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ANALYSIS OF VEHICLE COLLISIONS WITH THE SDC METHOD

P. Aleksandrowicz*

Abstract: *The article covers the problem of verifying vehicle crashes with the use of research procedures referred to as the SDC method. Performing research following that procedure facilitates verifying the crashes of vehicles which result in damage to the car body and elements of the vehicle, infrastructure in terms of extortion of undue damages. Simplifications in the process of vehicle damage claim management lead to potential abuses and more and more sophisticated extortion methods require a development and improvement of engineering tools to verify the claims notified. To facilitate the SDC method analysis, there has also been developed a dedicated IT tool automating the decision-making process for verifying the vehicle crashes with the method proposed. The author's research, with actual damage-inflicting incidents, has demonstrated a practical application of the SDC research method and, at the same time, the problem of a lack of effective research procedures in case of frauded damage claims in insurance companies and a lack of verification before such claims are referred to court proceedings.*

Keywords: SDC method, Crash verification, Fraud, Damage claim verification.

1. Introduction

Every year insurance companies in Poland manage, on average, about 1 700 000 motor insurance claims under the obligatory third-party civil-liability insurance policies held by the owners of motor vehicles and optional comprehensive-cover insurance (http://piu.org.pl). All that results in the payment of damages to restore the damaged property. And the vehicle repair costs provide the grounds for the extortions of damages for the costs to be covered most frequently under the insurance policy of the offender indicated. Interestingly, the average vehicle damage claim in which passive safety systems, in a form of gas bags were started, can make the repair of a few-year average-class vehicle non-cost-effective (Aleksandrowicz, 2015). Insurance companies see the problem of insurance crime, however, they do not introduce any research methods to verify the vehicle crashes which would use the accomplishments of post-accident engineering and newly-developed methods. Neither is the actual scale of the insurance crime known. Scientific theories concerning high values of the so-called dark figure of crime (the ratio of the undisclosed to disclosed acts) in financial crimes point to an expected high rate of unknown irregularities (http://piu.org.pl). With that in mind, this study presents the procedures developed and the author's research the results of which focus on enhancing the effectiveness of identifying fake incidents in motor insurance claims. Therefore the problem covered here is valid both in practical and cognitive approach. The research methods have been broken into three groups; the static analysis (S), the major objective of which is geometrical verification of damage in terms of their compliance on the study objects, dynamic analysis (D) the objective of which is to verify the circumstances of the car crash applying simulation programs used in the reconstruction of car accidents as well as the analysis of characteristic damage (C) to verify the marks of a mutual contact of the objects during the crash declared (Aleksandrowicz, 2016, https://www.youtube.com/watch?v=T0Bkum_8A64&feature=youtu.be).

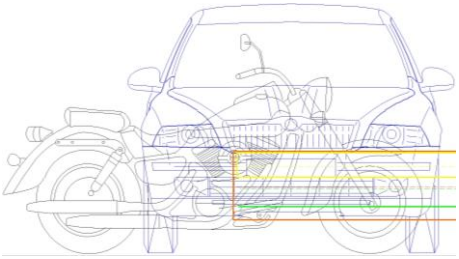
2. Static analysis (S)

The best results of verification in terms of determining whether there is a geometric matching of the damage of vehicles is provided by a comparison of real objects participating in the vehicle damage claim notified. However, the possibilities of such comparisons are usually limited; hence a proposal of alternative research methods; the above-mentioned comparison of real objects, a comparison of one of the

* Piotr Aleksandrowicz, PhD.: Machine Maintenance Department, Institute of Machinery Operation and Transport, University of Science and Technology, Al. prof. S. Kaliskiego 7; 85 796, Bydgoszcz; Poland, p.aleksandrowicz@utp.edu.pl

objects with disassembled elements of the other one, the use of photographs of both objects to make the transparent superposition involving the placement of scaled photographs on each other and the breakdown of vertical stylings of both vehicles (http://www.autoview.at). Tab. 1 illustrates the research methods proposed.

Tab. 1: Static (S) research methods.

Comparison of real objects	Comparison of vertical stylings
	
Comparison with vehicle elements	Transparent superposition
	

3. Dynamic analysis (D)

To perform a dynamic analysis, the potential of simulation programs applied in road accident reconstruction, including Multi Body Systems (MBS) modelling IT tools, e.g. PC Crash, Virtual Crash and VSIM is used (http://www.pc-crash.com, http://www.vcrashusa.com, http://www.cyborgidea.com.pl). The simulation programs are applied to verify the crashes of vehicles and their post-collision positions and the time and space relations of the objects necessary for the occurrence of such crash.

