Improving the processing of emergent value-added product by Gaussian statistical approach

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In TASA (Taiwan Space Agency), Emergent Value-Added Product (EVAP) workflow has been established to acquire satellite images and carried out the analysed results corresponding to the affected areas if the disaster events are triggered. For example, when an Emergent Observation Request (EOR) is sent by Sentinel Asia (SA) and accepted by TASA, corresponding workforce will be engaged to work together and follow the workflow of EVAP to carried analysed results. The work flow including acquisition tasking and scheduling, ortho image generation, affected target identification and report delivering. As the previous study, QGIS graphical modeler was developed to carry out change information including result of Change Vector Analysis and spectral indices differences of NDVI and NDWI. Then, thresholds were found manually and applied to identify potential changes. However, manual thresholds were still dependent on operator's pixel by pixel measurements on change image. Moreover, some manual computations were still needed to find optimal thresholds and repeat the process iteratively. Not to mention that the threshold could be incorrect if the threshold is measured on the noise pixel and the problematic results would be generated. In this study, a supervised change detection method is proposed based on gaussian statistical approach. The major idea is that it is always easier for operator the select "changed" areas as training samples when compared to mark change pixels. Furthermore, from statistical point of view, selecting changed area as training area can always get more correct change pixels than noise pixels. Therefore, by assuming that the statistical distribution of each selected training area is Gaussian, a set of upper and lower bounds of the thresholds on change image for detecting changes can be determined by a percentage confidence interval. Notice that in the proposed method, we assume that differences of NDVI and NDWI and output of Change Vector Analysis in change image are independent to each other and bounds obtained from several 1-D Gaussian distributions are operated by logical "AND" for generating final results. Finally, an improved version of EVAP workflow can be carried out by developing above-mentioned approach with QGIS graphical modeler. According the test cases, a forest fire happened in Canada, demonstrated in this study, satisfied result can be delivered with six training areas manually selected by operator.

Keywords: Gaussian statistical approach, Confidence interval, Training area, QGIS graphical modeler, Emergent Value-Added Product.