Emergency Pre-plan and Incident Command (epicGIS)

When on the scene of an emergency deployment, Emergency Services personnel often need access to spatial information. However, they do not have time to navigate through traditional GIS applications. The city of Olathe, utilizing MapObjects, created an easy to use, intuitive application for field use at incidents involving schools or public buildings. The application is loaded onto laptops and allows personnel to access maps, floor plans, images, hazardous materials, and contact information.

Introduction

The Olathe Fire Department (OFD) is a full service emergency services organization south of the Kansas City metropolitan area. It serves a 60 square mile area and has an approximate population of 102,000. A call-for-service agreement between the metro fire chiefs means that the OFD could potentially assist other metropolitan agencies in covering jurisdictions beyond the city limits. Due to the rapid growth that Olathe has experienced during the past few years, it has been difficult for the fire department to keep up with the incredible volume of new construction throughout the city. Attempts to keep up were made by conducting company level fire inspections. In doing so, fire crews could at least get into each of the occupancies in their districts and become somewhat familiar with the layout and possible hazards. This was relatively easy when the city was smaller, but as the city grew the task became much more difficult. Furthermore, the information was available for each of the high hazard occupancies but it was not available while on scene—when we needed it most.

Getting Started

In an effort to provide emergency responders with accurate information on the buildings in our community, we started thinking of ways to assist field crews with basic data for structures. Our assessment was that we needed to have rapid access to pertinent data such as contact information, hazard locations, shut offs, etc. We looked for products currently on the market, but could not find anything that would interface with our existing systems or provide the necessary information we desired. After brainstorming all of the components that we would ultimately like to have in a field program, we expanded our thoughts beyond just tabular information. As a result, we started looking into importing images that would be listed on a CD by address and building names. During the next several months the idea transitioned from images, to videos, to floor plans. When we approached the idea with our GIS staff, they discussed other options such as linking the images and videos to existing information in our Geographic Information Systems (GIS) database. This would enable us to select a structure and access
all of the pertinent data on that structure by simply clicking on a map.

Word got out about the idea and the police department advised us that they would like some input into the system. They were also interested in developing pre-plan information on current high hazards within the community. Our initial efforts were directed at our area secondary schools. The intention was to pre-plan the buildings for fires and medical calls. However, we were provided with an opportunity to prepare for the worse case scenarios as well, (such as the recent school shootings across the country.) School resource officers were assigned the initial tasks of gathering the basic data—i.e. contact info, call out, emergency escape plans, and photos and videos throughout the Olathe secondary schools. The fire department staff utilized all of the current International Fire Code and Life Safety pre-plan data set to input the information we needed, for each of the building occupancy types.

Application Development

Development Environment

Microsoft Visual Basic 6.0 and Environmental Systems Research Institute (ESRI) MapObjects 2.1 were used to create this custom GIS application for first responders and incident commanders. The application is based on a sample map viewer created by ESRI and packaged with MapObjects 2.1. During the application development process, the city acquired Visual Basic .NET and MapObjects 2.2. Once the application has been successfully implemented, work will begin on upgrading to the new versions.

In addition to the mapping and GIS tools, the application stores pre-plan and incident command information locally for access offline. Information is organized according to occupancy type, and then by name or address. Pre-plan information includes digital images and videos, as well as information about the structure, potential hazards, and the safety procedures in place at a specific occupancy. Incident command information includes contact and scene management information. All of the pre-plan and incident command information is stored locally in one of nine Microsoft Access databases, (each occupancy type has its own database, due to differences in the information that is gathered.) Users can quickly retrieve, add, or update pre-plan and incident command information. New or updated information is stored locally until the workstation is reconnected to the city network. When connected to the city network, each time the application is started or closed the local database on each individual workstation is reconciled with a central database. The central database is a single Microsoft SQL Server 2000 database that combines the tables from each of the local Access databases. Microsoft SQL Server 2000 is the city standard.

