This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 814761

iDREAMS

NEWSLETTER

No. 2

July 2020

IN THIS ISSUE

iDREAMS

DEAR READER,

I am proud to present the second newsletter of the Horizon 2020 *i-DREAMS* project to you.

Unfortunately, since our last Newsletter in January 2020, the world has changed unimaginably. The COVID-19 pandemic affected all our lives, and it will continue to do so for at least some time in the future. Notwithstanding several practical challenges resulting from the COVID-19 outbreak, the *i-DREAMS* consortium made great progress in realizing important milestones and key outcomes contributing to the ultimate goal to develop a driver monitoring system that will provide interventions to keep drivers within a safe driving zone.

In this newsletter, we highlight a few important achievements. For instance, the project consortium implemented a first prototype of the monitoring equipment in a pilot vehicle to validate and showcase the *i-DREAMS* in-vehicle platform. In parallel, the safety tolerance zone logic and technology for real-time interventions were designed and the conceptual design of the post-trip intervention web platform and visual identity of the smartphone app for the end-users were created. These developments were discussed with relevant project stakeholders during a User Advisory Board workshop. Finally, both a private and a heavy vehicle driving simulator were implemented, enabling initial validation and user experience testing of the *i-DREAMS* platform with real drivers of different transport modes.

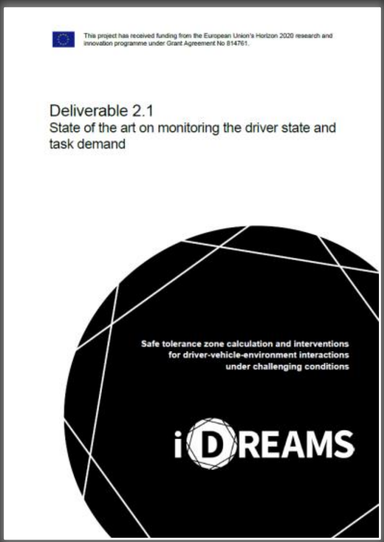
I hope you enjoy reading our newsletter and invite you to check our website, follow us on social media or contact us directly for more information.

Yours sincerely,

PROF. DR. TOM BRIJS
COORDINATOR

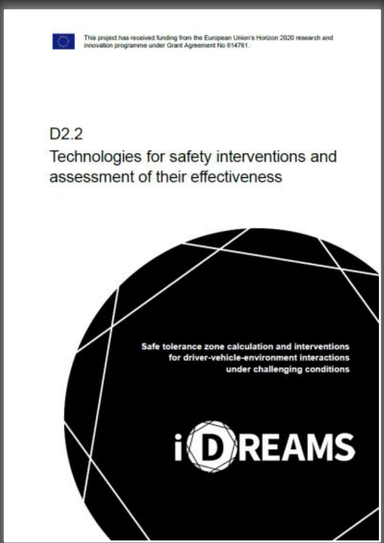
SIX NEW TECHNICAL REPORTS SUBMITTED IN THE PAST SIX MONTHS

Since our first edition of the newsletter, the consortium picked up the pace and submitted six new technical reports to the Commission. While we are currently waiting for permission to make them downloadable on the website, we are happy to give a sneak peak of what to expect:



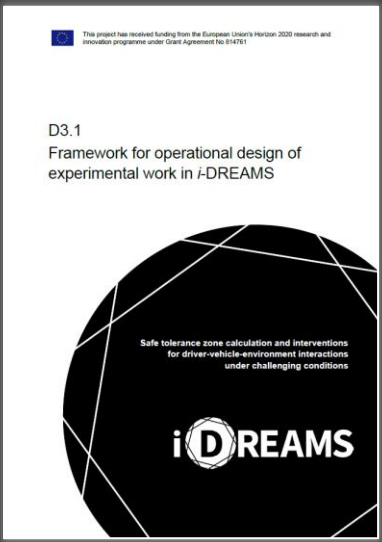
Deliverable 2.1: State of the art on monitoring the driver state and task demand

In this report variables that influence the level of individual risk in a given traffic situation are identified. These can either be endogenous factors for monitoring driver state (such as distraction, fatigue or cognitive impairment) or exogenous factors such as weather, time of day and traffic conditions which can increase the task complexity. A common set of validated indicators is synthesised and combined to assess the individual level of risk (safety tolerance zone). Furthermore the report describes the results of the review of in-vehicle technology to measure the identified endogenous and exogenous factors in a reliable way.