Due to the availability of data for calculations, the procedure was divided into material- and human-based evidence procedures (Aleksandrowicz, 2016). Fig. 1 presents a crash verification analysis result sample (https://www.youtube.com/watch?v=T0Bkum_8A64&feature=youtu.be).

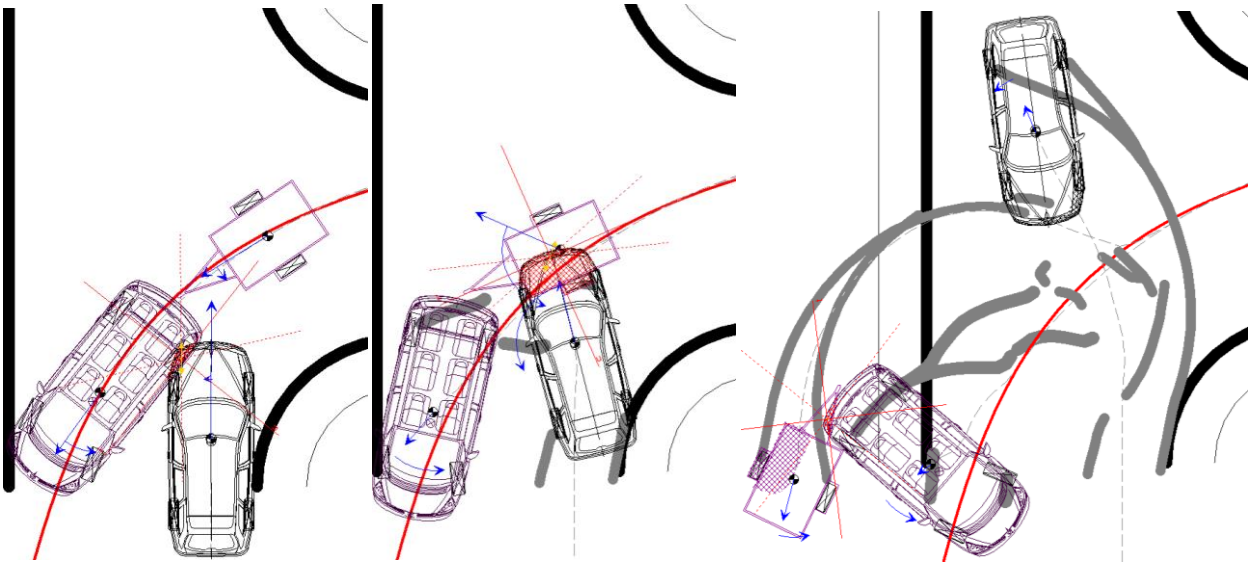


Fig. 1: Dynamic analysis result recorded.

4. Characteristic damage analysis (C)

To perform the characteristic damage analysis, site inspection of the objects damaged or the photographs taken at the resolution allowing for multiple magnification are used. The analysis aims at identifying the marks of contact between the vehicles in a form of paint layers, shape mapping, etc. (Aleksandrowicz, 2016). Fig. 2 presents a sample mark of the mapping of a part of vehicle registration number of the crashing vehicle on the bumper of the claimant's vehicle.

Fig. 2: Characteristic damage identified.

5. The IT tool developed to support the decision-making process with the SDC method

To enhance the effectiveness of the research methods applied, an IT tool has been developed which offers decision variants once the results of procedures S, D, C of a given damage verified are entered. Figs 3 and 4 present the dialog boxes of the program (http://wim.utp.edu.pl/dok/wyklady/analiza_sdc.xlsm).

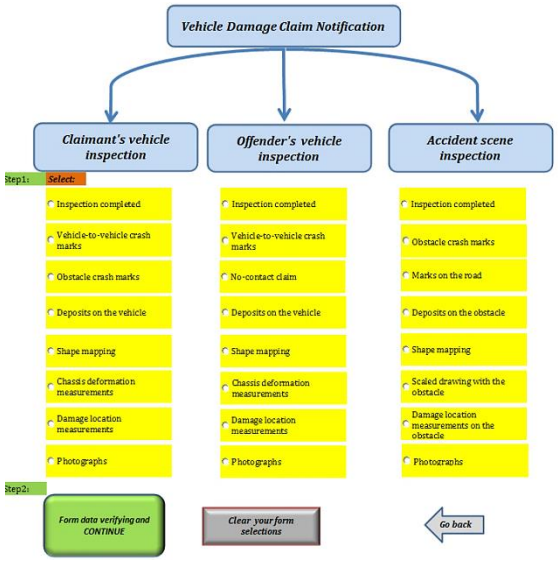


Fig. 3: Program dialog box - entering the input data.

