized plan or not

This project will eliminate the need for human specialist tour planner.
The users will express their interest and preferences into the application, and with this information, the application will plan and output a custom 24 hour itinerary for the user.

the application will give users a tour itinerary that is based on their expressed preferences and interests as opposed to presenting users with an auto-generated tour plan based on metrics unknown to them

This system will take away the human layer that comes with personal tour planners and in doing so it:
- Reduce feedback time between the planner and the tour as the application will respond in an automated manner
- Reduce cost for the tourist as they dont pay to hire a personal planner
- Make changes to their itenary in a timely manner as the plans offered by the system are editable.

In all, it will save time and money for the tourist while offering them personalized itinerary that meets their needs on their trip.

These preferences can also be re-used by the user for different locations or they can choose to create a new one for each tour.

1.2 Motivation

People go on tours to have experiences outside their normal day-to-day lives, meet new people, learn about different cultures and destinations, to do business amongst others.

Touring, though it has its benefits, often requires a lot of planning to ensure they get the best of it and enjoy their time. This plan entails tourists take into consideration how much time they have planned, their budget, their personal preferences and other details that make the tour enjoyable.

There are platforms and services available on the internet to automate this planning processes for the tourist. These solutions range from booking flights, hotels, planning itenary to as far as suggesting locations and spots to tourists in their city or location of interest.

In the area of touring and exploring different locations, a lot has also been done as we have various applications and platforms that work to provide a curated list of activities to the user to explore and experience while on their tour.

While these solutions are helpful, they leave out a very important aspect of tourism, which is customization and user preference.
Showing most popular activities to users based on location alone, does not take into account the users preferences, their budget neither does it consider the time they have planned for their visit.
These platforms do not consider what is important to the user while showing the listings and activities in their location of interest.
This lack of personalized listings is the primary reason experts believe that almost half of all travel booksing still come through offline channels.

Using this available data on open APIs and getting more details about the tourist, City tour planner can create a personalized one-day tour for the tourists. This tour will meet the restrictions defined by user profile, start and end locations, time, their dietary preferences, showing them what they can eat where while on their tour.

The application built from this project will enable users to plan their tours and eliminate the need for offline consultations or the hiring of a personal tour planner or spend time spend time planning personalized tours themselves.

1.3 Aims and Objectives

The aim of this project is to develop an Android application that will enable a person to easily plan a one-day city tour, that allows her to best utilise her time, according to her interests.

For the application to achieve this, it should be able to do the following:

- Allow a user to sign up/login
- Allow a user to update their profile with personal details like gender, age etc
- Allow the user to create a new tour
    - The user needs to enter location to create a tour or allow the app to auto-detect location by enabling it in their system preferences (if it is not enabled already)
    - Ask the user specific questions to understand their preferences for this tour. These questions allows the user to express their preferences for the tour
    - If this is not the first tour of the user, the application should provide user with the option to use or update previous preferences for a past tour or decide to answer the questions for this specific tour

- Retrieve data from open APIs using the normalized user information
- Analyze this data from APIs using time and the proximity constraint to create an itinerary for the user tour
- Return this itenary to the user
    - Itenary should include start location and time
    - Distance between each venue in the itinerary
- Allow user to select from a set of options generated using their preferences, which will then be used to create the final itinerary
- Allow user to view this itenary on a map or a list
- Store the user and trip data to provide better experience and recommendations for future tours
- Store the user tour data to provide better experience for next tour using recommendations and learning from this tour
- Allow user share their tour itenary as a URL link
- The tours must be bound in time to 24 hours (A Day)
- Output the plan to the user

1.4 Scope

The scope of the work being carried by this project is limited to building an android application creates a 24-hour city tour plan for a user using their preferences, time.

This project does not cater for group tours, where more than one person is touring a location. It can be extended in the future for this behavior but that is not in the current scope.

This project employs open and free APIs for its data collection, and the language of content and communication on the app will be the English language.

While applications should be built for accessibility and wide user reach, the scope of this project does not allow for it to cater to people with certain disabilities such as blindness, as it does not have the resources needed for users with such conditions to enter or read information

1.5 Overview of Dissertation

2. Related Work

This chapter describes existing work in the area of tourism as it relates to tourists and travellers exploring destinations and having interesting experiences in different locations with the aid of technology, both offline and online.

RoadTrippers, a web and mobile application, is a road trip planning application that helps
users dscovers items such as accommodations, restaurants, attractions and culture, outdoor and recreation activities, entertainment and nightlife, shopping, sports and motoring
along the route of their road trip. It does this in the following steps:
- users select start and stop locations for their trip
- the application generates a map showing the users items such as , that is available on the route of their trip from start to stop locations
- users can select any of the items, adjust the budget setting (if it applies to that item category)
and add to their trip.
- Users can then save trip by creating an account and it is the trip is available on their profile

RoadTrippers boasts database includes millions of the world's most fascinating places, making planning the unexpected easier for its users.

