Intelligent Vehicle Damage Assessment and Cost Estimator for Insurance Companies

Abstract:

By reducing loss adjustment costs, improvements in the First Notice of Loss and the speed with which claims are examined and evaluated might save a lot of money in the automobile insurance claims process. Car damage is automatically identified and classified using advanced picture analysis and pattern recognition technology. A technique that compares before-andafter-accident car images to automatically detect

Introduction:

In today's world, it can observed that the number of vehicles we use is quickly expanding; let's agree that there isn't a single street without a car. As a result, an increase in the number of automobiles on the road may lead to an increase in the percentage of accidents occurring nearby; additionally, the number of accidents occurring nearby would be significant; the accidents would not be particularly serious, but the automobile would be damaged, prompting people to file insurance claims

Literature:

Paper 1:

K Kouchi and F Yamazaki, “Damage detection based on object-based segmentation and classification from high resolution satellite can be studied.

A strong earthquake of magnitude 6.8 struck the Mediterranean coast of Algeria on 21 May 2003 and the city of Zemmouri in Boumerdes province was most heavily damaged. QuickBird satellite observed the Zemmouri area on 23 May 2003. By image sharpening, buildings, cars and even debris can clearly be identified in a natural colour image. Preliminarily, the present authors performed visual damage inspection comparing the post-event image with an image acquired before the earthquake. As a result, totally collapsed buildings, partially collapsed buildings, and buildings surrounded by debris were visually identified. Additionally, debris surrounding damaged buildings was also extracted. Although these observations indicate that high-resolution satellite images would be able to provide quite useful information to emergency management after natural disasters, it can also be said that the visual damage interpretation is time-consuming. For practical purposes, it must be necessary to complete damage detection as quick as possible after the occurrence of disasters in order to make use of the detection result in emergency management. Hence, an automated damage detection method, in which debris is identified, is required to be developed. In this study object-based image segmentation and classification technique as well as pixel-based technique have been applied. This technique would make it possible to consider not only the spectral characteristics of objects but also the spatial relationship

between objects that consist of homogenous pixels. For the purpose of investigating their effectiveness on identifying debris, the accuracy of the detection result has been assessed and compared with that of the pixel-based damage detection result.

Paper 2:

Michael Giering Mark R. Gurvich Soumalya Sarkar, Kishore K. Reddy,proposed “Deep learning for structural health monitoring: A damage characterization application,” in Annual Conference of the Prognostics and Health Management Society.

Abstract and Figures

Structural health monitoring (SHM) is usually focused on a fact of damage detection itself (e.g., Yes/No) or approximate estimation of damage size. Any additional details of the damage such as configuration, shape, networking, geometrical statistics, etc., are often either ignored or significantly simplified during SHM characterization. These details, however, can be extremely important for understanding of damage severity and estimations of follow-up damage growth risk. To avoid expensive human participation and/or over-conservative SHM decisions, solutions of computational recognition for damage characterized are needed. Autonomous SHM from visual data is one of the significant challenges in the field of structural prognostics and health monitoring (PHM). The main shortcomings of the image-based PHM algorithms arise from the lack of robustness and fidelity to handle the variability of environment and nature of damage types. In recent times, deep learning has drawn huge amount traction in the field of machine learning and visual pattern recognition due

to its superior performance compared to the state-of-the-art techniques. The paper proposes to formulate and apply a deep learning technique to characterize the damage in the form of cracks on a composite material. The deep learning architecture is constructed by multi-layer neural network that is based on the fundamentals of unsupervised representational learning theory. The robustness and the accuracy of the approach is validated on an extensive set of real image data collected via applying variable load conditions on the structure. The paper has shown a high characterization accuracy over a wide range of loading conditions with limited number labeled training image data.

Paper 3:

Maeda, Hiroya, proposed the paper "Road damage detection using deep neural networks with images captured through a smartphone.

Research on damage detection of road surfaces using image processing techniques has been actively conducted, achieving considerably high detection accuracies. Many studies only focus on the detection of the presence or absence of damage. However, in a real-world scenario, when the road managers from a governing body need to repair such damage, they need to clearly understand the type of damage in order to take effective action. In addition, in many of these previous studies, the researchers acquire their own data using different methods. Hence, there is no uniform road damage dataset available openly, leading to the absence of a benchmark for road damage detection. This study makes three contributions to address these issues. First, to the best of our knowledge,

for the first time, a large-scale road damage dataset is prepared. This dataset is composed of 9,053 road damage images captured with a smartphone installed on a car, with 15,435 instances of road surface damage included in these road images. In order to generate this dataset, we cooperated with 7 municipalities in Japan and acquired road images for more than 40 hours. These images were captured in a wide variety of weather and illuminance conditions. In each image, we annotated the bounding box representing the location and type of damage. Next, we used a state-of-the-art object detection method using convolutional neural networks to train the damage detection model with our dataset, and compared the accuracy and runtime speed on both, using a GPU server and a smartphone. Finally, we demonstrate that the type of damage can be classified into eight types with high accuracy by applying the proposed object detection method. The road damage dataset, our experimental results, and the developed smartphone application used in this study are publicly available

Paper 4:

]U. Waqas, N. Akram, S. Kim, D. Lee and J. Jeon, "Vehicle Damage Classification and Fraudulent Image Detection Including Moiré Effect Using Deep Learning," 2020 IEEE Canadian Conference on Electrical and Computer Engineering.

Image-based vehicle insurance processing and loan management has large scope for automation in automotive industry. In this paper we consider the problem of car damage classification, where categories include medium damage, huge damage and no damage. Based on deep learning techniques, MobileNet model is proposed with transfer learning for classification. Moreover, moving towards automation also comes with diverse hurdles; users can upload fake images like screenshots or taking pictures from computer screens,

etc. To tackle this problem a hybrid approach is proposed to provide only authentic images to algorithm for damage classification as input. In this regard, moiré effect detection and metadata analysis is performed to detect fraudulent images. For damage classification 95% and for moiré effect detection 99% accuracy is achieved.