Paper ID: 40036
student

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Advanced Satellite Services (4)

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SATELLITE VISIBILITY MAP FOR EMERGENCY APPLICATIONS

Abstract

The project CopKa investigates the possibilities of enhancing the overview of emergency situations (both routine and major incidents) in the coordination center, while decreasing the workload of the people on-site. Video and telemetry data from different sources at the emergency scene (vehicle, multi-copter etc.) is streamed to the coordination center through a secured satellite communication link via a geostationary relay satellite. The satellite link from the emergency site is provided through a deployable high-gain Ka-Band antenna that is mounted on the emergency vehicle. Since the idea of this project is to make this service available to a large number of vehicles, expensive satcom-on-the-move terminals are not feasible. The proposed solution is a simplified mechanism that deploys the antenna as soon as the vehicle stops and stores it when the vehicle is on the move again (similar to digital satellite news gathering vehicles). The advantage of a satellite link over for instance the mobile radio network (MRN) is that it will also work in rural areas where MRN is not provided or not sufficient for high data rates. Furthermore, the MRN might break down during a major event. The disadvantage of a satellite link is its need of a line-of-sight to the geostationary satellite. Especially in mountainous regions or urban areas this can be a problem. Without the ability to get a satellite connection on the move the vehicle would have to stop to assess the link availability. The study addresses this problem by adding the line-of-sight information to a street map to show the driver of the emergency vehicle where satellite links are available. It is also possible to add several satellites to the map in case one of them is not visible. To calculate the line-of-sight information, a high-resolution surface model is transformed from a Universal Transverse Mercator projection with quasi geoid height to an earth-centered earth-fixed frame to get a correct geometrical representation. To get a high spatial resolution the line-of-sight between the center of a geostationary box and each data point in this model is calculated. To address the restricted resources of a navigation system, only boundary points between visible and non-visible areas are saved for the creation of the map layer. Furthermore, the density of points on a straight line can be decreased significantly. The paper will present relevant requirements, implemented designs/technologies and results of such a satellite visibility map.