Geographic Information System Applications

Outputs

- Propagation coverages for one or more transmitters draped over surfaces created by the program or imported by the user.
- Analysis of interference and overlap coverages of multiple transmitters.
- The ability to create and modify catalogs of imagery at various resolutions and city catalogs of building information.
- 2.5D or fly-through 3D visualization with interfaces to 3D visualization tools.

ITS continues to develop a suite of Geographic Information System (GIS) based applications which are available to public and private agencies for propagation modeling and performance prediction studies. A GIS efficiently captures, stores, manipulates, analyzes, and displays all forms of geographically referenced information in a user-friendly and flexible manner. Databases for use in GIS systems are now commonly available at affordable prices and include such data as terrain, satellite photo imagery, aircraft imagery, road infrastructure, communications infrastructure, building locations and footprints, land type and use, water bodies, streams, population densities, and many others. These are distributed in many GIS supported formats and can be maintained in relational database management systems (RDBMS) which can be connected to the GIS. The Institute has modified and distributed this tool to many groups with modifications tailored to specific applications.

One form of this GIS tool is called the Communication Systems Planning Tool (CSPT). CSPT is a menu-driven propagation model developed for applications at frequencies as high as 50 GHz. The accuracy of the results and the usefulness and flexibility of the presentation of the results are enhanced by the power of the GIS background. CSPT allows the user to import digital imagery or other remote sensing data which have been converted to 3-dimensional models of the region. This environment is then taken into consideration as the model calculates the results of the desired analysis. Contained within CSPT are propagation "engines" valid at frequency ranges used by cellular, personal communications services (PCS), radio, TV, pagers, microwave, and other communication links. New propagation models can easily be connected to the GIS with minimal effort, providing the user with greater flexibility and future growth.

The user begins his/her analysis by defining an area within which a study will be performed. This analysis area can be defined graphically by zooming into an image of the world or by defining the latitude and longitude of the boundaries of the desired area. As the user defines the analysis area, the tool displays imagery of this area at a resolution appropriate to the scale of the view area. This imagery is displayed from image catalogs available through the tool that cover much of the world. The user then imports desired GIS information such as building data, roads, rivers, special imagery, or application-specific GIS data. Figure 1 below shows an analysis area of the Waikiki beach area around the Royal Hawaiian Hotel, including building footprints and color imagery.

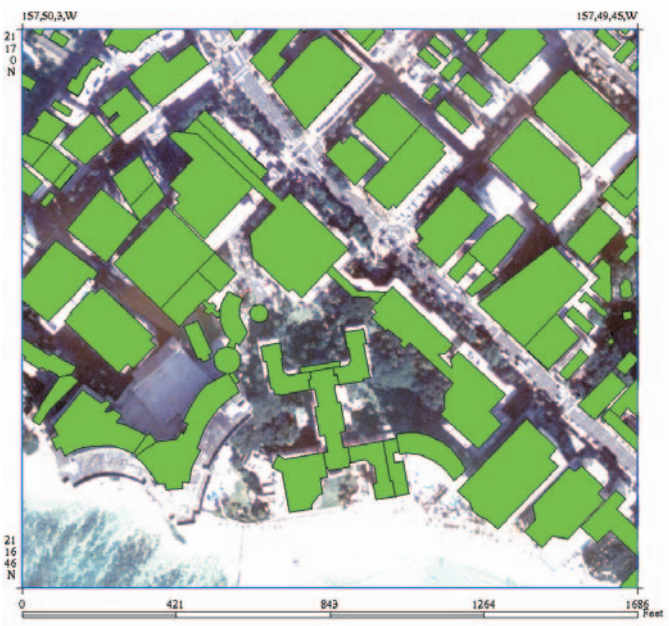

Figure 1. Analysis area of Waikiki Beach, Hawaii.

