University of Texas at Arlington
Department of Computer Science

Advanced Database Systems Project Interim Project Report

Designing UTA's map on a GIS and Spatial database system

Under the guidance of
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Project Group: Map Section G

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Objective

The objective of this project is to put together knowledge of spatial database concepts covered in the course to design & develop a system consisting of a spatial database and a GIS interface that would allow a user to perform specific operations such as, finding the shortest path between two locations, locate academic or administrative buildings, closest residence apartments from a given building and so on.

Initial Design

1. The first stage of the project involves creating a KML file on top of the Google Maps map section of UTA campus section G. This KML file includes place markers for marking entrance and exit points of buildings, polygons marking the buildings and paths connecting the buildings.
2. Since KML files are not standard for GIS programming, we convert all the collected KML files to shapefiles(ESRI standard) in QGIS by adding a vector layer.
3. Next, we add a geographic boundary layer to add context to the map.
4. Now that all the files are present in QGIS, we import the shapefiles to PostgreSQL database using QGIS-PostGIS manager tool and establish connectivity to the database.
5. QGIS will allow users to run basic queries like finding POIs, measuring distances between two points and other such spatial queries.
6. We will use C# or python UI libraries to create a UI which will enable users to execute queries interactively.

Data Types

The implementation will make use of basic spatial data types, namely:

1. Points
2. Lines
3. Polygons

These data types will be acquired in data files of '*.kml*' extension and will be then converted to *.shp* files for export to PostGreSQL.

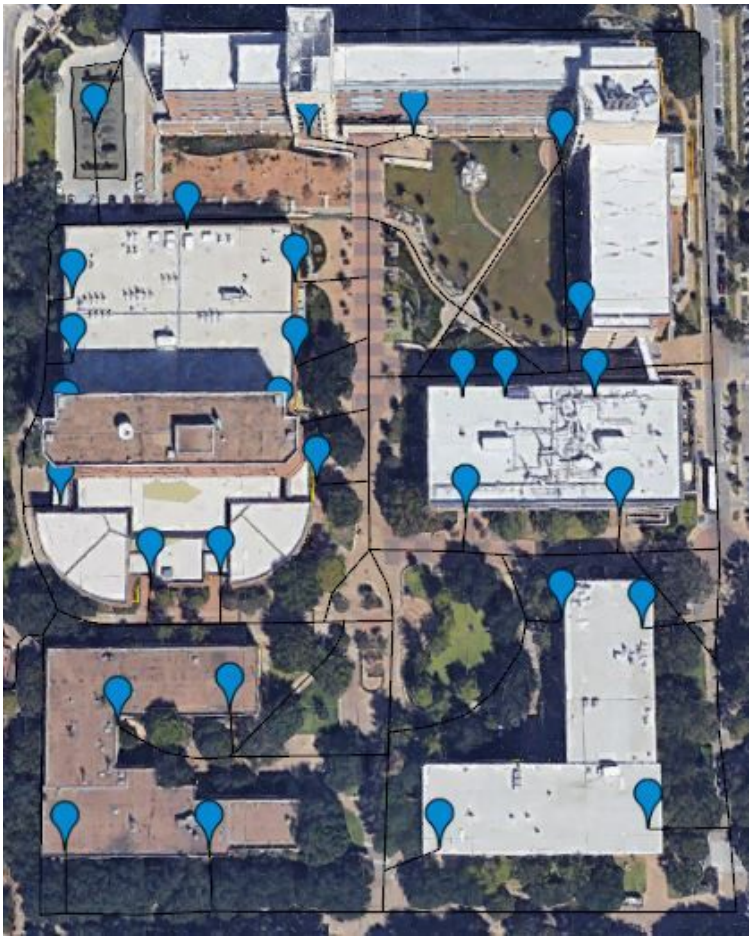
Methods

Methods to obtain information:

1. **KML:** We have collected Map KML by use of Google Earth Pro.
2. **Shapefile:** With QGIS we have converted KML files to Shapefile.

Map Specification

The section G of the alloted map covers majorly **Academic Buildings** with multiple entrances and several walkways. Below is a picture of the completed kml file along with markings of polygons, paths and points of interest. Following that is a list of tables that specify the map details and give layout examples of a few buildings.



1.Buildings, Types, Entrances/Exits

Name of the Building	Type of Building	Number of entrances
Engineering Research Building	Academic	4
Nedderman Hall	Academic	10
Wolf Hall	Academic	4
Geoscience	Academic	4
Engineering Laboratory	Academic	5

2. Engineering Research Building Layout:

Entrance Point	Outgoing Path	Path Connects to
G_ERB_MAIN1	G_PATH_ERMAIN1_MAIN	G_PATH_MAIN_YALE
G_ERB_MAIN2	G_PATH_ERMAIN2_MAIN	G_PATH_MAIN_YALE
G_ERB_E2	G_PATH_ERBE2_MAIN	G_PATH_ERMAIN1_MAIN
	G_PATH_ERBE2_ERBE3	G_PATH_ENG_ANNEX
G_ERB_E3	G_PATH_ERBE3_MAIN	G_PATH_ERB_COMMON

4. Polygons:

Building	Name
ERB	G_ERB
Nedderman Hall	G_NED
Wolf Hall	G_WH
GeoScience	G_GEO
Engineering Lab	G_EL

Systems/Software Considerations

Our project implementation will be based on the following systems and softwares:

- **QGIS -** to design a Visual representation of UTA's map we are considering QGIS that supports viewing, editing and analysis of spatial data. The main advantage of QGIS is that it is cross platform and it supports python over ArcGIS.
- **PostgreSQL -** PostgreSQL a object-relational database which stores spatial data. PostGIS is an open source software to support graphical objects. This is externally added as an extension to PostgreSQL.
- **Python/C# (optional) -** creating UI or to call functions or run queries.

Progression Flow Chart