Introduction

King Abdulaziz University (KAU) is one of the largest and most prestigious universities in the Middle East that seeks to recruit new developments and technologies to improve operations that help controlling facilities and services in the campus. In recent years, GIS has been improved in capturing, manipulating, analyzing, managing, and visualizing spatial data in 3D forms. KAU authorities and decision-makers decided to benefit from these advances especially in its 3D uses. In this project, the project team built and manipulated two different databases for the two parts of the project: 3D modeling and 3D interactive indoor evacuation plan. The first database was built to store all the spatial data and visualize it in a 3D model. The KAU model was prepared to be published to the public as a web scene to facilitate storing and sharing the spatial data with better visualization capability. In addition, due to the lack of the safety standards at KAU, a second database was built to develop an interactive indoor evacuation plan that has been customized for the King Abdulaziz University Hospital building. The evacuation plan supports both handicapped and non-handicapped modes.

3D Modeling

Problem Statement:

In a large area such as the KAU campus, with much existing information and data, it is hard for developers and decision-makers to get an overview of all these data and its geographic locations in a single map, including the external geometry of the buildings, especially when the data are in many different formats. Therefore, the Vice President for Projects Departments wanted a 3D model that collects all the university data to facilitate its use.

Proposed Solution:

Creating a 3D model would help simulate the real world and include all spatial data. The proposed 3D model for KAU was developed by using Esri CityEngine. The model used many data sources in different formats. All objects were extruded into 3D models by using two different methods.

1. Using the 2D GIS data with its attribute tables and rule packages is the first method. It was the most frequently used method to extrude the model.

2. Some structures required customized 3D models to better simulate reality. The KAU stadium was built by using Revit Software.

Workflow & Result:

The project team built and manipulated two different databases for the two parts of the project: 3D modeling and 3D interactive indoor evacuation plan. The web scene was ready to be published on web pages by using an ArcGIS enterprise account.

3D Evacuation Plan

Problem Statement:

The KAU campus has many very large buildings, such as the hospital building, that host many people but do not meet the required safety standards including emergency evacuation plans. The Vice President for Projects Departments sought to meet the safety standards by creating an interactive system that would help the Disaster and Emergency Center in case of an emergency.

Proposed Solution:

Creating a sophisticated system and building the suitable environment on the hospital building would help in an emergency to locate the affected areas. The proposed system would interact with the affected areas and route an appropriate evacuation plan that leads form a chosen point in the building to the closest exit or safe areas inside the building. In addition, the proposed system would serve as an efficient method of communication between the rescue teams and the Disaster and Emergency Center for training on how to act and behave in different emergency scenarios.

Workflow & Result:

The indoor 3D evacuation plan was focused on the KAUH building. In the evacuation plan, hallways, rooms, assembly points, and exits are the required feature classes. The hallways feature class was in the KAU hospital network dataset creation.

3D Evacuation Plan and Visualization for King Abdulaziz University

<table>
<thead>
<tr>
<th>Structures &amp; Buildings</th>
<th>Orthoimagery</th>
<th>Streets &amp; Roads</th>
<th>Vegetation &amp; Trees</th>
<th>Final Plan</th>
</tr>
</thead>
</table>

| 1. Selecting an incident location on a floor, choosing the Exit feature class as the facility, and leaving the Handicap check box unchecked. |
| 2. Selecting an incident location on a floor, choosing the Assembly Point feature class as the facility and selecting the Handicap check box. |

There are two different scenarios for using the evacuation tool:

- Input Network Dataset
- Input Facility Layer
- Handicap check box
- Input Incident Locations
- Input Restriction Locations
- Output File

Evacuation tool interface.