Precision Geolocation for Propagation Measurements in the Field: Considerations and Best Practices
USNC-URSI National Radio Science Meeting

A. Paulson[(1)]
(1) Institute for Telecommunication Sciences, Boulder, CO, 80305,
https://www.its.bldrdoc.gov/about-its/contact-us.aspx

Geopositioning can be a large source of uncertainty while conducting propagation measurements in the field. Researchers currently have access to highly detailed terrain, propagation, and locational data sets, but these data are useless if you don't know where you are in the world; and this, in turn, hampers the development of propagation models. Getting to know where you are with some certainty requires careful study and frequent use of commercial off-the-shelf navigation resources such as global navigation satellite system (GNSS) receivers and antennas, geographic information system (GIS) applications, inertial measurement units (IMU), simultaneous localization and mapping (SLAM) sensors and software, and data fusion methods sourced from control systems engineering.

Beginning in 2016, the US Department of Commerce's Institute for Telecommunication Sciences (ITS), the research and development laboratory for the National Telecommunication and Information Administration, started taking steps to improve the geopositioning ability of propagation measurement systems. The uncertainty at the start of the project was as high as 5 m in outdoor areas with a generally unobstructed view of the sky (e.g. rural and suburban areas) and dramatically higher, as much as 40 m in urban areas with an obstructed view of the sky (e.g. urban canyons). To date, we have achieved a nearly 600 fold improvement in accuracy under static, "blue sky" conditions. The project is still in progress, but the solution we are pursuing should mitigate the problem of dynamic positioning in urban corridors and reduce our initial positioning uncertainty by an order of magnitude.

The focus of this presentation is to share current field testing results as well as lessons learned while integrating the system to illustrate how other researchers might improve their own geolocation tools and abilities.