INTELLIGENT VEHICLE DAMAGE ASSESSMENT & COST ESTIMATOR FOR INSURANCE COMPANIES

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LITERATURE SURVEY

Introduction

According to August 22, 2018, 'China Banking and Insurance Regulatory Commission Office on the Monitoring of Small Claims Insurance Services in 2017' data show that: In 2017, 55.4113 million automobile insurance claims were settled normally. Among them, there are 40.128 million small-scale cases, accounting for 72.22%. The average insurance payment period for small-scale automobile insurance cases is 11.8 days, while the claim period for investigation, damage assessment and claim collection accounts for 9.94 days.

These data have triggered several reflections on small-scale cases: Firstly, for insurance companies, 72.22% of small cases require the presence of damage fixers, which leads to high cost of risk investigation, and the leakage problem in the process of damage fixing is difficult to control. Secondly, for the accident party, the long waiting time at the accident site, the slow payment process, the unreasonable fixed price and other issues, to a certain extent, reduce customer satisfaction with the insurance company. In addition, the potential dangers of traffic congestion and secondary accidents caused by small-scale cases also bring a great pressure to the traffic control department.

Effect Diagram of Vehicle Appearance Damage Recognition Algorithm

S NO.	TITLE	AUTHORS	ABSTRACT	DRAWBACKS
1.	Research on Intelligent Vehicle Damage Assessment System Based on Computer Vision	Zhu Qianqian ,Guo Weiming ,ShenYing and ZhaoZihao	In this paper, based on the demand of automobile insurance claims for intelligent transportation, combined with abundant basic data and advanced machine vision algorithms, an intelligent damage determination system of 'Artificial Intelligence Vehicle Insurance' is constructed. This paper first introduces the functions of the intelligent damage assessment system.Secondly,it discusses the realization path of each functional module in detail, and finally puts forward the vision for the future.	The drawback is to explore the innovation of insurance technology of 'AI + Vehicle Insurance.
2.	Damage Assessment of a vehicle and Insurance Reclaim.	Vaibhav Agarwal ,Utsav Khandelwal, Shivam Kumar, Raja Kumar, Shilpa M	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- and after-accident car images to automatically detect the damaged location.	The major Drawback of the Proposed model is that it only Identifies the Physical visible Damage and not Of the internal or the interior damage.

3.	Assessing Car Damage with Convolutional Neural Networks	Harit Bandi,Suyash Joshi,Siddhant Bhagat,Amol Deshpande	Manual estimation of damages in fields like construction, vehicular accidents has been the mainstay of the insurance business. However, such methods are replete with biases and inaccurate estimations.	The drawback here is Driver behavior monitoring.Machine learning enhanced solutions help in monitoring driver's behavior.
4.	Car Damage Assessment for Insurance Companies	Mandara G and Prashant Ankalkoti	The data contains three classes namely train, test and validation. Trained image is compared with the test image. Car has to be trained for many times by using epochs which means how many times the algorithm can work between the whole training dataset. In this graph they can take only two times of running the algorithm.Finally the comparison is completed lastly print the graph containing accuracy, validation accuracy, loss and validation loss.	Need for human involvement. Although the process could be absolutely automated, it still needs human involvement to detect and avoid fraudulent insurance cases.

Vehicle Appearance Component Recognition Algorithms.

According to the statistics of vulnerable parts in vehicle accidents, thirty-one vehicle exterior parts have been identified in this product. Each part is divided into front and back parts, regardless of left and right parts.

Aiming at the recognition of 31 vehicle appearance parts (regardless of left or right), the recognition algorithm for panoramic or local vehicles is realized, in the complex environment of rain and snow, too strong light or dark, by using the self-built data set of vehicle appearance parts and the depth learning target detection algorithm.The list of parts is shown in Table 1. The component recognition algorithm AP50 is 88.7%.

Number	Component	Number	Component	Number	Component	Number	Component
1	Front Bumper	2	Rear Bumper	3	Hood	4	Headlamp
5	Roof Panel	6	Front Fender	7	Rear Fender	8	Front Door

Table 1..Partial List of Vehicle Appearance Components

In order to avoid overlapping of location areas after vehicle appearance parts detection, it is difficult to determine the location relationship of subsequent damage. The method of case segmentation is adopted, that is, the appearance of the image is recognized by the method of pixellevel object segmentation. As an extension of Faster R-CNN [6], Mask R-CNN [7] can achieve object segmentation. The effect of the recognition algorithm for vehicle appearance parts is shown in Figure 1.

Figure 1. Effect Diagram of Vehicle Appearance Component Recognition Algorith**Damage Recognition Algorithms for Vehicle Appearance Components**

This product is aimed at six types of vehicle appearance damage, and also applies the deep learning target detection method. Through the self-built damage data set, it can recognize high-light pictures, low contrast pictures and multi-category mixed damage. The list of damage types is shown in Table 2. The damage recognition algorithm AP50 is 87.6%.

Number	Damage Type	Number	Damage Type	Number	Damage Type
1	Scrape	2	Scratch	3	Deformation
4	Cracking	5	Damage	6	SeriousDamage

Table 2. Damage Type List of Vehicle Appearance Components.

Damage data sets are labeled with rectangular frames. The effect of vehicle appearance damage recognition algorithm is shown in Figure 2.

Figure 2. Effect Diagram of Vehicle Appearance Damage Recognition Algorithm

Figure 3. Input Image

Table 3. Damage Results List.

Component	Damage Type
Front Bumper	Scrape
Front Bumper	Damage

Output of Loss Assessment Result

The output of fixed-loss results can not be separated from maintenance rules and repair logic. Among them, the maintenance rules are based on the experience of fixing damage and testing the appearance of components in the specific material damage needs to be maintained. The repair logic needs to formulate the damage inclusion relation logic, for example, if there are two damages in the same component, the maintenance scheme should adopt the scheme with higher maintenance level. Based on the maintenance rules and the repair logic, the repair knowledge base is established, the output of the maintenance plan is finally realized. The list of replacement knowledge is shown in Table 4.

Component	Material	Damage Type	Maintenance Item
Front Bumper	Plastic	Scrape	Repairing
Front Bumper	Plastic	Damage	Replacement

Table 4. Partial Replacement Knowledge List.

Vehicle Insurance Anti-Fraud

The automobile insurance fraud of intelligent damage determination system is mainly embodied in the following three aspects. It realizes the fraud recognition in the whole process of damage determination and can effectively control the cost expenditure of insurance companies.

(1) Recognition of vehicle parts logical: It can identify whether there is logic between the model and the parts, and it is not allowed to choose the parts that are not logical when the

damager automatically points out the damages. For example, the Corolla 2018 1.2T Intelligent Edition will warn and record when choosing the parking radar before and after parking.

(2) Recognition of loss logic: After selecting assembly parts, the included parts will not be selected repeatedly.

(3) Recognition of image fraud: It will automatically identify whether it is an accident photograph taken in real time, whether it is a PS photograph and so on.

(4)

Conclusion

In the future, we will continue to explore the innovation of insurance technology of 'AI + Vehicle Insurance'. We hope that we can use the power of intelligent damage determination system. On the one hand, the owner can take photos by one click to achieve rapid loss determination, price estimation and immediate compensation. On the other hand, it assists insurance companies to achieve rapid and accurate pricing in the process of fixing losses and claims. Finally, by combining the rapid compensation of accident vehicles to relieve traffic pressure, to avoid more serious personal and property losses caused by secondary accidents.

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