

Newsletter 2020

DEAR READERS,

in a few days, a (hopefully) unique, incisive and memorable year will come to an end.

The Corona pandemic has challenged us personally, socially, and economically, and has also turned established things in our work and road safety world upside down. Personal contacts at conferences and conventions are lacking, meetings and coordination take place online, and opportunities for personal exchange have been reduced significantly.

When we at VUFO soon close the year 2020 and take stock, there still remain many positive things of which we are proud. The most important is that through discipline, responsibility and adherence to necessary rules, so far no member of our team has been sick with corona and we very much hope that it will stay that way.

In addition, we are also proud that we were able to successfully continue the GIDAS accident investigations in and around Dresden against all odds. Finally, VUFO as company will close 2020 with a very good result.

We would like to take this opportunity to sincerely thank all project partners, customers, suppliers, authorities and stakeholders for their cooperation and support!

We wish that you and all your contacts stay healthy and that you can spend a peaceful and Merry Christmas.

Let us enter 2021 together with optimism and make the best of the situation with undiminished drive, reason and pragmatism!

Best regards, on behalf of the entire VUFO team,
Henrik Liers, Uli Uhlenhof & Thomas Unger

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Postponement of the basic course accident reconstruction

At the beginning of 2020, VUFO successfully held the "Basic Course Accident Reconstruction" for the first time. In cooperation with Dr. Heinz Burg, the participants - mostly prospective accident experts - were taught comprehensive knowledge in the field of accident analysis and accident documentation in three seminars, each lasting 4 days.

Although the Corona pandemic has accelerated the use of digital learning and virtual meetings in VUFO as well, we believe that the complex course content in accident reconstruction is best taught in face-to-face sessions.

Due to the Corona pandemic situation, we will therefore postpone the next “Basic Course Accident Reconstruction” to the following dates:

- Part 1: 03.06. – 06.06.2021
- Part 2: 17.06. – 20.06.2021
- Part 3: 08.07. – 11.07.2021

Other VUFO education modules, such as the **Basics of traffic accident investigation** (including observation at accident scenes), will also only take place in face-to-face format.

The module **Basics of Electronic Vehicle Data** can take place at any time and of course also virtually. Current dates and further information on all training courses can be found on the VUFO homepage:

<https://vufo.de/bildung/kurse-und-seminare/>

New employee

Already since 01.03.2020 **Dipl.-Ing. Stefan Babisch** strengthens the team of Data analysis and simulation as a research assistant.



With his background in vehicle technology and his programming skills, he primarily works on projects related to PCM and scenario analyses. Already in the few months he has been working for our company, he has succeeded, among other things, in implementing a calculation of TTC (Time-To-Collision) for all GIDAS PCM cases, which in turn serves us as a basis for the development of further criticality metrics.

DATA INVESTIGATION

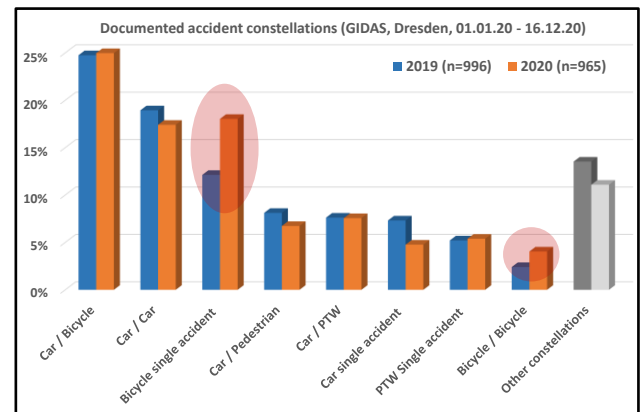
Review of the (accident) year 2020

For most, the personal, social and economic consequences of the Corona pandemic are predominantly negative. For us in the road safety world, however, there is at least one ray of hope: Decreased traffic due to lockdowns, less travel and more mobile work - will bring the **number of traffic fatalities in Germany down to well below 3,000** for the first time. Current forecasts predict a figure of just under 2,800 traffic accident victims.

Our GIDAS investigation team, on the other hand, will again scratch the "magic" mark of 1,000 accidents recorded in 2020, but will probably fall very just short of this mark due to corona. VUFO will document **about 995 accidents** in the **Dresden survey area**.

Another Corona consequence is a noticeable change in the modal split, i.e. the choice of means of transport. In 2020, the use of bicycles, which had already been on the rise for years, once again increased significantly. In addition, proportionately more journeys are again being made by car. In contrast, the number of trips made by local public transport declined.

The following figure shows the proportion of several accident constellations recorded by VUFO in 2019 and 2020 up to mid-December (unweighted, regardless of cause).