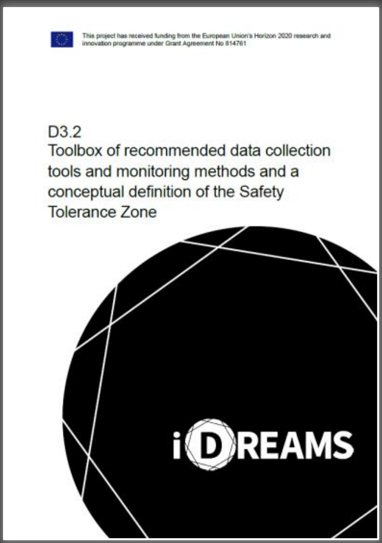
Deliverable 2.2: Technologies for safety interventions and assessment of their effectiveness

This deliverable aims to compare and contrast the available technologies for safety interventions both in real-time (i.e. during a driving session) as well as post-trip. These safety interventions will be a significant module within the *i-DREAMS* project, as they will inform or warn the driver with regards to the real-time safety level, and will provide a gamified coaching platform to enhance long-time driving performance or skills. The findings of this review, form the results of Task 2.2, within WP2 of the *i-DREAMS* project.



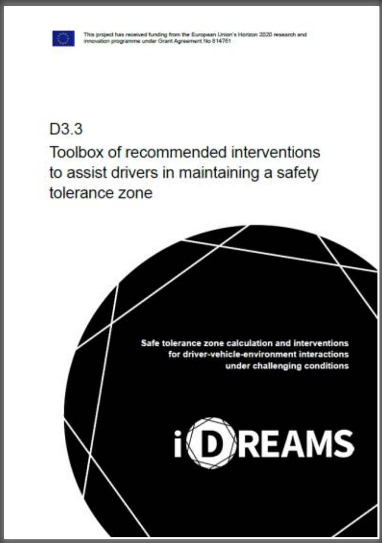
Deliverable 3.1: Framework of operational design of experimental work in *i-DREAMS*

There are two main purposes of this report. The first is to outline the theoretical framework that relates to driver and context monitoring within the *i-DREAMS* platform, with a specific focus on the concept of the Safety Tolerance Zone (STZ). This includes an overview of the theories that describe the driving task and a detailed theoretical description of the *i-DREAMS*' Safety Tolerance Zone (STZ) concept. The second purpose is to define the *i-DREAMS* transport modes and to indicate areas of difference between them that will affect the development of the monitoring and communication tools that will be developed by the project. A survey of stakeholders is presented as part of this work.



Deliverable 3.2: Toolbox of recommended data collection tools and monitoring methods and a conceptual definition of the Safety Tolerance Zone

This deliverable aims to present the practical conceptualisation of the Safety Tolerance Zone (STZ) in order for the project to transition from a theoretical framework for operational design into the practical implementation of the STZ estimation in the subsequent Work Packages (WPs) of the project. In order for this transition to be outlined, the proposed measurements and technologies for driver monitoring and evaluation need to be contrasted with the sensing capabilities of the technologies available within the project and an appropriate modelling framework is defined for the STZ.


This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 814761

D3.3
Toolbox of recommended interventions to assist drivers in maintaining a safety tolerance zone

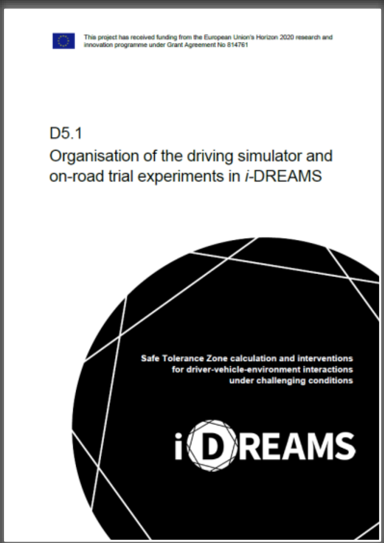
Safe tolerance zone calculation and interventions for driver-vehicle-environment interactions under challenging conditions

i-DREAMS

Deliverable 3.3: Toolbox of recommended interventions to assist drivers in maintaining a Safety Tolerance Zone.

The main purpose of this deliverable is to elaborate on the more precise operationalization of the in-vehicle and the post-trip interventions provided in the *i-DREAMS* platform. The more specific objectives inside the *i-DREAMS* platform are:

- To identify the objectives targeted by the in-vehicle and post-trip interventions.
- To select methods for behavioural change which are appropriate for the achievement of the objectives targeted by the in-vehicle and post-trip interventions.
- To identify critical parameters for the way in which the selected methods will be practically applied in the in-vehicle and post-trip interventions.
- To translate the selected methods for the in-vehicle interventions into material designs (i.e. front-end) that take the critical use parameters into account.
- To translate the selected methods for the post-trip interventions into gamification mechanisms and features (i.e. front-end) that take the critical use parameters into account.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D5.1
Organisation of the driving simulator and on-road trial experiments in *i*-DREAMS

