

GIS IN PRACTICE

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Abstract. The name of Autodesk sounds familiar for everyone. The AutoCAD is said to be the best-known software of their products. Autodesk Map is a GIS and mapping software that combines the power and precision of AutoCAD with the specialised tools for creating, maintaining and producing maps and geographic data. It is optimised for precision mapping and GIS analysis in the AutoCAD environment and used to solve both traditional and unique mapping challenges across many areas and industries. Customised applications can be developed using the AutoLISP API for Autodesk Map that is included with the software itself. My paper is about such an application, which provides examples of using Custom Menus, Programmable Dialogue Boxes and AutoLISP routines. A diverse set of real-world challenges can be solved applying these features and the power of topology, topology functions, overlay operations and external databases. Maps are not dead papers any more, they are turned into powerful tools for analysis and decision support.

Key words: Geographic Information system, Autodesk Map, application development with AutoLISP

1. Introduction

Where it is located? How to get there? How much time does it take me to reach it? Which is the shortest path there? Which is the best route if I want to visit several places? Can I use some kind of public transport? These questions can be answered with ease using some kind of Geographic Information System. Autodesk Map is an AutoCAD-based mapping product that contains all the functionality of AutoCAD, as well as its own powerful mapping tools designed for mapping and GIS professionals. I am developing a software which try to respond these questions in point of view of a foreigner who does not know the city, but wants to find his way.

2. Exact aims

I like travelling very much in my spare time. To discover a new city alone is always a big adventure, and what is more it is a big map-based adventure. Traditional paper maps are destined for providing help you, but lots of people cannot use them correctly, and they do not answer questions mentioned above. Autodesk Map is suitable for solving such problems, but its successful usage requires special GIS knowledge. These circumstances have given me the idea of creating an application working as an interface between digital maps and users without GIS skills. My conception is supported by the following facts:

- Although almost every aspect of Autodesk Map can be customised.
- AutoLISP lets developers write macro programs and applications in a powerful high-level language.
- AutoLISP is an integral part of the Autodesk Map package.
- Custom dialogue boxes can be defined using DCL (Dialogue Control Language).

So I have created a list about situations in which my program could be useful. To suggest a path after selecting sights the user intends to visit seems to be the largest task. The procedure of selecting sights must be helped in several way, for example brief texts about places of interest, or watching a picture about it makes the decision certainly easier. The output must

appear not only on the screen but in paper-format. This can be a report describing the suggested path or a plotted map sheet showing the route. It is recommended to pay attention to the user's wishes whether he would use some kind of public transport or not.

Additional smaller functions of the program could provide quick help if you are looking for a street, building, sport facility and so forth, or if your time is limited you could inquire about sights reachable within the given time.

Such an application must provide the opportunity of selecting languages of course, because of the wide range of users' nationality. So my last expectation was to create a multilingual program, where the user could choose the language of communication and experienced Autodesk Map users could define additional languages after some work, following my instructions precisely.

3. Tools of creation

Menu customisation lets you tailor the AutoCAD interface to your specific application. The term menu file actually refers to the group of files that work together to define and control the appearance and functionality of the menu areas. The appearance and actions of a menu are defined in ASCII files of the type *.mns*. If a Menu Lisp file is situated in the same folder as the menu file its AutoLISP expressions are evaluated as well. (A Menu Lisp file has the same filename as the menu file, with an extension of *.mnl*.) AutoCAD supports the following menu areas [1]:

- Screen menu
- Pull-down/shortcut menus
- Image tile menu
- Toolbar definitions
- Accelerator key definitions
- Pointing device button menus
- Digitising tablet menus
- System pointing device menus

A menu file can contain sections for each of these menu areas, but I only needed to create a pull-down menu with submenus, a toolbar for selecting language and their help strings of course.

