Technology Offer

AUGEO: Semi-automatic detection of artificial terrestrial targets for image geo-referencing

A research group of the Institute for Sustainable Agriculture (IAS-CSIC, Cordoba, Spain) has made contributions to improve the georeferencing accuracy for whichever platform the image has been taken (satellites, conventional airplanes and UAV). AUGEO system intends to assess and decrease co-registration errors in remote imagery through geo-referenced terrestrial targets (TT), captured in the imagery and semi-automatically recognized by AUGEO2.0® software. This works as an add-on of ENVI® for image co-registration. A higher number of TT used in the geo-referencing process leads to a lower obtained error (RMSE). Pair/ **c**ouple TT considerably increased accuracy. Furthermore, results from coupled analysis show that TT detection increased as the distance between the TTs decreased. AUGEO system requires considerably less time than conventional georeferencing field work and subsequent computer work, and allows the georeferencing of images of areas that do not contain recognizable ground control points for verification and validation. The AUGEO procedure developed could have a wide acceptation in remote sensing for precision agriculture if artificial terrestrial target of automatic opening will be used and captured in the remote images

Input prescription maps (IPM) takes up the image geo-referencing error and, consequently, each "IPM micro-plot" does not coincide with its corresponding "ground-truth micro-plot". The percentage of non-overlapping area (%NOA) between both micro-plots has been developed as a function of the positioning error (PE/RMSE), α° (the angle between Φge and the operating direction, Φop), and the micro-plot size. The %NOA consistently increased as the RMSE and α° increased, and it decreased as the micro-plot width or length increased. The decision about micro-plot size should be based on the RMSE, α°, and the maximum admissible %NOA.

Registered software: García-Torres L., D. Gómez-Candón, J. J. Caballero-Novella, M. Jurado-Expósito, J. M. Peña-Barragán & F. López-Granados. 2009. AUGEO Software for the semi-automatic georeferentiation of remote images using artificial terrestrial targets, Instituto Agricultura Sostenible, CSIC, Madrid, Public Notary document 9L2314291-292, 29 October. Entidad titular: IAS/ CSIC
Articles.
-- D. Gómez-Candón, F. López-Granados, J. J. Caballero-Novella, M. T. Gómez-Casero, M. Jurado-Expósito, and L. García-Torres. 2011. Geo-referencing remote images for precision agriculture using artificial terrestrial targets. *Precision Agriculture*, 12, 6, 876–891, DOI 10.1007/s11119-011-9228-3; http://link.springer.com/article/10.1007/s11119-011-9228-3
-- D. Gómez Candón; F. López Granados; JJ Caballero Novella; JM Peña Barragán; MT Gómez Casero; M. Jurado Expósito; L. García Torres. 2012. Understanding the errors in Input Prescription Maps based on High Spatial Resolution Remote-sensed Images (IPME). *Precision Agriculture*, 13, 5, 581-593, DOI 10.1007/s11119-012-9270-9; http://link.springer.com/article/10.1007/s11119-012-9270-9
-- D. Gómez-Candón, F. López-Granados, J. J. Caballero-Novella, J. M. Peña-Barragán, M. T. Gómez-Casero, M. Jurado-Expósito, and L. García-Torres. 2013. Semiautomatic Detection of Artificial Terrestrial Targets for Remotely Sensed Image Georeferencing. *IEEE Geoscience and Remote Sensing Letters*, vol. 10, no. 1, January 2013; DOI 10.1109/LGRS.2012.2197729
http://ieeexplore.ieee.org/xpl/login.jsp?tp=&arnumber=6208814&url=http%3A%2F%2Fieeexplore.ieee.org%2Fxpls%2Fabs_all.jsp%3Farnumber%3D6208814