RoadTrippers has its own set of places APIs, Boone (available for use at a price), that it uses to
serve the application Backend. some of the endpoints are:
- Search: The Search endpoint powers discovery of the most interesting travel and tourism places.
It takes a coordinate center and a search radius, as well as a list of optional tags (see Standard Tags to
pull a currently available list) and returns a list of relevant places.
- Place Details: Return name, address, hours, photos, reviews, tags, and more about any place in the Boone database

With these endpoints built around the database, RoadTrippers returns items along a route for
a start and stop location within a specified radius to its users.

Tripit,a web application, plans the itenary for the user with their booking details.
tells them where to be when, alerts them on next moves, shows nearby places etc.
Users can book their trip on TripIt supported booking sites and share the booking details with Tripit,
Tripit then plans an itenary for them for when they arrive at the airport to their final destination.
Tripit also alerts users on time to their next action on the itenary and for discounts for nearby events
or things to do.

Musement, an online platform offers to help travellers get the "best" from destinations by providing a great choice of
local tours and attractions bookable on multiple devices.
As seen on the website, they offer a range of services that includes temporary, exclusive, hidden-gem and even free activities for multiple locations.

some of its service offerings include: book guided tours online
- buy entrance tickets
- register to join bus tours
- day trips and excursions etc.

Blink Travel, also an online platform for tourist offers the users curated cards of "best" attractions and experiences.
the user can schedule things to see or do by viewing the card and making their schedules
its card categories include: top attractions, what to eat, the best things to see and the best things to do amongst other things

While there are multiple platforms on the internet with automated solutions to help users get the best experience
on their trips, travels and tours, there are also applications that offer physical consultation and experts online
to guide the tourists and travellers in making the best from their trips as well.

The **Personal-Trip-Planning-Service** on **Adventurelink** is another service where tours are planned personally for the tourist.
Tourist answer questions that help the platform create a personal itenary for them to use on their trip.
The questions asked include:
What's the purpose of your trip?
What's your preferred trip?
What would you like to do?
And the aim for these questions is to get more details about the tourists preferences and needs for their tour.

Journy, is an online application that helps travellers plan their trips by connecting them with
a personal trip designer.
It works in the following steps:
- Users share their travel preferences by filling out a questionnaire about how they like to travel and
things they would like to do on their trip.
these includes questions about travellers budget, dietary restrictions, interests etc
- Users get paired with a personal trip designer that works with them to review and plan their trip via email and chat on the application.
- users receive a customized itinerary with activity bookings and restaurant reservations, which they can access by the application
or by web browser.

With platforms like Musement, TripIt etc, it is a wonder why the likes of GoJourny still have millions of user base.

As a user on GoJourny put it:
“I found Journy after already getting an itinerary from a typical travel agency. Simply put, Journy’s recommendations blew theirs out of the water. Every concierge we worked with really listened to what we wanted as travelers and led us to the off-the-beaten-path sights we were looking for. Plus, the process is super smooth and easy!”

The key words to note in the user review are: "worked with them" and "listened to what they wanted". This is one of the key selling features of the Journy platform.

While there are multiple platforms on the internet with solutions around how a tourist can enjoy their time in a location or have a planned itinerary, the recommendations from these platforms are not based on personal preference of the tourists.

People want to be listened to and want their input to be taken into consideration when a tour is being planned, but the existing platforms do not offer a solution for this challenge.

This creates the need to have an online platform application that works with tourists/users to get the profile, know their needs and discuss their preferences for their tours.

City Tour Planner gives users an itinerary and tour plan that is based on what they like to do and how they enjoy spending their time.
It does not offer an auto generated itenary to the users based on metrics unknown to them.

This system will take away the human layer that comes with personal tour planners and in doing so it:
Reduce feedback time between the planner and the tour as the application will respond in an automated manner
Reduce cost for the tourist as they dont pay to hire a personal planner
Make changes to their itenary as the plans offered by the system are editable.

In all, it will save time and money for the tourist while offering them itinerary and plans that are customized to their needs on their trip.

The need for personal tour plan is one of the major reasons why offline travel agency and tour planners still have thousands of users.

This project will also develop to learn more about the user, based on their interaction with the initial provided tours, thereby using their data as they go on multiple tours to plan tours for them in future.

3. Implementation

3.1 System Functionality specification

To achieve its objectives, the system will be implemented using a set of technologies.

This section discusses how this project will be developed and the various components built to achieve the set project objectives.

System Architecture and Components breakdown
The system will be broken down into two components
- The Backend
- The Android app (front-end)

3.1.1 The Backend

This component will be built using Nodejs as the server side framework,
relational database (MySQL) to store user and tour data.

