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MODEL OF ANALYSIS IN VEHICLE-MOTORBIKE COLLISION

Munteanu A. I.[1], Pap B., Toflea I., Costan E., Trusca D. D.[2]

1. Transilvania University of Brasov, Brașov, Romania,
2. alexandru-ioan.munteanu@student.unitbv.ro, balazs.pap@student.unitbv.ro d.trusca@unitbv.ro ionut.toflea@student.unitbv.ro , eduard.costan@student.unitbv.ro

Abstract: *Delves deeply into the consequences and dynamics of collisions between motorcycles and automobiles. Through rigorous research, you explore the specific impact of these accidents on both motorcyclists and car occupants. By examining factors such as collision speeds, angles, and vehicle structures, your study aims to comprehend the physics behind these collisions. Additionally, you investigate the injuries sustained by motorcyclists and car occupants, analyzing the severity and types of injuries to discern patterns. The project also assesses the role of safety equipment, road conditions, and human factors in these collisions. The research extends to proposing effective safety measures, including improved vehicle designs, awareness campaigns, and traffic regulations, to mitigate the impact of motorcycle-car collisions. Ultimately, analysis aims to provide valuable insights for policymakers, engineers, and safety advocates to enhance road safety and reduce the severity of such accidents.*

Keywords: *accidents, dynamics, road safety*

INTRODUCTION

Road safety is a significant issue worldwide and collisions between cars and motorcycles are a major concern. In this context, analyzing optimization models for car-motorcycle collision can bring significant contributions to the development of solutions for preventing road accidents. This thesis aims to analyze optimization models for car-motorcycle collision from the perspective of preventive solutions for road safety. The paper addresses issues related to identifying the factors that determine the occurrence of these accidents and analyzes the optimization methods used to prevent or minimize the effect of the collision. Ultimately, the goal of this thesis is to contribute to the

development of solutions for preventing road accidents by analyzing and evaluating optimization models for car-motorcycle collision and proposing optimal solutions for road safety.

ACCIDENTS STATISTICS

Every year thousands of people lose their lives or are severely injured in road accidents in the Eu. Between 2010 and 2020, the number of road traffic deaths in Europe decreased by 36%. In comparison to 2019, when there were 228000 victims, 4000 fewer people lost their lives on the EU roads in 2020. Preliminary figures show that 18 EU member states recorded the lowest numbers of road accidents resulting in casualties. Sweden continues to have the safest roads (18 victims per 1 million inhabitants), while in Romania had the highest rate (85 deaths per 1 million inhabitants). The Eu average is 42 per million, compared to the global average of over 180 per million. The impact of reduced traffic due to the pandemic is evident but difficult to measure. 7 In 2018, 12% of the individuals killed, on EU Roads where aged between 18 and 24, while only 8% of the European population falls into this age group, indicating that young people are disproportionately more likely to be involved in a fatal road accident. However, the number of deaths among this age group has decreased by 43% since 2010. The proportion of deaths among the elderly (people aged 65 and over) increased from 22% in 2010 to 28% in 2018.Children under 15 years old represented 2%. In three-quarters (76%) of the fatal road accidents in the Eu, male victims were involved, a relatively unchanged pattern since 2010 and consistent across all EU countries. Recently published road safety figures by the European Commission are concerning for motorcyclists. Despite a 12% decrease in the number of fatal accidents over the years (due to an increase in the number of motorcyclists), in 2020, in the European Union and countries 3042 motorcyclists and 495 moped riders lost their lives in road accidents. In Romania, according to the figures provided by the Police regarding motorcycle accidents, there were 92 fatalities and 470 serious injuries in 2020, which is similar to the figures in 2021 (99 fatalities and 331 serious injuries). At the European level, the proportion of motorcyclists killed compared to all deaths in road accidents has increased from 14%-16%. From moped riders, the proportion has remained constant at 3% (from 2011 to 2020) for deaths and has decreased from 7% to 5% for severely injured victims. During this period the number of motorcycles has increased while the number of mopeds has decreased. In this work, various mathematical and algorithmic optimization models for carmotorcycle collision will be examined and their efficiency will be evaluated. Additionally 8 existing road safety technologies will be analyzed, and new optimization solution will be proposed to reduce the number of accidents. [1]