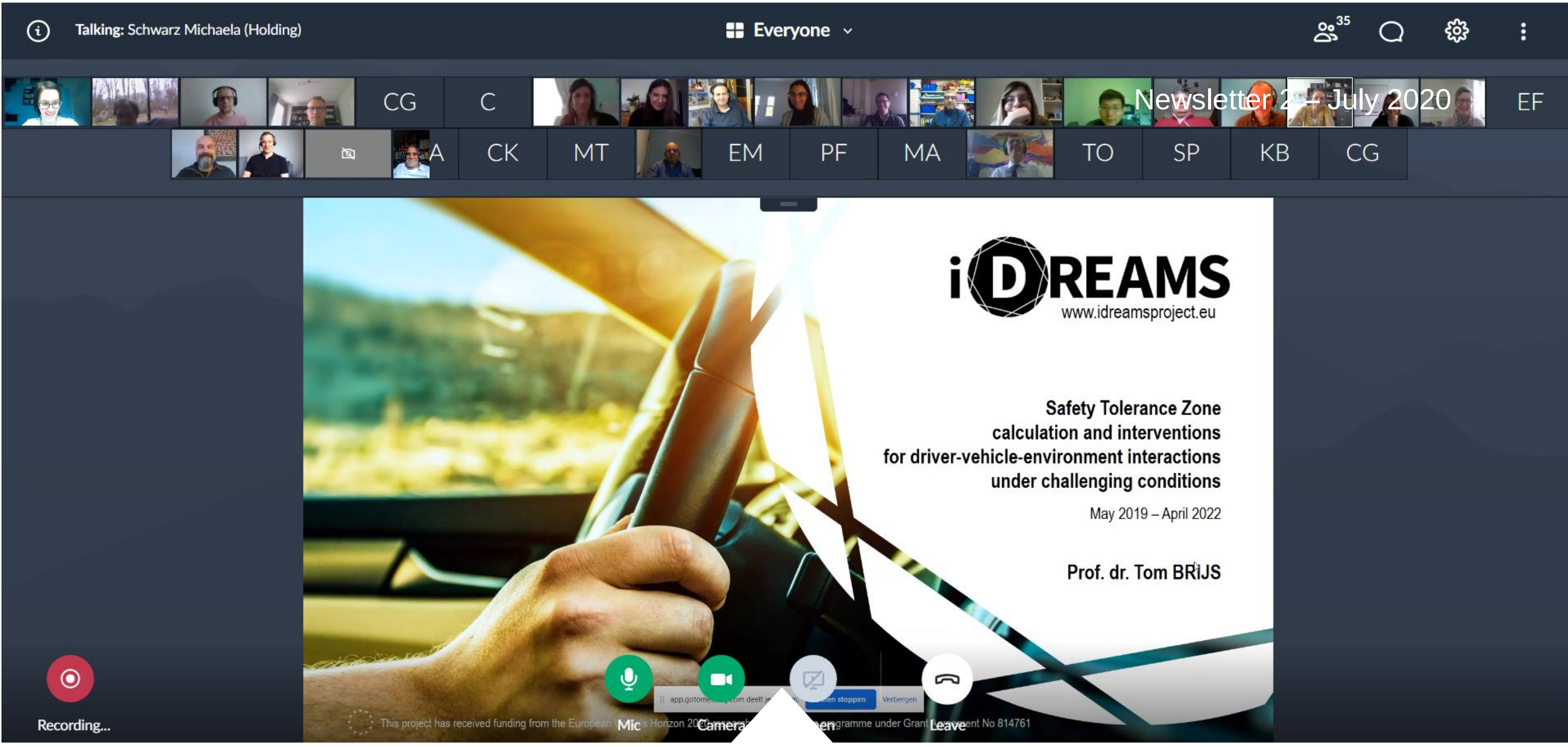
Safe Tolerance Zone calculation and interventions for driver-vehicle-environment interactions under challenging conditions

i-DREAMS

Deliverable 5.1: Organisation of the driving simulator and on-road trial experiments in *i-DREAMS*

The *i-DREAMS* project will feature complex field operational trials (FOTs) across four modes of transport (passenger car, truck, bus and rail) and five countries. FOTs will be preceded by simulator trials to test the *i-DREAMS* platform ensuring the Safety Tolerance Zone (STZ) monitoring technology and model works appropriately.

There are two main purposes of this report. The first is to identify the best practice when planning and implementing FOTs, detailing the steps required by *i-DREAMS* for alignment with these. This includes distinguishing the main lessons learnt from previous large scale FOTs and naturalistic driving studies to ensure *i-DREAMS* takes these recommendations into account. The second is to create a 'roadmap' for the successful implementation of the FOTs and simulator trials. This includes expanding on how project Tasks will build on one another to aid in successful implementation of the trials. Current plans for both the simulator trials and FOTs are outlined, possible legal and ethical issues specific to each trial partner and country of operation are investigated.



MEET THE USER ADVISORY BOARD

The impact of the project is maximised through the User Advisory Board (UAB), which is established right at the start of the project. This UAB acts as a counselling body throughout the project's lifetime. The UAB consists of core stakeholders comprising public authorities, companies, and key international organizations representing road users, associations, fleet operators, vehicle manufacturers and insurance companies. The role of the UAB is to support the consortium in ensuring the research continues to address the key issues as well as to provide suggestions for the implementation (valorisation) of the results.