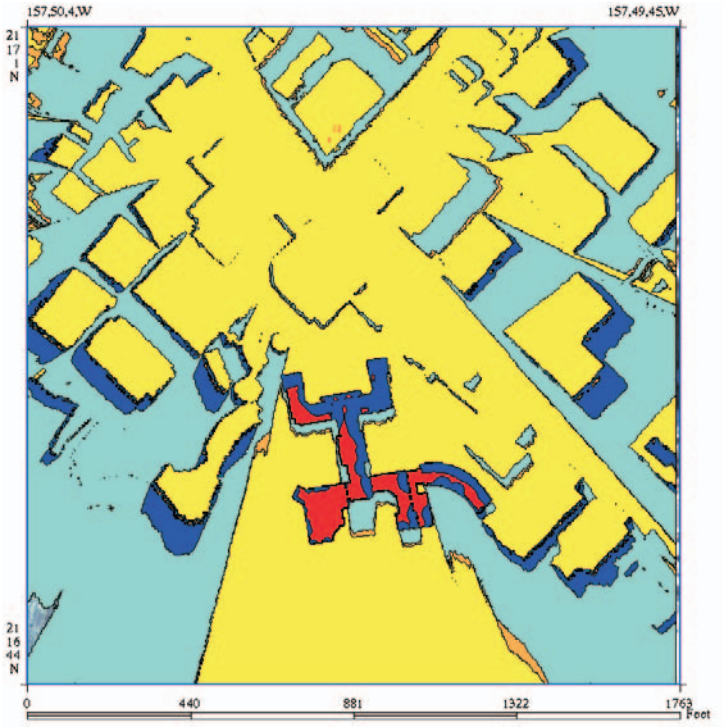

Figure 2. CSPT outdoor/indoor coverage prediction.

Then 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. ITS is currently developing a coupled indoor/outdoor propagation model which will allow the user to predict signal strength penetrating a building or escaping from a building.

Figure 2 (left) shows the hypothetical coverage of a transmitter on a building top north of the Royal Hawaiian Hotel. This coverage shows both the outdoor and indoor predicted signal strength around the hotel.

Figure 3 (below) shows this coverage in a 3D fly-through form useful for detailed visualization. Predictions such as this can be very useful in public safety applications where coverage predictions within buildings are critical in safety of life missions.

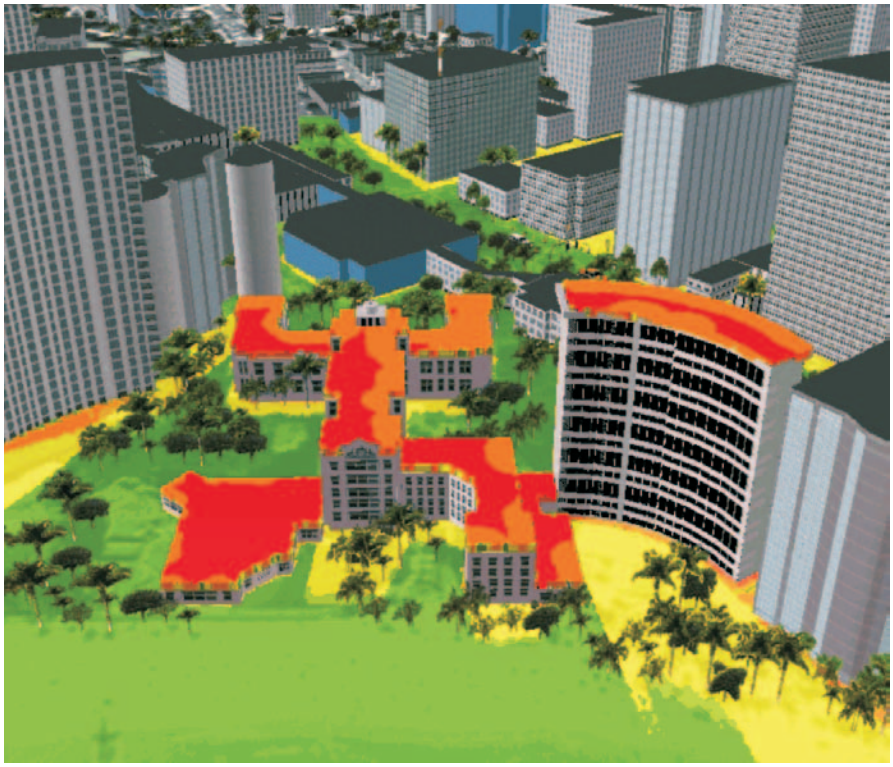

Figure 3. Same area of coverage shown in Figure 2, in 3D fly-through form.

CSPT is available for Windows® NT platforms. CSPT contains an extensive help system: most menus have a "help" button which displays an explanation of the options on that menu. A user's manual is available. We suggest that users have an account with ITS on our TA Services computer so that we may provide phone support.

For more information, contact:
Robert O. DeBolt
(303) 497-5324
e-mail rdebolt@its.bldrdoc.gov