Mapping and GIS Tools

The map viewer features a set of basic GIS tools. These tools provide the same functionality commonly found in ESRI’s desktop applications and other custom desktop and web applications. Some of the tool functions include map navigation, address location, feature identification, and feature selection. Map navigation tools include: zoom in, zoom out, zoom to full extent, zoom to layer, and pan. The zooming
tools change the map extent to show more or less area, and more or less detail, respectively. The pan tool allows the user to slide the map in any direction, in order to view the area adjacent to the current view. Address location uses the street centerline to find the approximate location of an address. The feature identification tool provides access to the attributes assigned to each feature. Clicking on the attribute displays a window with field names on one side and the corresponding values next to them. Selection tools allow the user to select features graphically, by clicking on the map, or through a simple attribute query. The tool set also includes tools for printing, adding additional map layers, and a graphic toolbar that lets users draw shapes and create custom labels.

Map Layers

Map layers that contain essential information are loaded automatically when the application opens. Several of the layers are primarily used for reference. The list of reference layers includes the city limits, city and county streets, private drives, edge of pavement, building footprints, and aerial photos. Other layers provide information about the occupancy. These layers include floor diagrams, door points, room numbers and photo points. The photo points are used to label the locations where images and videos were collected. Other layers will be added later, which will include points representing hazardous materials, sprinkler systems, and fire alarm control panel locations. Users have the ability to add layers while working in the application, or add to the list of layers that load automatically.

Pre-plan and Incident Command Information

Pre-plan and incident command information is accessed through the Occupancy Info window by clicking on the appropriate button in the toolbar. This button is last on the toolbar, closest to the right side of the application’s main window. When a user opens the Occupancy Info window, first an occupancy type must be selected. Selecting an occupancy type triggers an event that populates the name and address lists with occupancies that belong to the selected type. A user can select occupancies by name if the current name is known, or by address in the case that the name has changed and has not been updated in the list of occupancy names. If an occupancy name has changed, the occupancy information stored by the application can be edited. Any occupancy information related to the selected occupancy can be changed by clicking the Edit Occupancy Info button.

After selecting the occupancy name or address from the list of available occupancies, images and videos can be viewed using the photo select tool to click at photo locations on the map. The photo select tool requires the user to specify the photo location layer from a list. This is necessary because in the case of multi-level occupancies, each level must have its own photo location layer. Otherwise it would be difficult to distinguish between the photos on one level and those on the level above or below. If the selected photo location layer is not visible, the application reminds the user to make the layer visible. A future enhancement to the application will turn the layer on automatically when the photo location layer is selected.

Another way to view the images and videos is to select from file lists at the bottom of the Occupancy
Info window. When the lists are initially created by copying the files into the application, they consist of generic filenames generated by the digital camera. By clicking the Edit Image Info button, users have the option of creating alias names for the images and videos in the file lists. These alias names can be used in the place of the generic file names to help identify the image or video clip.

Regardless of how the images and videos are selected, they are displayed below the Occupancy Info toolbar in a Windows Media Player control. A stored description for the image or video clip is displayed above the media control. When the images and videos are copied into the application the description for each is the same as the generic filename. Users can change the description in order to help identify the image or video clip. Below the media control, a button allows users to view images in a larger window. The button is labeled "Full Screen View" but the larger view will actually be the same size as the application’s main window. This button is only enabled when an image is selected and displayed. Videos cannot be viewed any larger than they appear in the media control. Increasing the size of the video window distorts the video clip to the point where distinct characteristics of the filmed area can no longer be recognized.

When the occupancy has been selected, the pre-plan and incident command information for that occupancy also becomes available to the user. The pre-plan information gives details of the structure and potential hazards associated with the occupancy. Incident command information is limited to educational institutions, at this time. Some of the incident command forms are tailored more specifically to schools. However, any of the forms could be easily modified for use with other occupancy types. Modifying the forms would create the opportunity to develop incident command information for occupancy types that could include occupancies such as government buildings and financial institutions.

