

Visual surveying platform for the automated detection of road surface distresses

Thegaran Naidoo^{*a}, Deon Jouberta, Tapiwa Chiwewe^a, Ayanda Tyatyantsia, Bruno Rancatia, Asanda Mbizenia

^aCouncil for Scientific and Industrial Research, 627 Meyring Naude Road, Pretoria, 0001, South Africa

Abstract

Road distresses, such as potholes and edge cracks, are not only a source of frustration to drivers but also negatively impact the economy due to damage to motor vehicles and costly road repairs. Regular and rapid pavement inspection and maintenance is vital to preventing pothole formation and growth. To improve the efficiency of maintenance and reduce the cost thereof, the Visual Surveying Platform (VSP) is being developed that will automatically detect and analyse road distresses. The VSP consists of a vehicle mounted sensor system, consisting of a high speed camera and a Global Positioning System (GPS) receiver, and an analysis and visualization software suite. The system extracts both a visual image and the coordinates of a detected road defect from recorded video and presents it in an interactive interface for use by technical experts and maintenance schedulers. The VSP automatically detects and classifies road distresses using a two-stage artificial neural network framework. Video frames first undergo hue, saturation and value (HSV) colour space conversion as well as a spatial frequency transformation before being used as inputs to the neural networks. A road detector neural network first classifies which section of the image contains the road, after which a distress detector neural network identifies those road regions containing defects. Although the VSP can be adapted to detect any type of road distress it has been trained to specifically detect potholes. An initial prototype of the VSP was designed and constructed. The prototype was also trained and tested on real-world data collected from provincial roads.