Three Dimensional Propagation Prediction Using Online Geo-Spatial Data

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Out-door radio propagation prediction for wireless communications requires accurate geo-spatial information about the region of interest. Thanks to the fast development of Internet services in providing online geo-spatial data, it is now a common practice to navigate on an electronic desk globe to view many places in the world with adequate spatial details. Several software packages have been developed, e.g., Google's Google Earth, Microsoft's Virtual Earth, and NASA's World Wind. All of these packages provide the capability of viewing 3D imagery online. In Google Earth, it is possible to view 3D buildings in some urban areas with very accurate dimensions. It also provides the capability of measuring the 2D distance between two locations. Unfortunately, although the 3D building structures can be viewed online, Google Earth does not have the three dimensional data of the buildings available for its users. Unlike Google Earth and Virtual Earth, NASA's World Wind is an open source software package that provides the 3D geospatial data. The resolution of World Wind, however, is around 30 meters, which is not sufficient for accurate modeling of the 3D buildings in urban areas.

This paper presents some simple methods for the construction of 3D building structures based on the geo-spatial data available in the Internet. Our initial results show that very good accuracy can be achieved in modeling the 3D buildings. The resultant 3D model is then fed into our 3D ray-tracing programs and the path losses in areas of interest are calculated. The path-loss results match very well the published results in the literature. The resultant path losses can be stored in a KML (Keyhole markup language) file. Using Google Earth and/or World Wind, these results can be displayed together with the 3D imagery online. This method, therefore, provides a simple and economic means for constructing 3D outdoor propagation scenes based on the widely available online geo-spatial data. Integrated with the ray-tracing software, the new method is useful in the site planning for wireless communications systems.