



Agricultural terrace ridge delineation from remote sensing images by using an integrated approach of edge detection and terrain analysis

Wen Dai (1), Xin Yang (1), Liyang Xiong (2), Guoan Tang (2), Huang Nan (3), Jiaming Na (3), and Yumeng Zhou (3)

(1) Key Laboratory of Virtual Geographic Environment (Nanjing Normal University), Ministry of Education, Nanjing, China, (2) State Key Laboratory Cultivation Base of Geographical Environment Evolution (Jiangsu Province), Nanjing, China, (3) Jiangsu Center for Collaborative Innovation in Geographical Information Resource Development and Application, Nanjing, China

Agricultural terraces are important in agricultural production, as well as soil and water conservation. Terrace ridges, which form the main constructive part of agricultural terraces, are built by hand and require manual maintenance. If not managed properly, these ridges will collapse, and soil loss, gully erosion, and cultivation threats will be consequently induced. This study presents a novel method to automatically map terrace ridges by combining their image and geomorphology features. First, the terrace areas were extracted by object-based image analysis. Second, a Canny edge detector was employed to extract all edges from the image. Meanwhile, a digital elevation model (DEM) was used to generate contour direction. Then, the edges along the contour direction were searched and coded as candidate terrace ridges. Finally, only the candidate terrace ridges with lengths larger than an appropriate length threshold were identified as terrace ridges. The results from two different study areas show that the accuracy of correctness ranged from 88.28% to 92.58%, the completeness ranged from 76.90% to 90.02%, and the quality ranged from 72.43% to 80.41%. The length threshold affects the accuracy. A low threshold includes considerable noise, whereas a high threshold disregards short terrace ridges. A reasonable threshold should be a balance of maximum noise removal and terrace ridges detection. The results also show that image sources and DEM resolution have minimal effects on the accuracy; thus, this method can be used on available open-source data. In this regard, this method is successful and applicable.