

Recognition of different utility pipes size of ground penetrating radar images at different penetration depth

Abstract

Ground Penetrating Radar (GPR) is a geophysical locating method that uses radio waves to capture images below the surface of the ground in a minimally invasive way. It also requires two main essential equipment which is a transmitter and a receiving antenna. To address the problem, this project proposed the hyperbolic recognition of different utility pipes of GPR images at different level of penetration depth. In this framework, the raw data of GPR images were firstly to be pre-processed. The grayscale images were cropped, resized, and enhanced to increase the contrast of the features of the image. Then, the pre-processed GPR images were extracted using the Histogram of Oriented Gradient (HOG) method with three different windows. The extracted HOG features were then used as input to the k-Nearest Neighbor classifier. A series of experiments has been conducted using 10-fold cross-validation technique for training and testing the GPR data. Based on the result obtained, it shows that at depth 20cm the average accuracy is about 99.87%, whereas at depth 40cm the average accuracy achieved 100%. Thus, the result shows that the extracted HOG features exhibit the significant information of hyperbolic signature of different pipe size with different depth of buried object. Therefore the results seem promising in recognizing the hyperbolic of utilities.