Accident constellations documented in the Dresden investigation area in 2019 and 2020

There was a significant increase in the number of single bicycle accidents as well as bicycle-bicycle collisions. Thus, in 2020, **every second accident (51%) involved a bicycle**. For comparison: in 2019 it was 44%, five years ago 38%.

By contrast, single-vehicle accidents, which still frequently result in high levels of injury to the occupants, continued to decline.

DATA ANALYSIS AND SIMULATION

Scientific monitoring of the participation of very small electric vehicles in road traffic

Contact: Dipl.-Ing. (FH) Daniel Grosche

So far, there is no extensive knowledge about the participation of electric micro-vehicles in road traffic and their impact on the traffic situation. For this reason, the Federal Highway Research Institute (BASt) announced a research project at the beginning of 2020 with the aims of scientifically monitoring the participation of these vehicles in traffic and evaluating their effects.

Together with its four subcontractors, VUFO has succeeded in preparing a **successful project proposal** for this research project. This is a great success for us, as it is **VUFO's largest single project to date** (apart from GIDAS).

The focus of the investigations is, among other things, on the analysis of accidents in Germany, an in-depth analysis of the causes of accidents and evaluation of injury patterns, and the analysis of potential conflicts with other road users. Questions relating to traffic flow, user behavior, user characteristics and personal protective equipment are also considered.

Completion of the H2020 project "MeBeSafe"

Contact person: Dipl.-Ing. Johann Ziegler



Three and a half years of intensive research work have passed and we are proud to have successfully completed **our first H2020 project** on the development of safe behaviors in traffic.

The focus of the measures developed in the project to increase road safety was on so-called "nudging", i.e. the positive influencing of behavior without prohibitions or enforcement.

In the project, infrastructure-based and vehicle-integrated measures as well as coaching programs were developed and tested by the project partners. Concrete goals of these "soft interventions" included increased ACC use, reduction of drowsy driving, adequate speed, and increased attention in potentially critical situations.

In the project, VUFO evaluated the effects of all developed measures and extrapolated them to the future European accident scenario. For more information, see the project's latest newsletter:

<https://www.mebesafe.eu/mebesafes-last-newsletter/>

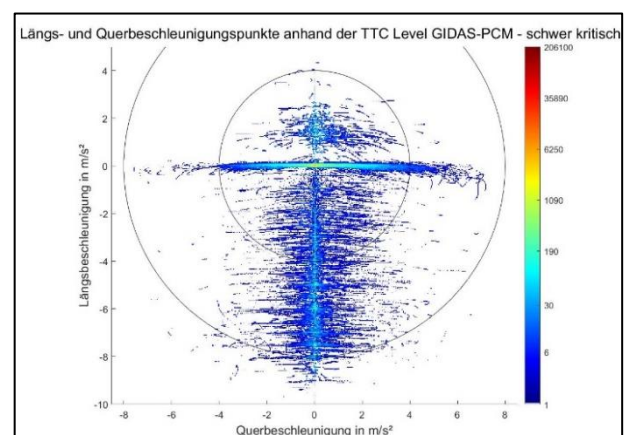
Research topic: Criticality of accident and traffic situations

Contact person: Dipl. -Ing. Stefan Babisch

The future of road traffic will be characterized by increasing automation and intelligent as well as connected systems, especially in motor vehicles. For the development, testing, and validation of assistance and autonomous functions, the currently available data and their evaluation methods are far from sufficient. Therefore, VUFO has intensively dealt with the criticality of accidents and traffic situations in the past year in order to be able to provide suitable answers and the corresponding data basis for future research.

Therefore, the extraction of the TTC from the GIDAS-PCM was initially implemented. This SSM is widely used in many areas and enables a simple evaluation of the scenario. VUFO is now able to analyze **TTC histories for more than 10,000 accidents**. The designed algorithms form the basis for further analyses.

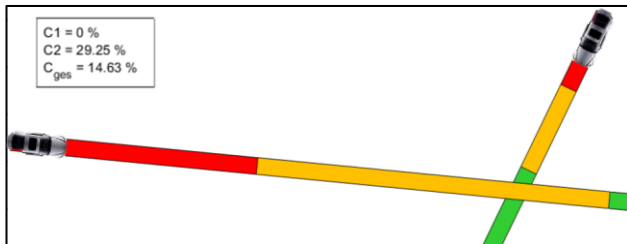
The information from GIDAS and the PCM can be used for classifications with different criticality metrics. This offers, for example, the possibility of identifying cars in a highly critical situation (TTC < 0.6s) and describing their driving dynamics.



Representation of longitudinal and lateral acceleration of passenger cars in highly critical situations (TTC < 0.6s)

In addition to the application of the TTC and other SSM, VUFO has developed its own approach to evaluate accident, but also traffic situations in terms of their criticality.

Here, driving tubes are projected in front of each vehicle. The length of them depends, among other things, on the ego speed and the physically possible steering and braking maneuvers.



