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Mobile-Based Nearby Mosque Determination System Application Using Particle Swarm Optimization (PSO) Algorithm In the Gayungan District

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ABSTRACT

Public facilities related to religion one of which is the mosque. Mosque Is a place of worship for Muslims worldwide. The city of Surabaya which incidentally is a tourist city that is often visited by foreign and local tourists, and especially the Muslims who want to establish prayer and need access to the location of the nearest mosque. The real condition that often happens is that tourists do not know the position of the closest mosque around them, so spend time searching for the existence of the mosque. Particle Swarm Optimization Method is an algorithm that is inspired by the behavior of a group of birds in a group to look for food. This method is one of the methods for searching the shortest distance. With this method, it can provide solutions to produce the closest location. From the tests carried out, the Particle Swarm Optimization algorithm has been successfully applied to the search for the nearest Mosque location point and has successfully designed and built a nearby Mosque location search application based on Android Mobile. By comparing with the euclidean distance algorithm the results of Particle Swarm Optimization show that 70% accurately show the same results.

Keywords: *System Optimization, Genetic Algorithm (GA), Mixing, Eggtray.*

1. INTRODUCTION

Along with the development of technology and information, a system that can make it easier to find and get directions to the location of the nearest mosque where tourists have only asked local residents is very time-consuming and lack of information on the existence of the mosque which makes many Muslim migrants, especially, unable to find a place worship in the city. Introduction

One method of determining the nearest appropriate route is to use the particle swarm optimization method. The method is one of the optimization techniques and belongs to the type of evolutionary computational technique. This method has a robust robust method for solving problems that have nonlinear characteristics and nondiffentiabillity, multiple optima, large dimensions through adaptation derived from psychology-social theory.

2. PARTICLE SWARM OPTIMIZATION ALGORITHM

Particle Swarm Optimization (PSO). PSO was first introduced by R.C Eberhart and J.Kennedy in 1995[1]. Simply stated, Particle Swarm Optimization (PSO) is based on the behavior of flocks of birds or fish. The PSO algorithm mimics the social behavior of this organism. Social behavior consists of individual actions and influences from other individuals in a group. The word particle shows, for example, a bird in a flock of birds. Each individual or particle behaves by using intelligence (intelligence) itself and also influenced by collective group behavior. Thus, if one particle or one the bird finds the right or short path heading to the food source, the rest of the group are others will also be able to immediately follow the path these despite their far location that group. In the Swarm Particle Optimization (PSO), assumed herd have a certain size with each the particle's position is initially located at a location which is random in multidimensional space. Every The particle is assumed to have two characteristics: position and

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speed. Every particle moves in a certain space / space and remember the position the best I've ever been through or found towards food sources or function values objective. Each particle conveys information or the best position for other particles

and adjust the position and speed of each based on information received regarding the position [2]

PSO has several parameters, namely: [3].

1. Swarm (number of particles): population of an the algorithm. Swarm or population size which is chosen is the problem faced with. In general, swarm size used between 20 and 50.

2. Dimension of particles: This depends on the problem to be optimized.

3. Learning rate. Usually c1 and c2 = 2.

4. Velocity: vector that moves optimization process that determines direction where a particle is needed for move to improve its position beginning.

5. Weight of inertia: weight of inertia symbolized where w, this parameter is used for controlling the impact of velocity given a particle. Weight of inertia introduced for a balance between global and local search capabilities. Usually w = 1. The search process can be expressed by the position vector. The search process can be stated with position vector, where, where in the dimension of space certain search [3]. In addition, the optimality of the solution in the PSO algorithm depends on each particle's position and updating speed using the following. equation.

The search process can be stated with position vector x_i^k where (i = 1,2,3) v_i^k where (i = 1,2,3) in the dimension of space certain search In addition [3], the optimality of the solution in the PSO algorithm depends on each particle's position and updating speed using the following equation

$$v_i^{k+1} = w.v_i^{k+1} + c_1.r_1(p_i^k - x_i^k + c_2.r_2(p_g^k - x_i^k) \quad (1)$$

$$x_i^{k+1} = x_i^k + v_i^{k+1} \quad (2)$$

i = particle i, where i={1,2,3,…}

k = PSO iteration to k, where k={1,2,3,4,…}

w = heavy inertia

c_1 = acceleration rate for cognitive factors

c_2 = acceleration rate for social factors

v_i^k = particle velocity i on iteration to k

x_i^k = the position of particle i on iteration to k

p_i^k = local best of particle i in iteration to k

p_g^k = global best on iteration to k

r_1 dan r_2 = random function, the value is between 0 to 1

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Flowchart :

