

## I. INTRODUCTION

**T**RAVELING is one of the activities chosen by many people to spend holidays. Some tourists want to go on vacation in a place they have never visited before, so they need a travel route planning where tourists can choose for themselves the tourist attractions they want to visit based on their preferences.

We analogize the determination of tourist routes using Traveling Salesman Problem (TSP). TSP is the combinatorial optimization problem to find the shortest route from a series of cities. TSP is very concerned about time complexity so that it is included in the Nondeterministic Polynomial-hard (NP-hard) [1]. TSP is widely used in finding optimal solutions in route determination [2]. Some algorithms that have been used to test the TSP are Particle Swarm Optimization (PSO) [3], Firefly Algorithm (FA) [4], Simulated Annealing (SA) [2], and Genetic Algorithm (GA) [5].

The main objective of the research in this paper is to find the optimal tourist route using the Swap Operator Based Artificial Bee Colony Algorithm. We chose this algorithm because it can solve combinatorial optimization problems and provide good performance [6]–[8]. Swap operators were first introduced by Wang et al. [9]. In 2003 they applied the swap operator to Particle Swarm Optimization (PSO) to solve TSP. In 2012, Li et al. [6] also implements swap operator to Discrete Artificial Bee Colony (DABC) Algorithm to solve TSP.

We also use Multi-Attribute Utility Theory (MAUT) to accommodate user needs for the route that recommended by the system. Users can express their needs through three criteria, that are: 1) routes with as many tourist attractions as possible, 2) routes that pass popular destinations, and 3) routes with minimal costs. The results of the MAUT are then used as fitness values in this study. The system takes into account the opening and closing hours of each destination that user wants to visit in determining tourist routes and in this study can only form a maximum route of three days, where each day starts at 08:00 until 18:00.