

FAULT DETECTION OF SATELLITE ANTENNA INSTALLATION USING MACHINE LEARNING

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Degree of Master of Science in Computer Science

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Declaration of the candidate & Supervisor

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Name: Dr. Thanuja D. Ambegoda

Abstract

With rapidly growing customer expectations, satellite antenna has become an integral part of day-to-day life nowadays. Due to the growing demand, the number of installations increase rapidly. When the installation quantity increases, the installation quality decreases gradually. This leads to more customer complaints. Currently, a verification team does a second-round check on the installation and the signal level. Even though this help in identifying installation issues before customer complaints, this has become a failure due to operational cost with the growing number of installations. The proposed method is based on an image classification technique using Convolutional Neural Networks (CNN) along with a transfer learning technique using the well-known model, VGG16. The experimental data set was created by capturing images of correct and incorrect satellite installations. The correct installation positions are covered with a set of predefined image templates (3 test scenarios). Images of the satellite installations were captured according to the templates and they were tagged as correct or incorrect by eye-bowling the installation. A basic CNN model, a VGG16-CNN model, and a random forest classifier were compared by evaluating the model accuracy and the balanced accuracy. The VGG16-CNN model was selected with the best performance. The average accuracy and the average balanced accuracy of the final model are obtained as 85.8% and 86.1% respectively. This study was performed on a Windows 10 Pro 64-bit machine with an Intel i5-7200U CPU operating at 2.50GHz and 16 GB RAM. The prediction time was fast with a mean time of 0.5 seconds per image. Experimental verification was done in the field and an average accuracy of 90.56% was obtained. With these prediction models integrated, the operational cost can be reduced and the coverage can be increased significantly.

Keywords: Fault detection, Image classification, Satellite, Antenna, CNN, VGG16

Dedication

To Sankha

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