Geophysical Research Abstracts
Vol. 21, EGU2019-6874-1, 2019
EGU General Assembly 2019

Re-purposing video data feeds for purposes of rainfall measurements

Shijie Jiang (1,2), Vladan Babovic (2), and Yi Zheng (1)

(1) School of Environmental Science and Engineering, Southern University of Science and Technology, China, (2) Department of Civil and Environmental Engineering, National University of Singapore, Singapore

This study develops a novel approach to measuring rainfall intensity in real-world conditions based on videos acquired by ordinary surveillance cameras. The proposed approach employs an optimization algorithm to effectively extract a pure rain-streak layer from a rainy image. Then, it estimates the instantaneous rainfall intensity via geometrical optics and photographic analyses. We investigated the effectiveness and robustness of our approach through synthetic numerical experiments and field tests. The major findings are as follows. First, the identification algorithm can effectively recognize rain streaks from complex backgrounds with many disturbances. Compared to existing algorithms that consider only the temporal changes in grayscale between frames, the new algorithm successfully prevents false identifications by considering the intrinsic visual properties of rain streaks. Second, the proposed approach demonstrates satisfactory estimation accuracy and is robust across a wide range of rainfall intensities. The proposed approach has a mean absolute percentage error (MAPE) of 21.8%, which is significantly lower than those of existing approaches reported in the literature (26% to 31.8%) even though our approach was applied to a more complicated scene acquired using a lower-quality device. Overall, the low-cost, high-accuracy approach to vision-based rain gauging developed in this study significantly enhances the possibility of using existing closed-circuit television (CCTV) surveillance networks to perform hydrological monitoring.