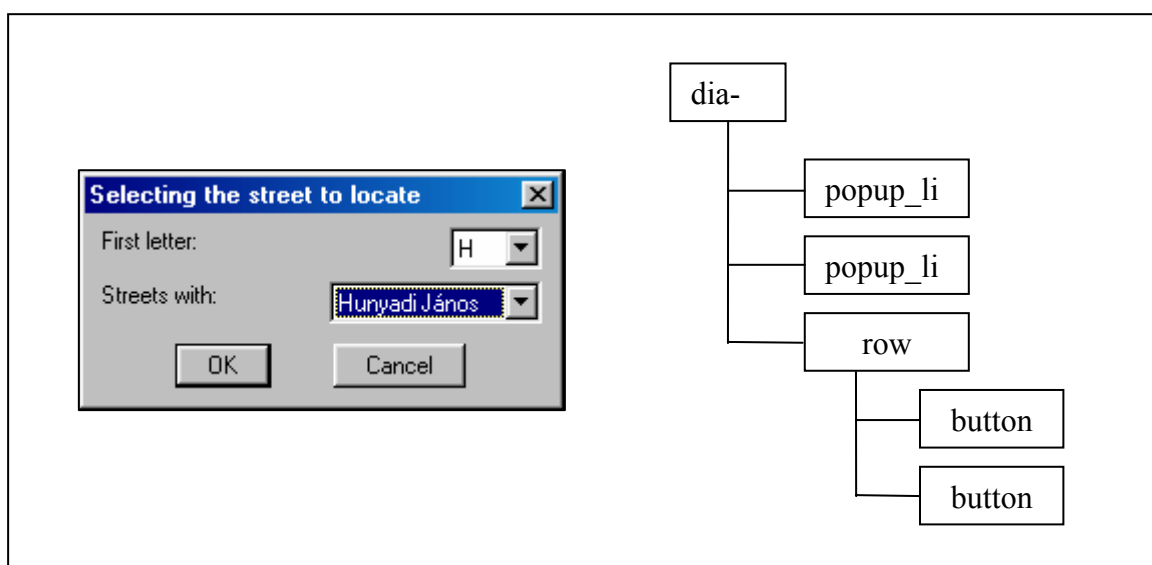


Figure 1: A dialogue box and its tree structure of tiles

Usually a dialogue box appears after selecting an item of a pull-down menu. Dialogue boxes are defined by ASCII files written in *Dialogue Control Language (DCL)* [1]. The DCL description defines how the box will appear and what it will contain, for example: buttons, lists, text, sliders, edit boxes which are called predefined active tiles. A dialogue box is essentially a tree of such tiles, and a DCL file is a readable version of such trees – readable both by human developers and by the AutoCAD PDB facility. Besides AutoLISP provides a package of functions that handle dialogue boxes. These functions load dialogue boxes from a DCL file, set values in tiles, get user input, specify actions associated with user input, and so forth.

To describe street network Autodesk Map offers the facility of network topology which defines the interconnection of links and, optionally, nodes at link junctions. Networks may contain loops, and network segments have a specified direction. Links can be lines, open polylines or arcs. Georeferenced raster images can be inserted directly into your Autodesk Map drawings and you can use them as raster backdrops to vector-drawn maps. Raster images add significantly to the display and impact of vector drawings. Once a topology is created, you can use it as a basis for spatial analysis and geographic analysis [3, 4]. Three types of network tracing can be performed like shortest path, best route and flood trace, from which I have applied the best route analysis. In order to produce an attractive and user friendly output you can generate reports by executing queries in report mode, you can plotting some parts of your map or you can use the feature of annotation as well.

AutoLISP is a programming language designed for extending and customising AutoCAD functionality. It is based on the LISP programming language, whose origins date back to the late 1950s. LISP was originally designed for use in Artificial Intelligence (AI) applications, and is still the basis for many AI applications. Visual LISP (VLISP) is a software tool designed to expedite AutoLISP program development. The VLISP integrated development environment (IDE) provides features to help ease the tasks of source-code creation and modification, program testing, and debugging. In addition, VLISP provides a vehicle for delivering standalone applications written in AutoLISP [2].

4. Achievement

My university is situated in Debrecen, and I live here as well, so this city is the subject of my Autodesk Map project. That means my program is a tool of getting information about Debrecen, which is the second largest city in Hungary. I think that people would use this program with pleasure at reception desk in the hotels, at tourist information offices or simply at travel agency. Keeping my instructions in view new databases and maps can be created about different cities, so a new application can be created without changing the code of the program.

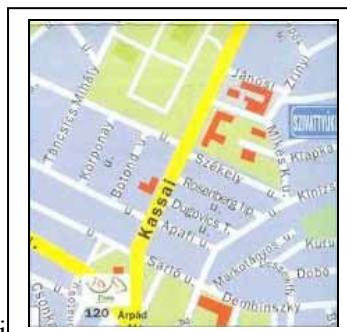


Figure 2: The called display of the raster background

As every system I needed data to establish the digital map, that is to say I had to create the digital version of the city's map. Raster data looks very attractive, but using of vector data

is more suitable. So there is a folder containing scanned tiles of the city's map called A1.bmp, A2.bmp, ... L16.bmp one after another. These raster images are inserted with correlation to a drawing's layer. Additional layers of this drawing contain the street network and the public transport network by types (bus, tram, trolley-bus) and their stops. Every street segment is stored as a link with nodes at street intersections, so a topology of network type could be built with ease after performing the cleaning up.