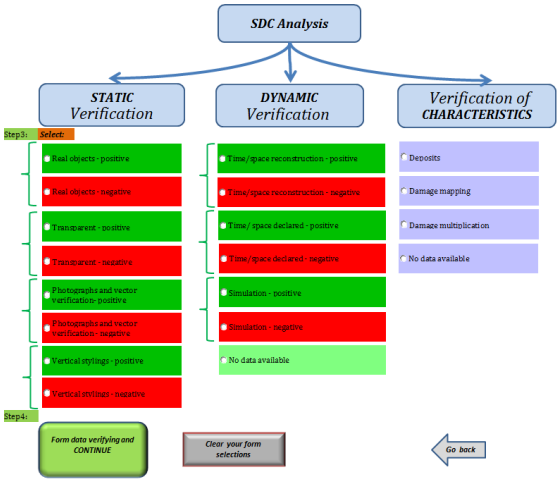


Fig. 4: Program dialog box - entering the results of procedures S, D, C.

6. Case study – own research

The research was performed in 72 vehicle damage claim cases in which the payment of damages was refused and damages were claimed by the parties already in court. To verify the position of the insurance company in each of the cases, the SDC method was applied. The analysis was made following the procedure S, D, C and then data was entered into the program developed to support the decision-making process (Aleksandrowicz, 2016, https://www.youtube.com/watch?v=T0Bkum_8A64&feature=youtu.be). Letters **P** and **N** stand for a positive or negative result of each research procedure separately, as compared with the total result provided with the SDC method. Fig. 5 presents the research results.

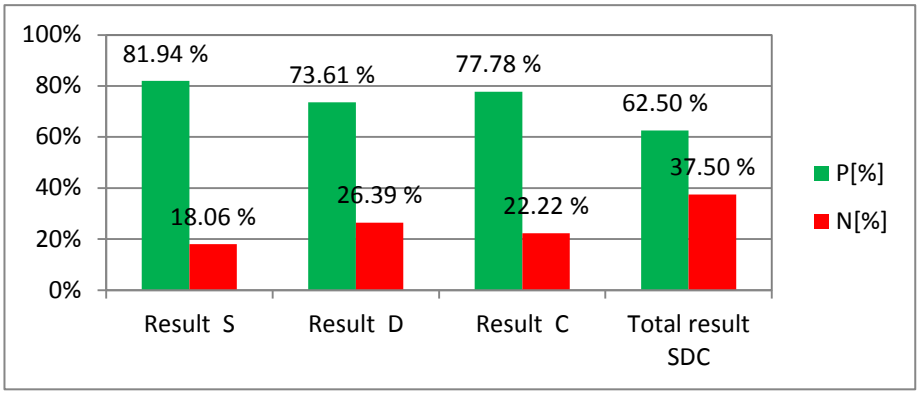


Fig. 5: Results of the research performed with the SDC method.

7. Conclusions

The SDC method can be used not only in the process of damage management to eliminate unjustifiable claims (extorted, frauded damages) but also by law departments of insurance companies to evaluate the justifiability of a dispute which, if lost, generates considerable costs. It is that functionality of the SDC method which has been applied for researching the cases analysed. The results of research have demonstrated that 62.5 % of the cases qualified by insurance companies as extortions and referred to court as a result of the claim of the claimants' for payment of damages turned out to be the claims which should have been accepted already at the stage of damage claim management. The results point to a problem faced in insurance companies related to an adequate claim verification at the stage of claim management. The proposed research method, SDC, together with the tool supporting the decision-making process, could find a practical application by optimising the process of damage claim management and cutting the costs of insurance companies' operation. Besides the research has shown that S and C procedures confirm only the contact of vehicles, however they do not determine the occurrence of the crash in the circumstances declared, which can be verified by applying procedure D since it facilitates the evaluation of the relations between objects in time and space as well as the very crash and its effects. Applying that procedure, one should remember, however, about a careful evaluation of the input data affecting the simulation result, which has been described in other papers (Aleksandrowicz, 2016 and Wach, 2015).

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