The UAB will gather at least three times throughout the project. The first meeting was planned on March 30, 2020. Unfortunately due to COVID-19 we were forced to meet digitally instead of in person. Luckily this did not hamper a fruitful gathering. 13 UAB members (out of 22 organisations who are officially part of the UAB), representing 13 different organisations joined the consortium for an interesting day of online sessions where discussions took place and ideas were exchanged. Some important conclusions were provided regarding:

- The type of crashes that is expected to be influenced the most by the i-DREAMS system, namely side (40%) and rear-end (40%) crashes that occur vehicle-to-vehicle (65%).
- The Safety Promoting Goals that are expected to be impacted most significantly by the i-DREAMS system, namely 'driver fitness' (35,4%), 'speed management' (31,2%) and 'sharing the road with others' (25%).
- Potential additional safety performance factors are anxiety, stress, illnesses (e.g. diabetes, sleep apnea), driver impairment due to alcohol and drugs, use of medication and distraction by the use of in-vehicle infotainment systems.

Furthermore a couple of interesting advices were provided on:

- Crucial factors for acceptance of technology such as a precise timing of the provision of interventions, privacy of drivers and human-machine interfaces.
- Market-driven applications for monitoring of truck drivers and bus drivers and the possibility to link i-DREAMS benefits with insurance reduction programs.
- Monitoring technologies where it is pointed out that driver behaviour will be influenced even without interventions, because drivers are aware of being monitored. Also the importance of tailgating, forward collision warning and interaction with pedestrians is emphasized.

The following organisations are represented in the User Advisory Board:

The **Finnish Crash Data Institute OTI** works to prevent road accidents in Finland and provides important information that can be used to improve traffic safety at both legislative and practical levels. The institute operates as an independent unit within the Finnish Motor Insurers' Centre.

Wiener Linien is Vienna's public transport operator and is responsible for some 180 underground, tram and bus lines. The underground network extends to 83 kilometers, the tram network comprises around 220 kilometers, which makes it the sixth-largest in the world, and the bus lines travel a network of 850 kilometers.

Nea Odos is the concession company which has undertaken the construction, operation, exploitation and maintenance of the "Ionia Odos" project, with primary objective to provide safe and faster transportation conditions, as well as high quality services, to all motorway's users in Greece

Budapesti Közlekedési Központ (BKK), (transl. Centre for Budapest Transport), is the largest public transport company in Budapest and one of the largest in Europe. BKK operates buses (200+ lines, 40 night lines), trams (33 lines) and trolleybuses (15 lines).

Edinburgh Trams is a tramway in Edinburgh, Scotland, operated by Edinburgh Trams Ltd. As of 2017 it is a 14-kilometre (8.7 mi) line between York Place in the New Town and Edinburgh Airport, with 16 stops.

The **City of Gothenburg**.

The **International Federation of Pedestrians** (IFP) is an umbrella federation for national pedestrian organisations, promoting and defending walking as a form of sustainable mobility throughout the world.

Autoridade Nacional de Segurança Rodoviária (ANSR) or the National Authority for Road Safety is a central government service with administrative autonomy. ANSR's mission is to plan and coordinate at national level to support government policy on road safety and the application of administrative law to the motorway in Portugal.

Carris (Companhia Carris de Ferro de Lisboa) (Lisbon Tramways Company) is a public transportation company in Lisbon, Portugal. Carris operates Lisbon's buses, trams, and funiculars. It does not operate the Lisbon Metro.

The **RAC Foundation**, located in London, is a transport policy and research organisation which explores the economic, mobility, safety and environmental issues relating to roads and their users.

The **Österreichische Bundesbahnen** or ÖBB (Austrian State Railways; historically also BBÖ) is the largest railway company in Austria.

The **Empresa Municipal de Transportes de Madrid** (also known as EMT Madrid) is the company charged with the planning of public urban transport in the city in Madrid, Spain. Among the services provided by EMT Madrid are urban bus transportation as well as the BiciMAD bicycle-sharing system.

The **Hellenic Institute of Transport** (HIT) is part of the Centre for Research and Technology Hellas (CERTH) which is a non-profit organization that directly reports to the General Secretariat for Research and Technology (GSRT), of the Greek Ministry of Development and Investments. HIT's main objective is the conduct and support applied research activities in the field of transportation in Greece.

Toyota Motor Europe supports the sustained development of Toyota’s operations in Europe, based on their key priorities of superior quality and customer satisfaction

The **European Cyclist’s Federation** (ECF) is a partnership between cyclist’s organisations at European level that promotes cycling as a sustainable and healthy means of transportation and recreation.

Federdrive is the federation of the Belgian accredited driving schools for obtaining driving licences and of the training centres within the framework of the training of professional competence/code 95 for professional drivers (trucks and buses), as well as for the driving proficiency centres.

