

Topographic Coast Monitoring Using UAV Photogrammetry: A Case Study in Port of Veracruz Expansion Project

Authors : Francisco Liaño-Carrera, Jorge Enrique Baños-Illana, Arturo Gómez-Barrero, José Isaac Ramírez-Macías, Erik Omar Paredes-Juárez, David Salas-Monreal, Mayra Lorena Riveron-Enzastiga

Abstract : Topographical changes in coastal areas are usually assessed with airborne LIDAR and conventional photogrammetry. In recent times Unmanned Aerial Vehicles (UAV) have been used several in photogrammetric applications including coastline evolution. However, its use goes further by using the points cloud associated to generate beach Digital Elevation Models (DEM). We present a methodology for monitoring coastal topographic changes along a 50 km coastline in Veracruz, Mexico using high-resolution images (less than 10 cm ground resolution) and dense points cloud captured with an UAV. This monitoring develops in the context of the port of Veracruz expansion project which construction began in 2015 and intends to characterize coast evolution and prevent and mitigate project impacts on coastal environments. The monitoring began with a historical coastline reconstruction since 1979 to 2015 using aerial photography and Landsat imagery. We could define some patterns: the northern part of the study area showed accretion while the southern part of the study area showed erosion. Since the study area is located off the port of Veracruz, a touristic and economical Mexican urban city, where coastal development structures have been built since 1979 in a continuous way, the local beaches of the touristic area are being refilled constantly. Those areas were not described as accretion since every month sand-filled trucks refill the sand beaches located in front of the hotel area. The construction of marinas and the comital port of Veracruz, the old and the new expansion were made in the erosion part of the area. Northward from the City of Veracruz the beaches were described as accretion areas while southward from the city, the beaches were described as erosion areas. One of the problems is the expansion of the new development in the southern area of the city using the beach view as an incentive to buy front beach houses. We assessed coastal changes between seasons using high-resolution images and also points clouds during 2016 and preliminary results confirm that UAVs can be used in permanent coast monitoring programs with excellent performance and detail.

Keywords : digital elevation model, high-resolution images, topographic coast monitoring, unmanned aerial vehicle

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