Pre-plan information is accessed by clicking the button with the image of the fire hat, on the Occupancy Info toolbar. The pre-plan form opens in a new window on top of the application’s main window. A tab strip located above the pre-plan window allows the user to select any of the forms associated with that occupancy. Depending on the occupancy type, there may be as many as thirteen different forms describing a single occupancy. These forms include information about Location, Hazards, Construction, Water Supply, Protection Systems, Utilities, Exposures, Special Resource Considerations, Technical Rescue Exposures, Remarks, Fire Evacuation Plans, Fire Safety Plans, and Emergency Evacuation Drills. Not every occupancy type will include all of these forms. Occupancies may omit the last three forms, where the information is not applicable to the occupancy type. The information gathered in each form is apparent from the name, with a few exceptions. Location provides the name and address of the occupancy, as well as contact information for responsible parties. However, location also describes the area with regard to access and equipment obstruction. Special Resource Considerations and Remarks are open-end forms for writing comments and any pertinent information that may not be covered on the other forms. The remaining forms describe exactly what the name of each suggests.

Incident command information is accessed by clicking the button with the image of the police hat, next to the pre-plan button on the Occupancy Info toolbar. The incident command window and tab strip are similar to the pre-plan windows, with fewer tab buttons. At present time there are five incident command forms for educational occupancies. These include General Description, SRO and Admin
Contacts, Command Post, Blocked Roads, and Buddy Schools. General Description is an open-ended form that allows users to type a detailed description of the property. SRO and Admin Contacts stores contact information for the school. In the case of educational facilities, these contacts generally include School Resource Officers, as well as principals and their assistants. However, the form is designed so that any person, up to eight individuals, can be listed as a contact if necessary. Command Post describes possible locations for the command post. Blocked Roads lists which roads will need to be blocked in each direction. Buddy Schools specifies which neighboring schools students and faculty will be taken to, in the event of an emergency. Provided that the pre-plan and incident command information is updated on a regular basis by connecting to the city network, users can access current information from anywhere.

The forms for both pre-plan and incident command are designed to validate user input. Required fields cannot be left blank and numeric fields will not accept non-numeric input. If an input is not accepted, a message box will warn the user of the mistake when the update button is pushed. The form cannot be updated until the validation process can run without finding a mistake.

Whenever a change is made to any of the information stored by the application the local database is updated on the workstation where the change was made. If the workstation is connected to the city network any changes that were made will be uploaded to a central database when the application is closed. This central database is located on a networked server and houses information for all occupancy types. Each time the application is opened or closed, the routines that reconcile differences between the central database and the local databases are run automatically. These updates allow all users to access the information entered offline, or at other workstations.

**Benefits**

Through our coordinated efforts, we have designed a system that provides public safety first responders with the necessary tools and information to safely and efficiently resolve nearly any crisis within the documented structures. This program will also provide the on-scene incident commander with vital response information specific to the incident location. It will enable the incident commander to visualize actual building components. Otherwise those components would only be known to those who have knowledge of the building from previous incidents. It will also provide video information that can be used to actually direct crews via a virtual tour concept. This will enable crews to respond more quickly to locations within the structure. These are just a few examples of tasks that the incident commander will be able to perform from the command post. Police personnel will also benefit by having access to detailed floor plans, images, and videos. For example, they will be able to determine the types of door configurations that exist within the structure and will know what types of tools will be needed for hostage entry teams.

**Future Enhancements**
Our goal for the future is to expand beyond just the district school buildings to include all of the more than four hundred high life and high risk structures within our community. In addition, the city is currently working on establishing a city wide wireless project. This will allow our personnel to quickly access the most current epicGIS data. Wireless hot spots will be located throughout the city. By driving into one of the hot spots, the program will be able to download any new information. Due to space restrictions, the application data will reside on a CD in the vehicle’s laptop. Until the new system is implemented, the CDs will be produced on a monthly basis as new data is compiled and verified as complete and accurate.

Summary

With more information and easy access to that information, our public safety first responders are better equipped to do their jobs. This application provides access to information that not only helps to ensure the safety of our citizens, but also the safety of our public safety professionals. When an incident occurs, a quick response time is very important. That includes gathering information quickly and that is one of the primary goals of this system.

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