Safe.T is an innovative online HR program for transport companies and truck drivers. This tool applies gamification principles to continuously monitor and coach drivers through a non-stop learning process.

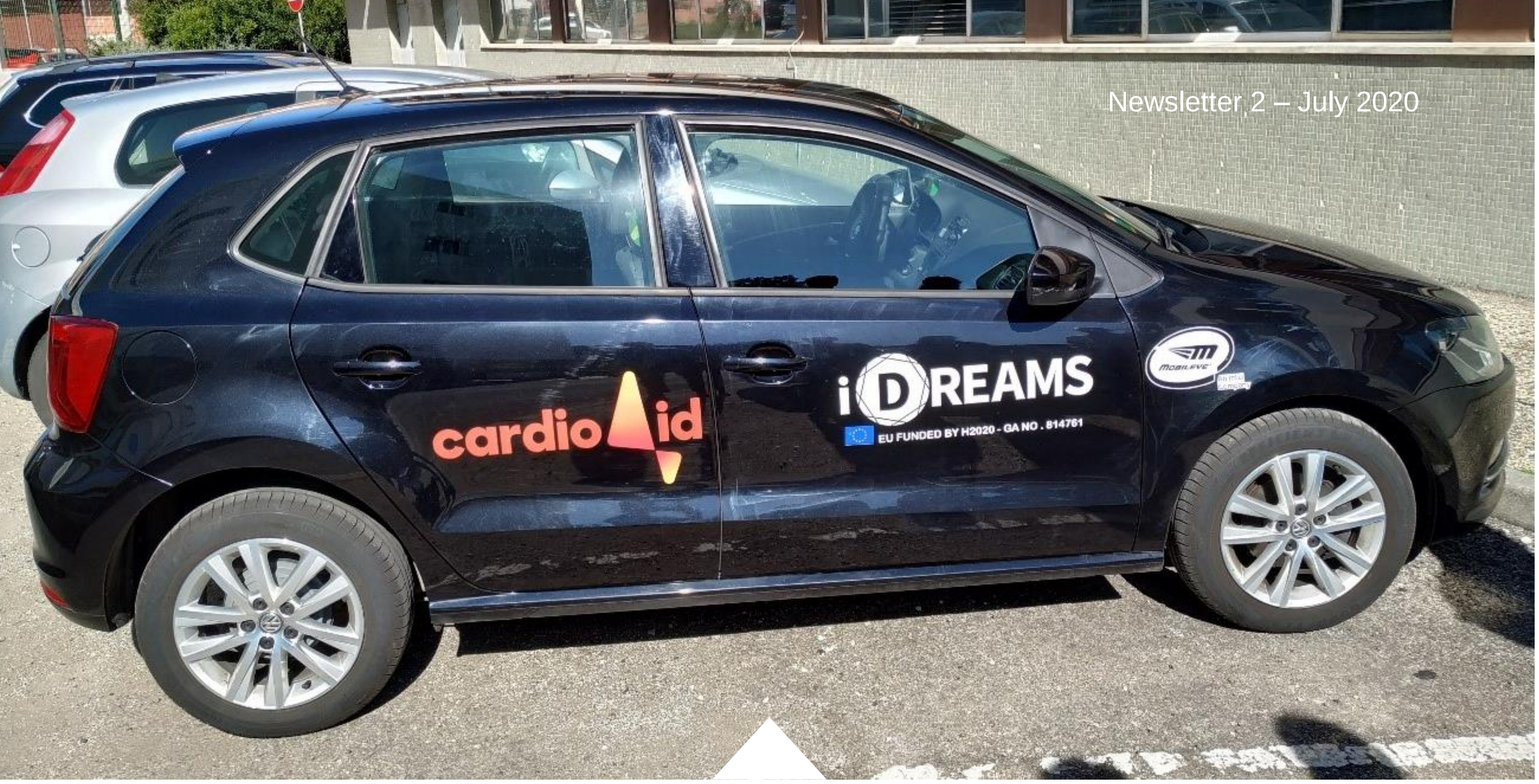
AustriaTech is a non-profit-organisation that focuses all its activities on topics related to digital, connected and automated mobility, decarbonisation and clean mobility as well as mobility innovations. AustriaTech supports the active shaping of these transformation processes in the field of mobility.

The **Automóvel Club de Portugal** (ACP) is a public utility institution, being today recognized as the largest Portuguese club. Its history has followed very closely the economic and social evolution of the country, always in the defense of all drivers, always in search of quality services for members. ACP’s vision is to creat more mobility for a better life.

Interamerican is a leading insurance company in Greece, operating all insurance business lines and engaging more than 1M individual & corporate customers. It belongs to the ACHMEA Group. The company was founded in 1969 and holds a leading position in the Greek market for more than 50 years. Its name is strongly related to the concept of private insurance in the country.

The **Ministry of Transport** of Greece.

The **Athens Public Transport Organization** (OASA S.A.) is a public utility company. Its key mission is the strategic and operational planning, co-ordination and control of the public transport carried out by (ground and underground) public transport means in the Attica Region.



