1. Introduction

In the last few years, people all over the world are experiencing the trend of digital traveling because of the fourth industrial revolution. This trend also resulted in an explosion of volumes of information on the internet about the best tourist attractions and travel itineraries. However, the traveling itineraries are mostly made of only based on the most famous attractions and sometimes the tourist itself is not comfortable with the type of attractions or the pace of the traveling itineraries on the internet. Hence, there is a need for personalized travel itineraries tools to help tourists plan their traveling activities.

The first step in the making of personalized traveling itineraries tools is to filter out tourism attractions based on what the user wants. This step involved taking user preferences and then find a list of tourist attractions that matched it. User preferences that commonly used for tourism are attraction types such as Historical Site[1], Cultural, Wildlife, and Amusement Park. One of the techniques that are commonly used in this task is Personalization techniques [2]. It is a technique to cluster an information object based on user preferences. This technique is commonly used for the recommender system. In the case of tourism, User preferences usually are attraction type, the location area of attraction [1], popularity level and lastly price of the tickets. These user preferences are used to filter all possible attractions by calculating the similarity value of the attractions and user preferences.

After having a list of user-preferred attractions, itineraries also need a good route in the manner of the distance between each location and the preferred time for each attraction. The step of creating an optimal route, including multiple destinations with restrictions is a superclass of TSP (Traveling Salesman Problem) which is known as an NP-hard problem [3]. The most known algorithm to semi-solves the problem is Ant Colony Optimization[1] and Genetic Algorithm[3]. Ant Colony Optimization(ACO) is an optimization algorithm to create a path/route and solve TSP by using the behavior of ant when they are traveling[4]. It spread out a so-called pheromone through its path and identify which path has the most pheromone which will be the optimum path to be taken. In the recent study of ACO, is now has been improved and implemented to a humanoid to solve a complex combinatorial problem[5].

While it is possible to create an optimal route in the manner of distance using ACO, we must also consider whether each attraction is placed at the right time or not. For example, a good time to visit farmland is in the morning to afternoon, such that we must allocate this attraction at the morning slot of time in the itinerary. This thing can be done by modifying Ant Colony Optimization to also user preferred time as one of the variables upon taking a decision where to go next. The preferred time will act as an increase of chance to be visited by ant collaborating with the amount of pheromone are there.

With all of the components to create an itinerary are set, the goal here is to create a good itinerary. A good itinerary can be described as an itinerary that considers what attractions users are preferred to, then placed in such a route that has optimal traveling distance yet also considers the timeline in which attractions should be visited.

Problems and Boundaries

In 2019, recommender systems for tourism are still circling the legacies algorithm of Content-based, Collaborative filtering and Demographic-Based system. The form recommender itself only stops after it gathers a list of objects that match. Combine it with Ant Colony Optimization to create a traveling itinerary, then the traveling recommender system will surpass its barrier not only giving a list of recommendations. Personalization techniques here are bounded to matching the inputed user preference with attraction tags.

This final project focuses on solving the problems listed below:

1. Upon creating a recommendation system, how to implement personalization techniques that integrates the creation of attraction list and the creation of itinerary routes?
2. Dealing with NP-hard Problem on itinerary creation, how to properly use Ant Colony Optimization to find an optimal route in the manner of distance traveled?
3. How to also consider when is the best time to visit an attraction while creating a route using Ant Colony Optimization?

The attractions data that being used in this final project are attractions around Bandung, West Java, Indonesia. The Itinerary will always start from Telkom University at 6:00 AM and the last attraction should be started before 7:00 PM. The itinerary is done using a car with constant speed at 60 Kilometers per hour.

Goals

The objective of this final project is to create a recommender system that able to consistently generate a good itinerary. Good itinerary can be described as an itinerary that considers what type of attractions user is preferred to, then placed in such a route that has optimal traveling distance yet also considers the timeline in which attractions should be visited.

The system should be able to:

1. Matches traveler preference using Personalization techniques then integrate it with the route creation.
2. Create an optimal route using Ant Colony Optimization yet also schedule the right timeline of attractions visit.