Modeling Sea Surge and Flooding using ALTA and TerraFly

The TerraFly team at the NSF I/UCRC CAKE at Florida International University, CAKE's member ALTA (Autonomous Lighter Than Air) Systems, Inc., and the SeaRobotics Corporation are producing smart balloons tethered to small unmanned vessels to collect environmental data. In combination with the geospatial data already served by TerraFly, continuing work on this breakthrough has the potential to transform the modeling of sea surges and flooding.

TerraFly (http://TerraFly.com) is a technology and tool set for fusion, visualization and querying of geospatial data. The visualization component of the system provides users with the experience of virtual "flight" over maps comprised of aerial and satellite imagery overlaid with geo-referenced data. Autonomous Lighter Than Air was invented by John Ciampa, the inventor and founder of Pictometry. The ALTA invention has been awarded three U.S. Patents. ALTA has sponsored research at FIU at about $1 million. SeaRobotics Corporation, located in Stuart, Florida, specializes in marine robotics. SeaRobotics Unmanned Surface Vehicles (USVs) are used worldwide by government organizations, academia, commercial survey companies, and others.

TerALTA balloon oblique multispectral aerial image, vegetation index in reddish color, derived nearshore sea depths and isobaths for NSF IUCRC Compendium CAKE-MSS Modeling Sea Surge and Flooding using ALTA and TerraFly. Image provided by CAKE.

This work represents an improvement over previous state-of-the-art because the addition of an aerial imaging and communication source provides valuable new sensing capabilities. The collection of sea depths near the shore has eluded traditional collection platforms such as LIDAR and aircraft-based aerial photography. The unmanned shallow draft vessel and the low altitude balloon aerial platform are uniquely suited to this task. The TerraFly system allows users to fuse and explore multi-source geospatial data. Examples of fusing ALTA oblique imagery with core geospatial data are at http://Teralta.com.

TerALTA balloon-mounted bathymetry sensor operated via a robotic vessel for NSF IUCRC Compendium CAKE-MSS Modeling Sea Surge and Flooding using ALTA and TerraFly. Image provided by CAKE.

The project is expected to result in a packaged product that would enable users to collect data in areas that are presently hard to access and to then immediately analyze them via the TerraFly system. Service packages capable of data collection, storage, and analysis are also possible for end-users who may then desire to periodically collect data or who have interest in particular locations at particular times.

Economic impact: With the help of FIU's TerraFly technology, ALTA opens a new multi-billion market for aerial photography. This is because it produces images of much higher resolution than are possible using other technologies. Image collection is currently accomplished from ground-based cameras, aircraft, and satellites. ALTA is higher than a ship-based camera and therefore sees more. ALTA is lower than an aircraft and therefore sees better. Additionally, compared to other aerial platforms ALTA has low cost components. For the capital outlay of one manned aircraft, hundreds of ALTAs can be deployed. Additionally, balloons are dramatically cheaper than drones. ALTA missions eliminate cost of pilots, aircraft, and airports. Costs of operation are a fraction of those of other aerial collection platforms. Moreover, ALTA can be deployed in minutes and have information and images returned instantaneously. The ALTA technology is thus poised to produce much higher-quality imagery at much lower cost than current technologies, thus opening up new markets and bringing new capabilities to existing markets such as public safety, real estate, construction, environmental monitoring, disaster mitigation and disaster recovery.

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