CARDIOID'S INSTRUMENTED VEHICLE

During the i-DREAMS General Assembly meeting in March, in Ericeira, Portugal, the consortium was given the opportunity to get acquainted and go for a short drive on CardioID's instrumented *i-DREAMS* car, equipped with a suite of monitoring technologies to be used in the project:

- CardioWheel - an Advanced Driver Monitoring System that acquires the electrocardiogram from the driver's hands to continuously detect drowsiness, cardiac health problems and biometric identity recognition.
- Mobileye – a camera-based driver assistance system that monitors the road environment and provides drivers with audiovisual warnings of potential hazards on the road.
- CardioID Dashcam – a small camera that records the driving process and provides a roadway scene video triggered by events (e.g. when a Mobileye warning is detected), compliant with the GDPR.
- CardioID Gateway – a customized IoT Edge Processing Unit that allows continuous aggregation of sensor data to estimate the Safety Tolerance Zone and triggers real-time in-vehicle interventions.

"It has been very challenging to create a modular setup that allows such an integration in different scenarios. We have also worked on optimizing all the parts and simplifying the installation procedure, that will allow the scale up of the project required for the upcoming 4-stage 5-country experiment"

ANDRÉ LOURENÇO, CARDIOID

The vehicle has been used for testing of real time monitoring and safety intervention technologies and the data originated from the various experiences has been an important feed into the calibration and refinement of the prototyped technologies.

The Consortium was provided the opportunity to better understand the potential of the hardware and software solutions developed so far, in order to continue to work together on its challenges, considering its large application on the upcoming field trials.

INTRODUCING THE DSS SIMULATOR BUILDERS

THOMAS STIEGLITZ

- Active at DSS since September 2019
- Diploma: Professional Bachelor Electronics-ICT
- Internship at IMOB-UHasselt
- Main task in i-DREAMS relates to electronics and software. More specifically, Thomas integrates hardware of other partners (especially CARDIOID) so that they can communicate at software level in the driving simulator. Futhermore he builds equipment and designs driving scenarios.

BART DE VOS

- Active at DSS since June 2019
- Diploma: Engineer Electromechanics with specialization "Automotive"
- As hobby he likes to work/play with simulators, thus DSS was the logical step.
- Main task in i-DREAMS is taking care of the mechanical design of the simulators and building the simulators. The aim is to make the simulators as similar as possible to real vehicles;

"As a technical layman, I had the pleasure to chat with the DSS builders about their activities in i-DREAMS. I imagined a very complicated conversation where I could hardly understand what they were talking about. Surprisingly though, they caught my interest and my admiration for their work has only increased."

EDITH DONDERS
ADMIN / DISCOM MANAGER i-DREAMS

CAR SIMULATOR

How difficult or easy is it to build a simulator?

Bart: *"The actual building is not that difficult, but it takes a lot of preparation. You start from an idea that you have to realize from scratch. Drawing in 3D, finding suitable parts, finding suppliers and then you can build. Parts are not made for a simulator, you often have to adjust them yourself to make them fit. It is actually a large construction kit where you first have to collect the pieces yourself before you can assemble them."*

Thomas: *"For me it is not so difficult, Bart does the hard work (laughs). The frame is there, I choose the screens that fit and I build the computer that can run the software. Then there is still some small electronics such as designing printed circuit boards and performing small-scale things. At the end I have to make sure that everything can communicate with each other and comes together in the simulator software."*

How do you ensure that a simulator mock-up is as similar to an actual vehicle as possible?

Bart: *"We started from the vehicle itself. The car simulator is based on a Peugeot 2016. We took those parts out of the car. We made the dimensions between objects as truthful as possible and compared them with different cars. Thomas has been in trucks as well and tried to take all the impressions he got from that with him."*

Thomas: *"I installed hardware in a few trucks for i-DREAMS. Then I took the time to feel everything, to photograph and to take measurements. We just started from there."*

You have a specific budget for building the simulators. Would they look differently if there was no budgetary restriction?

Thomas: *"The most important constraint for us is not the budget, but the time.*

There is not always enough time to experiment with everything.”

Bart: *“For example, we would like to integrate some kind of movement. That is indeed expensive, but if also takes a lot of time to research how to build that. But that would make it more truthful.”*

What are the main differences between a simulator and a real vehicle?

Bart: *“The visual aspect for sure. In a car you automatically tune in to the environment. But in the simulator you look at a computer image so that experience is very different. But we try to recreate it as good as possible. We cannot replicate the movement, but we do imitate forces in the steering wheel for example to make the experience as truthful as possible.”*

Why do we actually work with screens and not with 3D glasses so that you as a driver can look over your shoulders for example?

