GIS Applications

Institute for Telecommunication Sciences (ITS)

- **Propagation coverages for one or more transmitters draped over surfaces.**
- **Interference and overlap coverages.**
- **2-D and 3-D visualization environments.**
- **Fly through visualization capabilities.**

ITS has developed and continues to improve a suite of Geographic Information System (GIS) applications incorporating propagation models for outdoor and indoor analyses. Databases for GIS use include terrain, satellite and aircraft imagery, roads and other transportation infrastructure layers. Building data and population are also becoming more available and affordable. These databases can be easily connected to GIS systems and can be shared among users in web-based or stand alone GIS applications. The Institute has developed both generic and application-specific GIS programs which aid Government agencies, private cellular companies, public and private television stations, transportation companies and consultants in efficiently managing the telecommunications infrastructure in the United States.

Figure 1. A 3-D visualization of the City of Boston.

One GIS-based tool developed by ITS is the Communication Systems Planning Tool (CSPT). CSPT is a menu-driven and icon-driven propagation model developed for frequencies from 20 MHz to 20 GHz. CSPT allows the user to connect to a variety of image catalogs and terrain libraries which cover most of the world. The user can create specific analysis areas using these catalogs and libraries and can then perform propagation scenarios for his/her application. These applications can range from outdoor coverage studies of large scale areas of hundreds of square miles to indoor propagation studies of one building in an urban environment.

Current work efforts involve the development of stand alone and web-based GIS tools for outdoor and indoor propagation modeling as well as visualization capabilities which allow the user to fly into the analysis area and move around the environment as the tool updates the visualization imagery to the resolution appropriate to the display environment. The user can then drape coverages of outdoor and/or indoor scenarios and move around the environment to examine the output.

The general flow of the CSPT is as follows. The user defines an area within which a study will be performed. This analysis area can be defined graphically by zooming into a map of the world or of the U.S. or by defining the latitude and longitude of the boundaries of the desired area. The user then imports desired GIS information such as political boundaries, roads, rivers, special imagery, or application specific GIS data. Figure 2 shows an analysis area created for the city of Boston.

Figure 2. An analysis area created for the City of Boston.

After creating the analysis area, the user creates or imports transmitter, receiver, and antenna data. Lastly, the user selects the type of coverage and the propagation model to be used in the analysis. Figure 3 shows a composite analysis of the coverage of four transmitters located throughout the city. The analysis can be limited to sectors and specified distances around each transmitter to speed up calculations and focus on an area of interest.

Interference analyses can be run allowing the user to specify the Signal-to-Interference contours and colors as shown in Figure 4.

Coverages, composites and interference analyses can be imported into visualization tools allowing the user to see and often fly through their studies so that a better understanding of the analysis results can be obtained. Figure 1 shows a 3-D visualization of the Boston skyline made by such a visualization tool. Many such tools exist and ITS is developing methods to export CSPT coverages into such visualization tools.

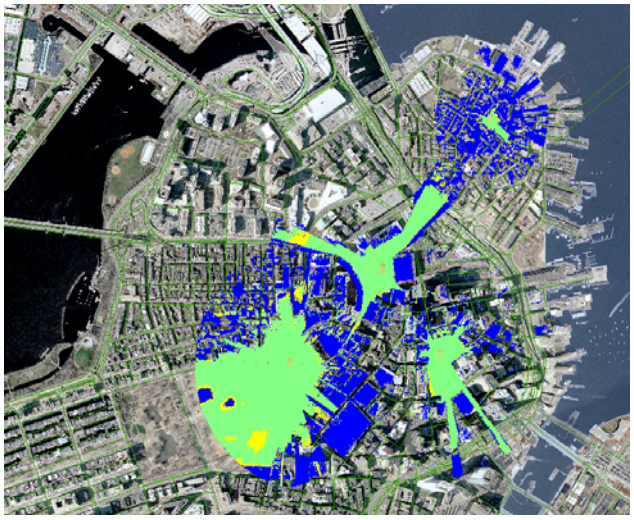

Figure 3. A composite coverage of four transmitters.

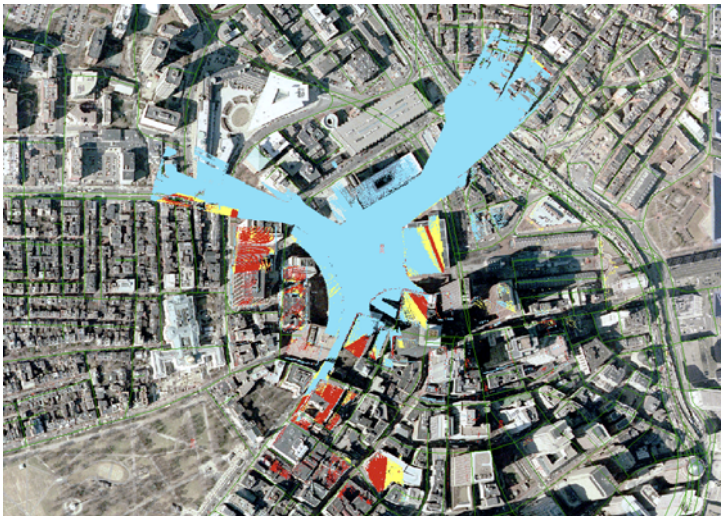

Figure 4. Signal-to-interference analysis with red indicating significant interference.

Contact: Robert DeBolt
303-497-5324
rdebolt@its.bldrdoc.gov

Institute for Telecommunication Sciences
325 Broadway, Boulder, Colorado 80305
http://www.its.bldrdoc.gov, 303-497-5216

The Institute for Telecommunication Sciences (ITS), located in Boulder, Colorado, is the research and engineering arm of the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce. ITS receives direct support from the Department of Commerce and is sponsored by other government agencies and U.S. industry. ITS performs telecommunications research and provides technical engineering support on a reimbursable basis. ITS also has cooperative research agreements with private companies.

(2006)