The backend will integrate with HERE and FourSquare REST APIs to retrieve the following datasets
- Places categories data: this fetch the categories of places available the tour location entered by the user.
These categories will be further used to make other calls to these external APIs to fetch data that match user selection under these categories.

NB: For the scope of this project and time limitation, user will be provided with a list of cities to select from.

- Places data: this will fetch the places and venues for the user selection under the places categories.
After a user has expressed their preferences for a tour, these values will be used to fetch Places data matching the queries expressed by user preferences.

The fetching of places from these external APIs will be done to get the best reviewed top results matching these queries.

The System Models:

The database will store the following tables:
- User: this is the user's basic profile information.

- Tour: This is all the tours created by the user. It has fields for userId, city and an Object that contains the final tour itinerary.
- Preference: This is the user preference for each tour, this preference can be reused for different tours.

There is a 1:M relationship between the Tour and the User as there is also between the Preference and the User models.
This means a user can have multiple trips and multiple preferences created on their account.

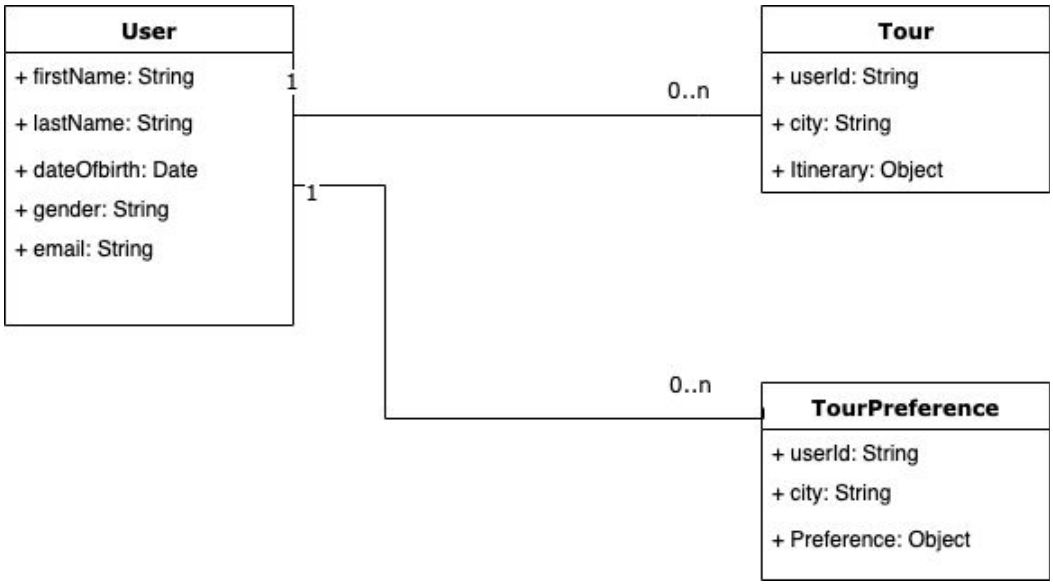

Figure 1: This Entity-Relationship diagram for the application models.