Thomas: *“That's a good question. It comes down to the same thing as with us wanting to recreate movement. The technology behind it is all new and not compatible with our current simulator software.”*

Bart: *“It also creates new problems. You will no longer see your steering wheel. And also with regard to "motion sickness" in the simulator, this is an extra risk for some people.”*

I know there are apps that allow you to see a new kitchen in the room before it is even built. And you can still see what is already in that space. Do 3D glasses not work in such a way?

Bart: *“Well, that is called "mixed reality" and generates 2 images together which is even more difficult because the computer then has to distinguish between what is real and what is being made. As far as I know that does not yet exist for simulators. And on the other hand, there is "virtual reality" where you are completely in a virtual environment.”*

Thomas: *“We've talked about it many times and dream about it though. Someday we will do this. We hope to be the first to come up with that. That would be nice!”*

Which scenarios have you already worked out to test in the simulators?

Thomas: *“For the time being, everything is still theoretical. There are no concrete scenarios yet. The scenarios we use now only serve to test the hardware. Of course, they contain all the elements that will be included in the formal test scenarios later. The documentation describing what the official scenarios should look like is already available. It will be my job to program those scenarios now.”*

How do you start with something like that?

Thomas: *“I get a description of things that need to be included in a scenario such as a traffic situation that needs to occur. Then I start programming the vehicles that carry out what is described and I first make sure that this works perfectly. If that's okay, then I start building the environment around it.”*

What has been the main challenge so far in building the simulators?

Thomas: *“For me, that was the communication between the simulation software and the hardware that CARDIOID provided. To get all that seamlessly in one data file. That took some serious time.”*

And what was so difficult about that?

Thomas: *"After a simulation you get one data file containing all parameters that you want to save. When you add new hardware from outside, you also want the parameters they offer to be in your data file. That is not supported by default. What actually needs to be done is: you have to constantly ask the hardware whether data is available and to send it. This forwarding must be done without errors and then it must be written to the data file. The communication between the two went well in itself, but there was always a delay. That has now been resolved."*

Bart, what was the biggest challenge for you?

Bart: *"A bit the same, also the integration of the i-DREAMS material with the material of the vehicle or the parts we purchased. That requires a lot of measuring and adaptation work. The bottom line is that you can't make your design beforehand before the pieces are there. So afterwards you have to improvise and adjust a lot to come to something that must also feel truthful."*

What do you think is the most important added value of the simulators in the project?

Thomas: *"I consider it to be the prototype. You can test everything perfectly in a safe environment. And we can already use the hardware from CARDIOID and test it perfectly without anyone really having to get in a car to take a ride. I think that's the biggest advantage."*

And may I assume that when hardware works in the simulator it will also work with 100% certainty in a real car or is there still some difference here and there that you have to take into account?

Thomas: *"It is actually designed for a real car, so implementation in the simulator is always more difficult than in the car. So chances are very small that if something works in the simulator it wouldn't work in the car. Furthermore, we have already equipped a number of vehicles for testing as well."*

Bart: *"I also spent some time working on CAN messages. These are communication protocols that are used in the car. Because our simulator does not have the same sensors that are in a car, but the hardware expects to have them all. In the simulator it is therefore a challenge to be able to send all the information about speed and braking behavior … to the hardware. A car is automatically equipped for that. You just have to connect with a cable and you have all the information. But that cable does not exist in the simulator. So getting all that information to the hardware is quite a challenge."*

But where do you get data of speed and braking behavior etc in the simulator?

Bart: *"In a car it comes from sensors. For example, the car engine is running and there is a sensor on it that shows the speed. With the simulator, that information is calculated in a program, so in the software itself. And we can extract and process it in realtime to simulate the signal sent out in a car. And then we have to get that signal into the hardware of CARDIOID. In a car, that communication with the hardware occurs simply via a cable, but in the simulator there is still a translation to be done."*

OK, it is clear that the work you are doing is immense and also very impressive. I think you can both write a doctorate about this perfectly (laughing).

<u>Thomas</u>: *“What is striking in the simulation world, is that people don't like to share information. We are certainly not the first to do this, but no one is publishing about it.”*

<u>Bart</u>: *“We understand that though, because of course there is an important commercial factor. This is also the case with us. We would like to give a global overview of what we have done, but we are not keen on revealing the specific developments that we carried out.”*

“Of course, you have gold in your hands now, so let’s keep it there. Thank you both, for your time and for everything you have realized zo far!”

