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Sidewalks Route Planning

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Abstract

Nowadays we can observe that the people are interested in perform efficiently their personal and organizational activities which could be their movement in the city (e.g. postman's task). To solve this kind of procedure, it is necessary to choose a good path taking into account the minimal quantity of constraints. In this work we survey the main approaches on sidewalks route planning to analyze and select the possible best path. We notice that route planning techniques are being used to several research fields, which we have classified them. In addition, we have carried out a theoretical study on route planning and we have implemented an experimental application named Router 2.0. Our research is a good start point to analyze the people movement considering their constraints.

Key words: Sidewalk Route Planning, Geographic Information System

1. Introduction

Route planning is a technique that allows the selection of paths that an agent needs to know to arrive at its destination. This paper is related to sidewalks management in Geographic Information Systems - GIS – which is the principal approach of our research.

We have started the analysis of previous work and we have developed an experimental application, named Router 2.0. Moreover, we have updated the acquired digital cartography, which our interest was focused in the Technical University of Catalonia campuses of the university zone of Barcelona.

2. Route planning

One of the most important spatial problems is route planning. To plan a route is not a generic task, but it rather depends on the context in which we are addressing our efforts with the goal of developing an application that offers support to the problem in question.

Route planning is a technique that allows the selection of a path in which a mobile object or agent (e.g. vehicle or pedestrian) can move from an initial point (origin, source) at time t_1 to a final point (destination, target) at time t_2 (where $t_1 + t_2$ is time constraint) considering all the possible static and dynamic variables which can be considered constraints (e.g. an irregular land or the interdiction of a road due to any incident), and that are related to the area in question (i.e. a specific context). Economic aspects, although not evident, can be taken into consideration too.

3. Router 2.0

The Router 2.0 is an experimental application and works with a geographic information system, and its main objective is to define the best way between two UPC buildings (origin and destination points) placed in the South and North campuses of the university zone of Barcelona. In addition, the initial architecture (Figure 1) of the Router 2.0 application was composed of three modules:

- MANAGEMENT Module: It is responsible for the application management, that is this module must be able to maintain in execution all the application modules;
- MAP Module: This module is responsible for the maps' control. The application uses this module to the managing of all map functions, such as draw, redraw, zoom and so on;
- ROUTE Module: This module is responsible for the best route calculus. It "runs" the Dijkstra's algorithm which is written on C.

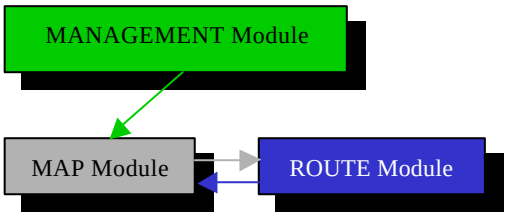

Figure 1. Initial architecture of the Router 2.0 application.

4. Conclusions and future research activities

This short paper has presented a experimental research on route planning. We believe that route planning techniques can be and is used to allow the pedestrians best movements by the selection of paths that takes into account some constraints.

We have perceived the need of implementing another algorithm such as A* search in order to examine in detail their results (e.g. distance criterion, time criterion and memory access criterion) and to compare them to Dijkstra's algorithm results. For this, we will use the C language to proceed the A* search algorithm implementations.

Furthermore, we will carry out a research on 3D geographic and spatial analysis focused on route planning. For this, we will propose to develop some additional modules (e.g. impedance control, animation and simulation) to the Router 2.0 application (Figure 2).

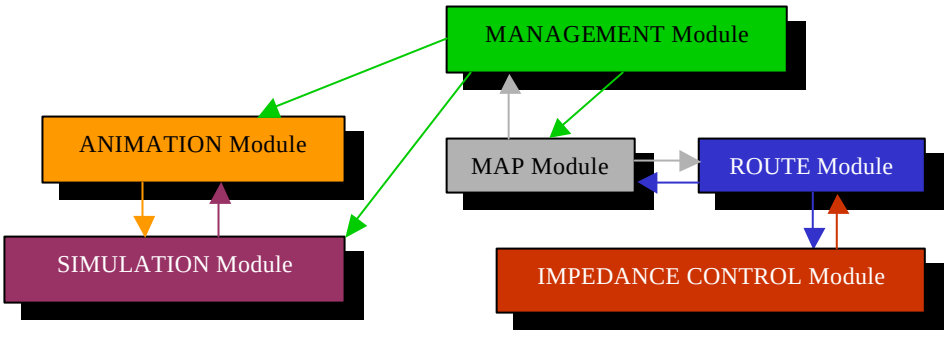

Figure 2. Future implementations. Additional modules: Impedance control, Animation and Simulation.