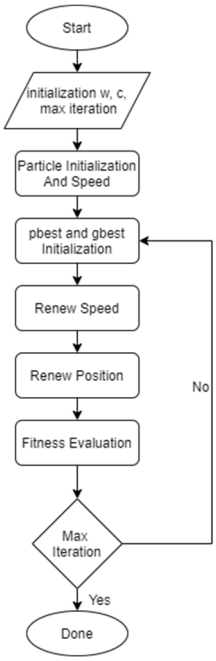

Figure 1. Flowchart PSO

The position of a particle is determined by the x and y coordinates represented by point vectors [4]. While the particle velocity is also determined by the coordinates x and y represented in the form of a direction vector denoted by v. the particle position in the next iteration is determined by the sum of the vectors between the particle position and the particle velocity. At the initial initialization, the speed and local best of each particle and the global best are randomly determined. The position of the particles in the next iteration is determined by the sum of the vectors between the particle position and the particle velocity as shown in Figure 2.

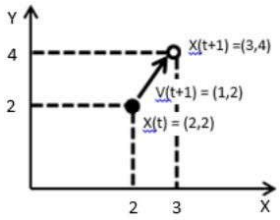

Figure 2. Vector position and particle speed

Research conducted by Ira Prasetyaningrum, Arna Fariza, Alkis Fuady about searching the shortest path using the Particle Swarm Optimization (PSO) Algorithm in Bangkalan Regency. In this study, the PSO method is used to find the shortest path in Bangkalan Regency. The results of trials in this study are the search for the shortest path using the Particle Swarm Optimization (PSO) method depending on the parameters entered, and the more input parameters will determine the success of the shortest path. [5].

3. SYSTEM PLANNING

In this system design chapter will discuss the Particle Swarm Optimization method used and the steps undertaken in the study to determine the nearest mosque worship location in the city of Surabaya. In addition, the processes used in this method are also explained and the functions and parameters are explained. In making the system the research steps can be described as follows:

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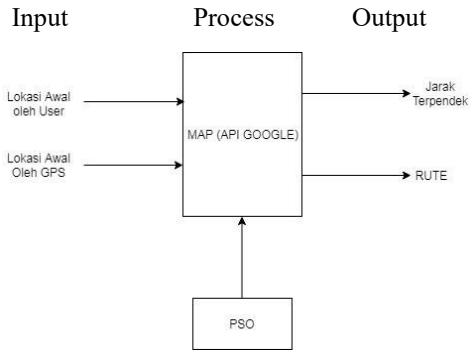

Figure 4. The flowchart of making a system

In the system design in line large starts with the user's initial location input then user coordinate data is calculated distance the shortest with the location of the mosque coordinates using the Particle Swarm algorithm Optimization. The results of the analysis will be simulated into the map image by showing the path shortest.

4. DESIGN INTERFACE

This is a display of the results of manufacture the shortest path search application with using the swarm particle algorithm, where this application must first be installed to in Hand Phone to be able to run it

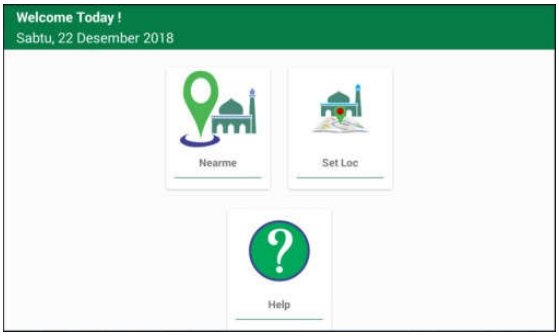

Figure 3. Interfaces Design

In Figure 4, the main menu is displayed as the menu the user will choose to determine the initial location or point where the user is located, among others as follows:

1. NearMe: Function to determine the user's initial location based on the location of the global positioning system (GPS).

2. Set Loc: Serves to determine the initial location of the user's manual manually by holding the touch point on the maps that are cooled.

