The implementation of digital differential analyzer algorithm for route determination’s topographic maps based on android

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Abstract. The route is direction that must be taken from the starting point to the destination point. Determination of the route is usually done for a reference trip that will be taken include the distance, time or slope of the terrain to be passed. In the implementation, the determination of the route is often used by agencies and organizations operating in the open nature where the activities require special expertise that can process geographic information systems. Although the tools and technology for route determination are sufficient, they are still less effective and efficient because to know the distance, time and slope of a terrain on topographic maps are still using conventional calculations, therefore the application of route determination's topographic maps based android and applying Digital Differential Analyzer algorithm. The algorithm can be used as a line maker to display a slope picture of the field being traversed. This application was developed using the Rational Unified Process (RUP) method which has 4 stages: Inception, Elaboration, Construction, and Transition. This application can be run at least on Android platform version 4.1.

1. Introduction

A route is a path or direction that must be taken from the starting point to the destination point. Routing is usually made to reference the trip to be covered, including the distance, time or terrain to be traversed. In its implementation, route determination is often used by agencies and organizations that have activities in the open, where their activities require special expertise, namely navigation skills to process geographic information systems. Important land navigation tools used to calculate the distance and slope of a terrain, namely maps, rulers and stationery. The Digital Differential Analyzer (DDA) is a line formation algorithm based on dx and dy calculations. A line is created by defining two endpoints, namely the start point and the end point. Each coordinate of a point that forms a line is obtained from the calculation, then converted into an integer value. The principle of the Digital Differential Analyzer (DDA) algorithm is to take the integer value closest to the line path based on a predetermined point (the starting point of the line).

Based on the background description of the problem above, the authors designed a route determination application on an android-based topographic map using the Digital Differential Analyzer algorithm as a line generator. Where the resulting output is a graph of the slope of a terrain, and the path line on Maps taken from the Google map layer with the working map boundary of the Mount Ciremai National Park Office as a medium for determining routes on the android platform. This is the background of the author in writing a thesis entitled "Implementation of Digital Differential Analyzer Algorithm in Determining Routes On Android-Based Topographic Maps". It is expected that
with this route determination application, it can minimize the estimated time when determining the route.

2. Methodology
Based on the main goal of making this research proposal is to create a route determination application on topographic maps that can help determine routes on topographic maps to be more effective and efficient by implementing the Digital Differential Analyzer algorithm to calculate the slope of the terrain on a topographic map. It should be noted that the Digital Differential Analyzer algorithm is a line formation algorithm based on dx and dy calculations. A line is created by defining two endpoints, namely the start point and the end point. Each coordinate of a point that forms a line is obtained from the calculation, then converted into an integer value.

The principle of the Digital Differential Analyzer (DDA) algorithm is to take the integer value closest to the line path based on a predetermined point (starting point of the line). The steps for forming a line according to the DDA algorithm are as follows:

a. Determine the two points that will be connected in the formation of the line.
b. Determine one of the points as the starting point (x0, y0) and the end point (x1, y1).
c. Calculate dx = x1-x0, and dy = y1-y0.
d. Determine the step, namely the maximum distance the number of additions to the x value and y value, by:
   - If the absolute value of dx is greater than the absolute value of dy, then step = absolute of dx.
   - If not, then step = absolute of dy.
e. Calculate the addition of pixel coordinates, namely increment = dx / step, and increment = dy / step.
f. Next coordinate (x + increment, y + increment).
g. The position of the pixels on the screen is determined by rounding off the coordinate value.
h. Repeat numbers 6 and 7 to determine the position of the next pixel, until x0 = x1 and y0 = y1 (Meca Agustama, Sri Handayaningsih, 2014).

3. Result and Discussion
The proposed route determination system will speed up the calculation of the distance and image of the slope of the terrain, besides that the data that has been created can be saved and can be viewed again.

The explanation regarding the rich picture of the proposed route determination system is as follows:

a. Navigator input points on each contour to be traversed on the topographic map.
b. The system processes distance calculations and displays an overview of the slope of the traversed terrain based on the calculation of distance and contour intervals on a topographic map.

From the results of the analysis conducted, it can be implemented in an application as follows:

a. Home Interface. On this page, you see menu buttons that users can choose from: Route Images, Hints, About apps, and About Authors.
b. Route Image Interface. On this page, you can see the route that can be traveled with more effective and efficient slope data.
c. Hint Interface. On this page users can see instructions for using the application
d. Interface About the App

4. Conclusion
Based on the research that has been done, the following conclusions can be drawn:
a. In the calculation of the Digital Differential Analyzer Algorithm, each point coordinate that forms a line is obtained from the pixel calculation (Dx, Dy) then rounded to an integer value, so it requires a fairly long process and the resulting line is not accurate enough.
b. By using the Digital Differential Analyzer Algorithm which is implemented for the formation of lines on the image of the slope of the terrain, the user (navigator) does not need any more calculations to produce an image of the slope of the terrain.
c. With the application of route determination on an android-based topographic map made using the Java Android programming language, the user (navigator) can easily determine the route effectively and efficiently.

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