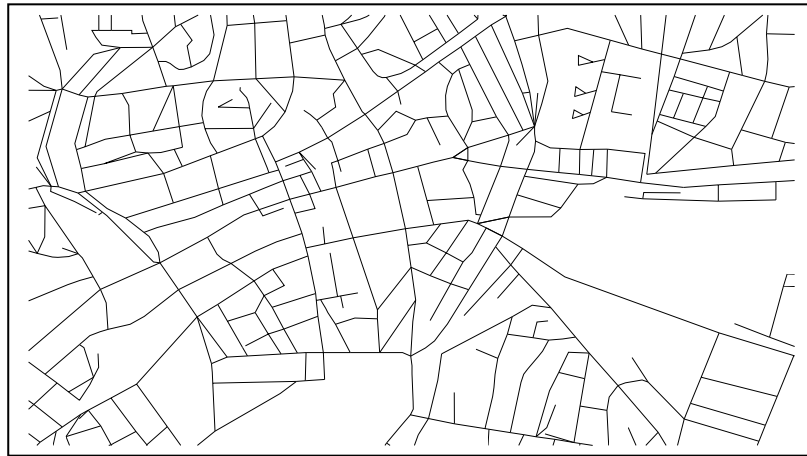


Figure 3: Street network without raster backdrop

The names of streets are stored in an external database attached to the project, because any changes of street names can be updated much more easier in external databases than in object data tables. Its records are linked to links, so 1:N type of relationship is realised. (Usually a street consists of many links.) A file stores a list about the sights of the city and the topology node ID closest to the sight. In this folder there are files storing brief descriptions about places of interest.

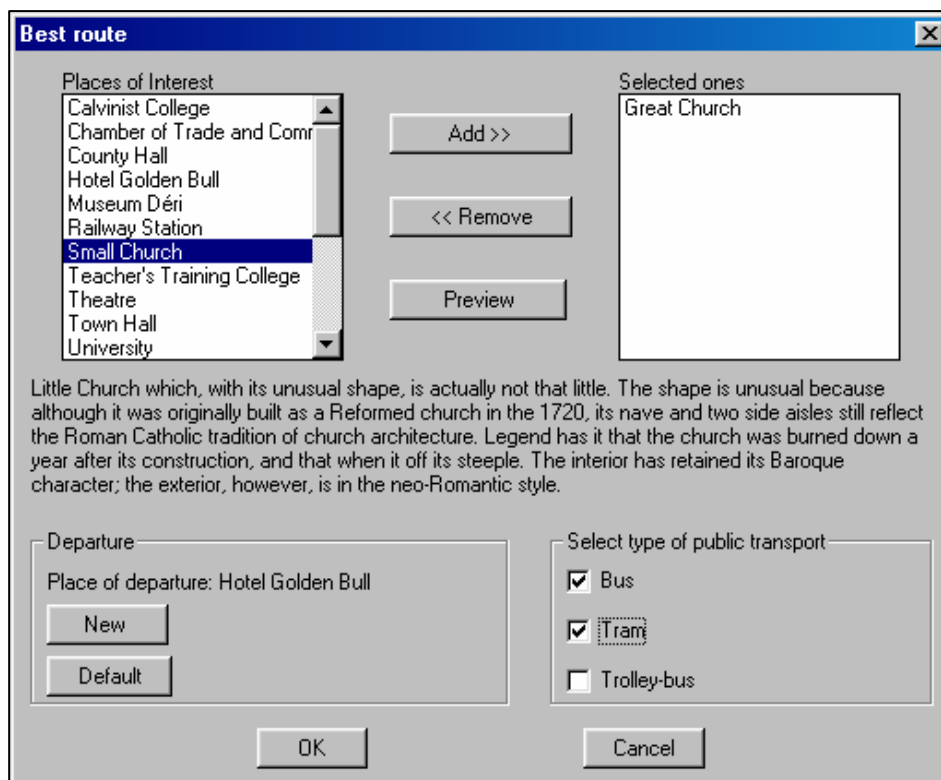


Figure 4: The dialogue box for defining the parameters of best route

- Finally after editing the menu file the two files with extension .mnr and .mnc must be deleted and restart the Autodesk Map in order that it recompiles the menu source file.

6. Future conceptions

After completing my Autodesk Map application I am going to continue the work until it becomes a web application. Autodesk offers a suite of products for this called Autodesk MapGuide that allows you to create, publish, and display maps, drawings, designs, schematics, facilities management plans, and associated attribute data over the Internet, an intranet, or an extranet. Autodesk MapGuide Author users access the data when they create maps, and Autodesk MapGuide Viewer users access the data when they view the maps on a web site. Autodesk MapGuide Server handles requests from both types of users and provides the data as specified by the map and as allowed by built-in security settings.

Using these features I would like to publish as much as possible from my application over the Internet, so it will be available for everyone not only at the reception desk or in tourist offices but at home.

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Recenzent: prof. dr hab. inż. Stefan PRZEWŁOCKI

Wpłynęło do Redakcji w czerwcu 2003 roku