Visualization of the driving tube based criticality for two crossing passenger cars

The driving tubes are also separated into different areas whose lengths result from braking or evasive maneuvers of different force. Longitudinal and lateral accelerations can be chosen at will - for example, they can be based on the "average" driver or the maximum coefficient of friction.

In the VUFO approach, the evaluation of the overall criticality (between 0% and 100%) is based on the overlap areas of the two driving tubes.

TTC and driving tube-based criticality are calculated for each time step of the GIDAS-PCM (usually 10ms) and include the current longitudinal and lateral dynamics. As a result, both criticality measures are available as curves over the entire simulation duration of the GIDAS-PCM cases and can be used for analyses and evaluations.

In combination with the point-of-no-return approach developed in 2019, VUFO can provide valid scenario assessments and data-driven support for developing assisted or automated functions as well as integral safety systems.

First GIDAS PCM in V5 format

Contact: Dipl. -Ing. (FH) Marcus Petzold

The PCM format was developed by VUFO in 2011 and was continuously adapted to meet growing requirements. The PCM as a format for storing pre-crash scenario data is established at many of our customers and is increasingly used by other accident research initiatives worldwide.

It is primarily used to store:

- Surrounding and infrastructure data (e.g. road layout, lanes, markings)
- Object information (buildings, walls, trees, fences, parked vehicles, traffic signs, traffic signals, etc.)
- Participant data (e.g. dimensions, mass)
- Dynamics data (e.g. trajectories, time histories of velocities and accelerations)

The format specification was fundamentally revised by VUFO and published in spring 2019 in **version V5**. Important innovations concern the general definitions of the format (usable for accident and traffic data) as well as the storage of 3D information.

This year has now seen the first release of the GIDAS-PCM in PCM-V5 format. This data source is the **world's largest database of pre-crash phases** based on accident reconstructions.

The conversion of the format needed extensive adjustments to the VUFO-internal tool chain. More than 150 scripts were reprogrammed, new program code was generated, for example to change the creation routines of the GIDAS-PCM from 2D to 3D. In addition, new plausibility checks were introduced to further increase data quality.

The result of this work is impressive: Currently, more than **10,350 traffic accidents** are available **in PCM format V5**, which can be used, for example, for the design, test and evaluation of ADAS and HAF functions.

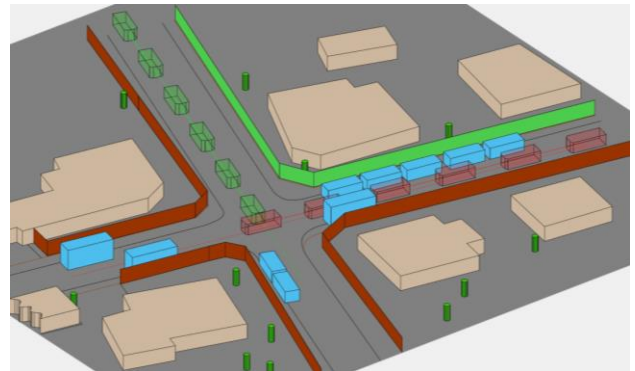
The current GIDAS PCM contains, among others, the following constellations:

- Car - Car (n > 4,100 cases)
- Car - Bicycle (n > 3,000 cases)
- Car - Pedestrian (n > 1,700 cases)
- Car - PTW (n > 1,000 cases)
- Car - Truck (n > 200 cases)

As a "waste product", a **PCM viewer** was created, which on the one hand supports our team in generating the sketches, but can also be used **as an external tool for visualizing the PCM cases**. Among other things, users can use it to generate images and videos of the accident sequences, which visualizes all objects and participants stored in the PCM data.

The following image shows a screenshot of a GIDAS PCM case including the positions of the participants at different times (each of 1s) as well as in the collision position.

Additionally, other relevant information is shown, like buildings, parked vehicles (light blue) and walls (brown) that act as view obstacles.



Visualization of a GIDAS-PCM case including different positions of the involved parties and documented objects

For more information on the PCM format specifications and associated libraries, as well as an example scenario, see:

<https://vufo.de/forschung-und-entwicklung/simulationen/>

Publications

IPG Apply & Innovate 2020

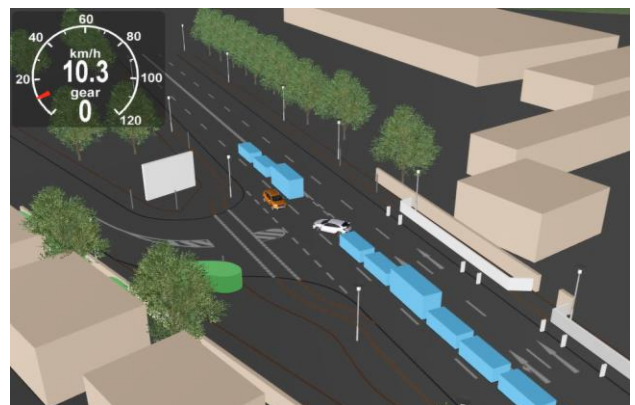
Apply & Innovate 2020 - TECH WEEKS was all about virtual driving tests in the various fields of application, from electromobility to autonomous driving. Experts had the opportunity to present their applications and projects from these research fields.