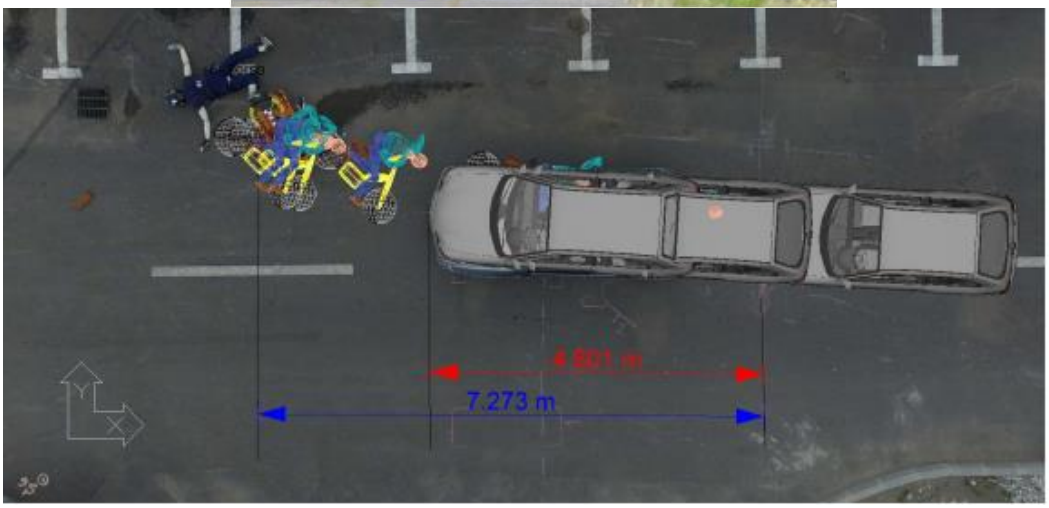
VEHICLE PREPARATION

For this test was bought two second hand vehicles: one Opel Corsa and one Moped. These two-vehicle needed to be prepared for the test. First of all, the moped: -It was cleaned the air filter and the spark plug in order to make its engine function -It was painted in a color which can be observed easily on high-speed camera -Then we tried to find some solutions to maintain its equilibrium during its movement; We tried 2 solutions: first solution was with two training wheels but this solution appeared to be useless.

The second solution was with a support with 4 wheels under the moped and this was a good solution for our necessities

after that we painted the wheels of the moped in two colors: black and yellow after the system adopted by Euro-NCAP Then we had to prepare the vehicle: - we verified the steering system and brake system -then we painted the wheels in black and yellow we marked the lateral parts of the vehicles with round targets with the radius of 100 mm disposed at the distance of 1000 mm between them. The marking started from the headlights. - on the hood and trunk has been applied a self-adhesive tape consisting of a rectangular grid with a width of 1 cm arranged at a distance of 20 cm from one another;
impact phases


1
2
3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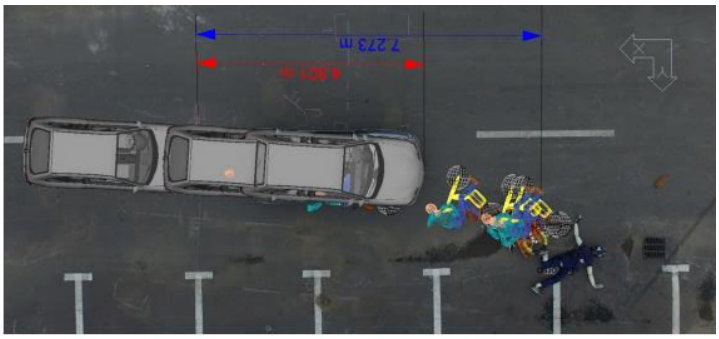
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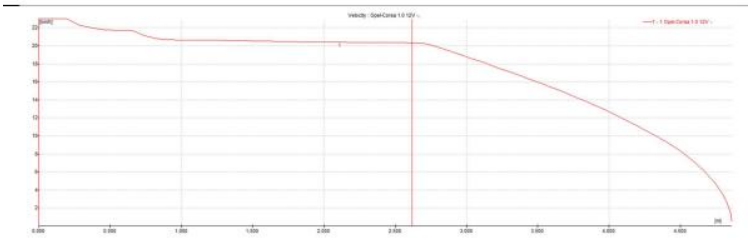

CONCLUSIONS

In conclusion, the bachelor's project addresses an extremely important and current issue concerning motorcycle accidents. Through the four chapters, namely the introduction focusing on motorcycle accidents, theoretical concepts, dynamic calculations, and an experimental simulation of a frontal motorcycle accident, various aspects related to this phenomenon were investigated and analyzed. In the first chapter, the introduction, a general overview of motorcycle accidents was presented, highlighting their severity and frequency within traffic. This served as a necessary foundation for understanding the issues addressed in the thesis. The second chapter, theoretical concepts, discussed key theoretical aspects and concepts regarding motorcycle accidents. Risk factors, primary causes of accidents, and behavioral characteristics of motorcyclists and two-wheeled vehicles were explored. The third chapter, dynamic calculations, represented a crucial stage in the project. Mathematical models and simulations were applied to analyze the dynamics of a frontal motorcycle accident. This aspect allowed for an understanding of the mechanisms of accidents and their consequences. Finally, the fourth chapter, the experiment, involved simulating a frontal motorcycle accident using laboratory methods and specific tools. Through this experiment, practical data and information were obtained, complementing and validating the previous theoretical approaches and mathematical models used. As a result of the entire project, a deeper understanding of motorcycle accidents was achieved, contributing to the identification of possible prevention and protection 107 measures for motorcyclists. The obtained results can be useful for developing road safety strategies and policies, as well as improving motorcycle design and road infrastructure. In conclusion, the bachelor's project provided a detailed perspective on motorcycle accidents, integrating theoretical and experimental elements. The obtained results can be practically applied to reduce the number and severity of motorcycle accidents, contributing to overall road safety improvement.

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