3. Help: Help on how to use the application.

Path Search Steps:

1. Select the Search Menu.
2. Input User Location.
3. Obtained Calculation Results.
4. Route Maps Display.

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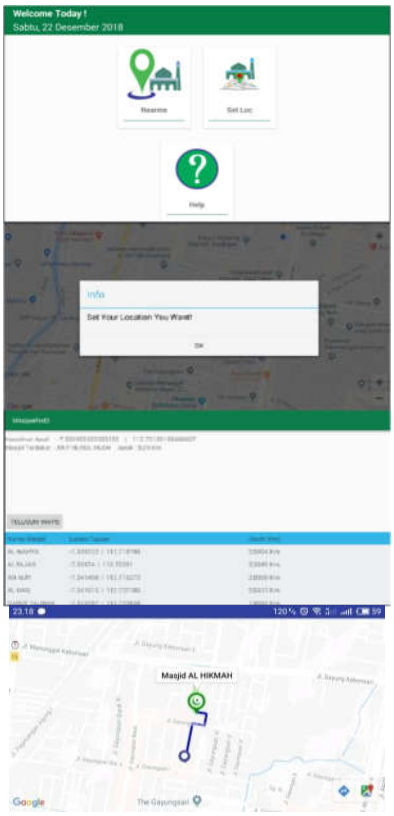

Figure 4. Route Search Steps

5. SYSTEM TRIAL

This trial is conducted to find out whether the application that is built can be applied to a Mobile Device and whether the application is running well and meets the specifications that have been determined when operated on mobile.

The test is done by changing the parameter x or starting location (Latitude and Longitude) to the nearest mosque by comparing the best solution with the algorithm ecludian distance. Following are the position values (Latitude and Longitude) that are tested:

Table 1. Test Location

No.	Nama Lokasi	Latitude	longitude
1	JL. jemur gayungan II	-7.325954	112.72906
2	Taman Pelangi	-7.327451	112.731177
3	JL. Ketintang baru VI	-7.312728	112.73170
4	JL. Ketintang timur PTT	-7.309930	112.73053
5	Ubhara Surabaya	-7.320994	112.73139
6	JL. Ketintang madya V	-7.317759	112.72193

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7	JL. Gayunagn No. VII	-7.336194	112.72606
8	JL. Gayung Kebon Sari	-7.328726	112.72103
9	JlL. Pagesangan baru VIII no 1	-7.335333	112.71649
10	JL. Gayungsari Barat II	-7.333148	112.71866

Testing the euclidean distance algorithm using the Android mobile-based application and for the Particle Swarm Optimizatin algorithm by manually counting using the parameter, = 1.5, = 0.3,= 0.6, v = 0.0000. The results of the calculation of the particle swarm optimization algorithm to find the best solution for the nearest mosque are as follows:

Table 2. Test Results

No	Best Solution		Comparison Result
	Euclidean Distance	Particle swarm optimization (PSO)	
1	Al Hidayah	Al Hidayah	Same Solution
2	Baitus syakur	Baitus syakur	Same Solution
3	Amanah	Amanah	Same Solution
4	Takhobar	Amanah	Same Solution
5	Arif nurul huda	Arif Nurul huda	Same Solution
6	Baitussalam	Baitussalam	Same Solution
7	Baitul Hikmah	AR-Rachman	Different Solution

8	Al Ihsan	At Taqwa	Different Solution
9	An nur	An nur	Same Solution
10	An nur	Al Ihsan	Different Solution

From the test results in 10 locations 7 different locations produced results the same and 3 locations show the results different, so the percentage of similarity results can be calculated by the formula:

$$\text{Similarity} = \frac{\text{Same Total}}{(\text{Same Total} + \text{Different Total})} \text{ X } 100\%$$
$$\text{Similarity} = \frac{7}{(7+3)} \text{ X } 100\%$$
$$\text{Similarity} = 70\%$$

So the value of the similarity of the solution of the algorithm particle swarm optimization and euclidean distance is 70% solution refers to location the same and 30% designate that location different.

6. CONCLUSIONS AND RECOMMENDATIONS

Conclusions:
From the results of the discussion that has been described, it can be concluded that:

1. Solutions produced in the Particle Swarm Optimization Algorithm do not always show the shortest distance.

2. The value of the similarity of objectives refers to 70% the same results and 30% different results.

3. The closer the particles are to the user, the more optimal the solution will be.

4. In the research implementation of Particle Swarm Optimization Algorithm in the program can not be done, so using manual calculations.

Recommendations :

From the mosque route determination system closest using the particle swarm algorithm optimization in the city of Surabaya district This dip, of course there are still many deficiencies that need improvement and development to achieve maximum results. Suggestions as a developer are as following:

1. In the application program code created Only using Algorithms Euclidean Distance So it is needed program code for Particle Algorithms Swarm Optimization that can applied to the application, Order time faster access.
2. Adding / Changing data needs to be added, for example adding mosques in other locations.
3. Page Interface is more attractive and user friendly.
4. Development of other

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