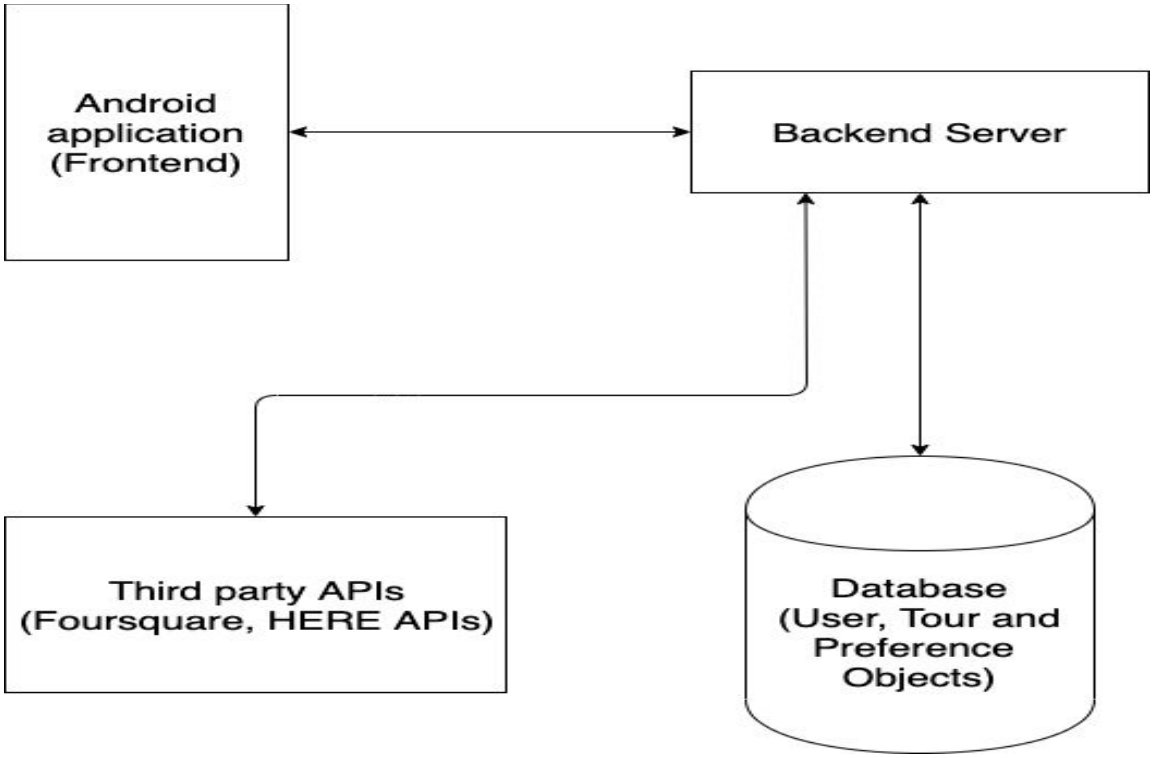

Figure 2: System architecture diagram

REST API

the backend will expose REST APIs for the frontend use.

the API endpoints will include:

- authentication endpoint: this will authenticate a user and returns a token that can be used to make requests by this user. This token will have TTL and when it expires, the frontend will call the authentication endpoint again
- user profile: this endpoint will return a user's profile
- user tours: this endpoint will return all user tours
- location categories: this will return the categories of places for a provided location
- itenary: this will return a tour itenary to the user. this itinerary is generated with the preferences expressed the user, sent through the frontend.

3.1.2 The frontend

The frontend is the point of user interaction with the application and allows the user to perform
the following actions:
- sign-up/login
- update and view profile settings
- create new tour itenary
- view created tours
- share tour itenary

The frontend for this project will be an android mobile app with different
screens, each screen presenting a user different types of actions to perform.
The screens will include:
- sign-up/login
- profile screen: view and update
- tours screen: where all tours for user will be displayed.
- create a tour screen: where a user can create a tour. this will also have other screens attached to this
action, such as the categories display and selection screens.
- the itenary display edit screen
- itenary list screen
- itenary map screen
- itenary item detail screen
- tour overview screen
- itenary share screen

This will be built with the Android framework, the authentication token from the backend will be stored in the mobile local storage for making request to the backend.
APIs calls will also be cached on mobile for requests that are not changing,
to help the app frontend work faster.

The Questionnaire:
The system will present q questionnaire to the user to help them
express their preferences for the tour. the questions have sub questions
that will help the system better understand the users preferences.

The following questions will be included in the questionnaire:

- Please select the things you would like to do on your tour:
  - categories present:
    - Arts & Entertainment (Museum/Art)
      - what kind of museums do you like?
      options: History, science, art, design, war
    - Events
      Question and options: <To be developed>
    - Food & Beverages
      - which cuisines will you like to have for breakfast and lunch?
      - which price category will you like have overall?
        options: Inexpensive, moderate, pricey
      - do you have any preferred dining environments?
      - do you have any dietary constraint?
    - Outdoors and Recreation
      - what outdoors and recreational activities interest you?
      options: <To be developed>
    - Shopping
      - what is your shopping budget?
      - what type of stores will you like to shop at?
      options: <To be developed>
    - Sports
      - feeling sporty? what will you like to do?
      options: <To be developed>
    - Nightlife
      Question and options: <To be developed>
    - performing arts
      Question and options: <To be developed>
    - Historical buildings
      Question and options: <To be developed>
    - Spa and Wellness
      - what Spa treatments will you like to have?
      options: facial, massage, yoga, bath house

When the user completes the questionnaire, the system should better understand their preference, and with these be able to generate a tour itenary that matches their needs.

Challenges faced:
Over the course of the implementation of the project's objectives, the following are the challenges that were faced:

- **Questionnaire development:** considering the time constraint in developing the itenary, it is challenging to develop the questions in an optimal way so the user has a few questions to answer and can have an itinerary that they will be able to complete. The approach used is to retrieve the best set of results for each category under the questionnaire, reminding the user of time constraint and asking them to delete items from the itinerary they think they won't have the time for during the day. This is where the edit itenary functionality comes in to help the user optimize their tour and delete items from it
- **Lack of more endpoints options:** FourSquare API used for development currently does not provide category of venues for selected locations. Its categories API provides all the categories in hierarchies. HERE API provides this API endpoint to query venue categories by location, but they have a different categories naming.
  Due to the difference in the categories API provided and naming between HERE and FourSquare API, the system decided to Adopt FourSquare as it has a richer set of categories to help users express their preferences better but with this, there is the assumption that these categories from foursquare is available for all locations, which might not always be the case.

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