VUFO also supported the Tech Weeks with a video contribution on the topic of **Simulating real accident scenarios with CarMaker**. The VUFO tool chain for the **automated creation of accident scenarios with IPG CarMaker®** based on GIDAS was presented.

It was shown how MATLAB is used to read out all relevant information from GIDAS and transfer it to CarMaker. There, the simulation of the road users involved in the accident scenario takes place.

In addition to the reconstructed trajectories, speed and acceleration curves, the detailed environment and object information obtained from the investigation at the accident site - partly by means of 3D laser scanning or photogrammetric recording - is crucial for creating comprehensive and realistic CarMaker files.

The figures show such an automated accident scenario from two perspectives, using a current GIDAS case as an example.



GIDAS turning accident incl. collision opponents, further vehicles and objects in CarMaker (overview)

In addition to the two collision partners, the overview also shows uninvolved vehicles and detailed information about the surroundings.



View of the collision opponent from the driver's perspective in a GIDAS turning accident in CarMaker

The picture from the driver's perspective of the turning accident causer again clarifies the situation involving view obstacles. The entire videos of the accident and the presentation of the tool chain can be found at the following link:

<https://www.youtube.com/watch?v=qgW-HJEU7Jo>

15th Praxiskonferenz Pedestrian Protection

The "Praxiskonferenz Pedestrian Protection" has been held annually at the Federal Highway Research Institute (BASt) since 2006 and is the world's largest meeting of experts on pedestrian protection. In 2020, due to the Corona pandemic, it was held under the motto "On Site & Digital".

Dipl.-Ing. Johann Ziegler gave a lecture on the "**Analysis of impact constellations of pedestrians and cyclists in frontal car collisions**".

The presentation provided insights into pedestrian and bicyclist head impact points and the resulting injury severities. The data provide a sound basis for discussion on the extension of existing head impact tests at the front of passenger cars.

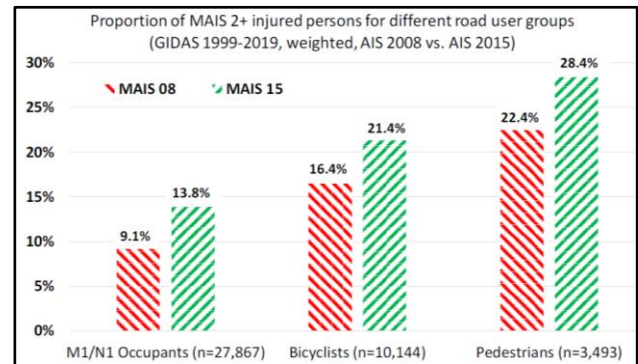
IRCOBI 2020

The IRCOBI conference did not take place in Munich this year due to corona, but will be held in 2021. Nevertheless, the scientific papers have already been published.

VUFO in cooperation with the University Hospital Dresden has contributed a paper around the new AIS revision (AIS 2015). Focus of the paper called "**Impact of the New Diagnostic Dictionary (AIS 2015) for Traffic Accident Research**" is the analysis of changes between the AIS Codebook 2005 Update 2008 and the current AIS and their impact on accident databases like GIDAS.

Each of the more than 2,000 individual injuries in the AIS codebook was considered. Coding of over 130,000 individual injuries documented in GIDAS was performed. The recalculated MAIS values for nearly 49,000 injured individuals were compared to those in the 2008 AIS Codebook.

One important result is that the **use of the AIS2015 codebook** leads to **significantly higher proportions of MAIS2+ as well as MAIS3+** injured persons (see following figure).



CTS Expert Seminar 2020

With a viable hygiene concept, large premises and reduced number of participants, the CTS expert seminar on September 3rd/04th in Münster was one of the few face-to-face events that could take place in 2020. The main addressees of the format are accident experts and analysts.

VUFO used its experience from various activities in the field of small electric vehicles to present initial findings on accidents involving this new form of mobility. In his lecture "**E-Scooters on German roads - Road safety as a victim of the new mobility?**" Managing Director Henrik Liers presented the accident figures available to date from Germany, Saxony and the GIDAS database, presented typical injury patterns and made a forecast on the number of unreported cases.

In addition, VUFO's reconstruction engineers used the platform to exchange ideas with other accident analysts and witnessed the exciting live crash tests.

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