EDITH DONDERS
ADMIN / DISCOM MANAGER i-DREAMS

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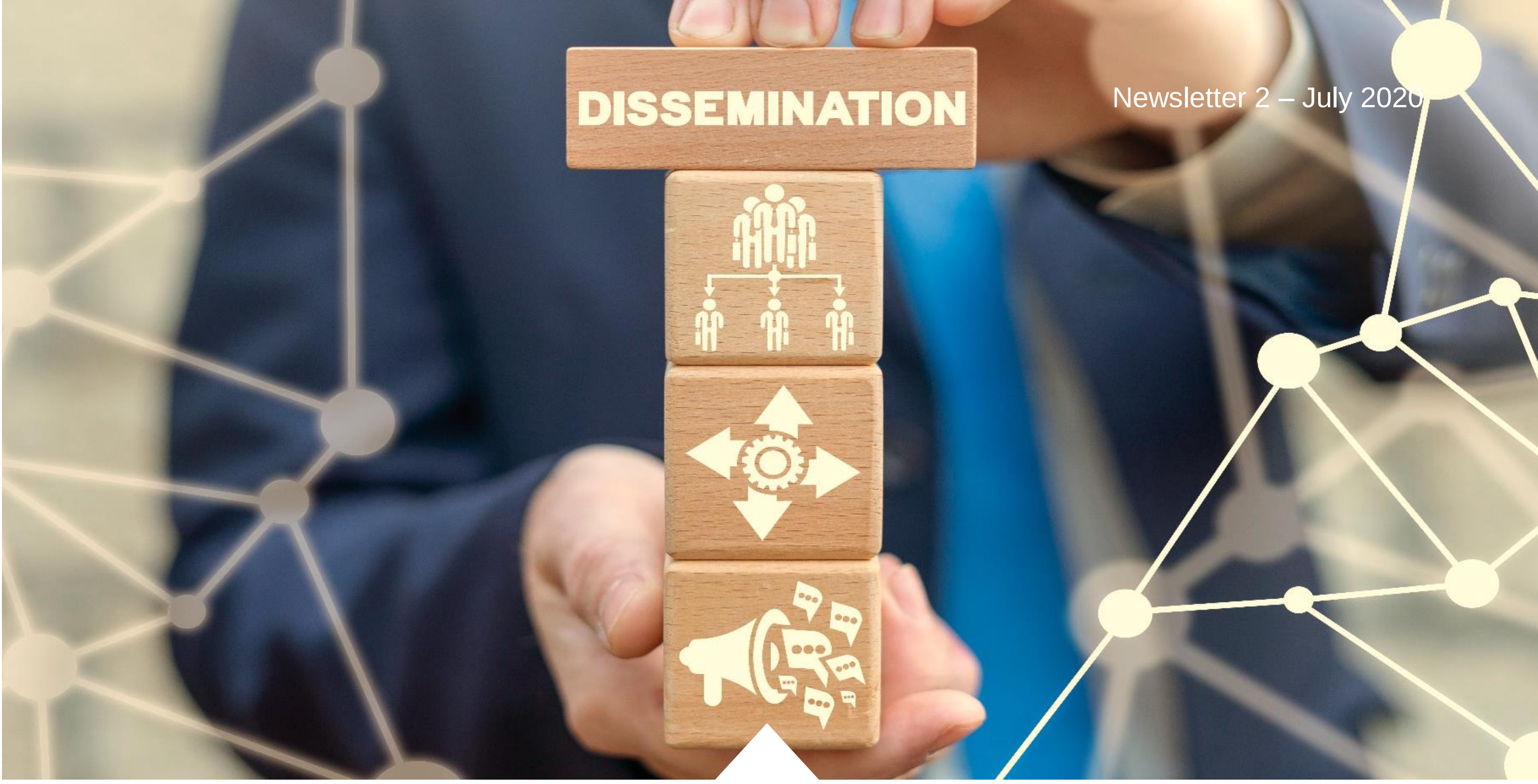
TRUCK SIMULATOR



i-DREAMS OUTPUT

Publications

Brijs T., Mauriello F., Montella A., Galante F., Brijs K., and Ross V. (2020) A Simulator Based Evaluation of the Effect of an ADAS on Lateral Clearance during Cyclist Overtaking by Cars. Paper accepted for publication in: Proceedings of the 7th Humanist Conference, Rhodes Island, Greece, 24-25 September 2020.

i-DREAMS CALENDAR

Internal activities

11-12
Mar 2020

i-DREAMS Third Steering Committee / First General Assembly
hosted by BARRA in Casa de Cultura Jaime Lobe e Silva, Ericeira, Portugal

30
Mar 2020

i-DREAMS First User Advisory Board
hosted by POLIS – online (due to COVID-19)

8-9
Jun 2020

i-DREAMS Fourth Steering Committee / First Extraordinary General Assembly
hosted by LOUGHBOROUGH UNIVERSITY – online (due to COVID-19)

Upcoming Activities

15-16 Oct 2020	**i-DREAMS Fifth Steering Committee / Third Data Knowledge & Management Committee / Second General Assembly** hosted by ETSC – physical or online, depending on the COVID-19 situation
30-1 Nov-Dec '20	**H2020 Road Transport Research Results conference in Brussels** Hosted by the European Commission together with the European Road Transport Research Advisory Council (ERTRAC) and the European Green Vehicles Initiative Association (EGVIA)
10-11 Dec 2020	**i-DREAMS Sixth Steering Committe / Second Expert Advisory Board** Hosted by TUM – physical or online, depending on the COVID-19 situation.

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