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

iDREAMS

NEWSLETTER

No. 5

June 2022

IN THIS ISSUE

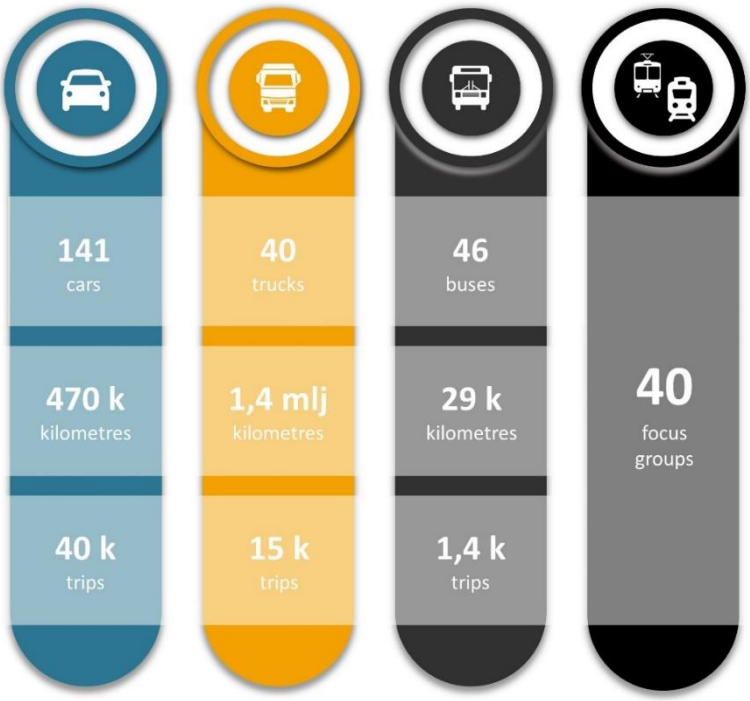
DEAR READER,

30 April 2022 marked the original end of the i-DREAMS project. However, due to corona, we were granted a one-year extension to carry out all of our plans. And although corona still left its mark on our activities, I am proud to say that the team realized some major achievements during the last couple of months.

Although we are still dealing with interrupted supply chains of electronic components, we were able to finalize the technology to continue with our field trials. Early this year we started the second wave of the field trials. To boost the participant recruitment, our team implemented an iOS version of the i-DREAMS smartphone app, which was not originally planned. To be able to efficiently start the second wave of the field trials additional recruiting efforts were organised, first wave vehicles were de-installed, first-wave participants debriefed and defective materials repaired. We then continued with new installations in cars, trucks and buses, new communication campaigns were started, aiming to support and guide drivers throughout their 18-week participation period. In parallel a back-office database was developed to manage and visualize all the collected data that was coming in. We started the pre-processing of big data and defined target variables and scripts for data analysis.

The first preliminary results from the Belgian and UK first wave field trials became available leading to a couple of interesting scientific papers. You will find them further in this newsletter.

Finalizing the field trials and analysing all the data will be the core focus of the last 12 months of our project. With the analysis scripts in place, I am really looking forward to some interesting results. The amount of material we are able to work with is immense. With the second wave of the field trial still ongoing, we already collected about 2 million kilometres of data. We currently have 141 cars, 40 trucks and 46 buses driving around with the i-DREAMS technology. Furthermore 40 focus groups with tram and train drivers were completed. In the upcoming months 80 cars, 46 trucks and 54 buses will be further equipped and 30 extra tram and trains drivers will be interviewed in focus groups.

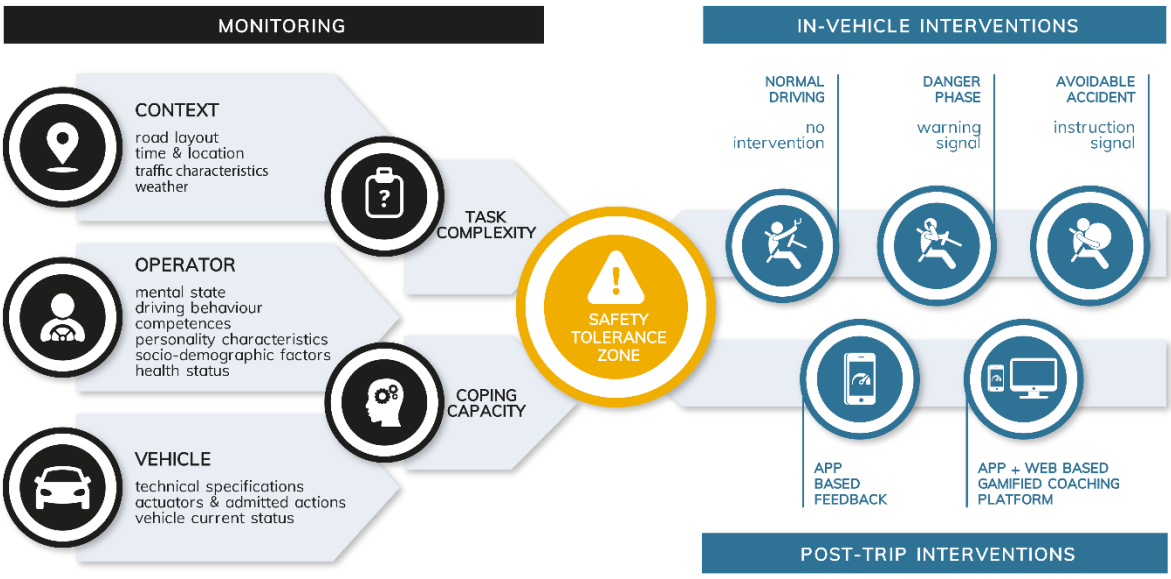


An impression of the current status of the field trials

Of course, the ultimate goal of i-DREAMS is to fill a need that we have identified in the market and in society. Bringing our products to the market is the essence of the eighth work package, led by Hasselt University. In this newsletter we interviewed a couple of researchers involved in WP8 to get a better insight in the strategy and the approach the consortium applies.

Again, I hope you will read this newsletter with great interest and enjoyment. With the summer holidays just around the corner, I wish you some well-deserved vacation days.

PROF. DR. TOM BRIJS
COORDINATOR



i-DREAMS IN A NUTSHELL

An important part of any Horizon 2020 project is valorisation. The research that is conducted and the results that emerge from it must contribute something to the market and society and provide an answer to the needs that exist. Before we take a closer look at the needs we are trying to cover and how we do that, let us recap what we are developing within i-DREAMS.

In i-DREAMS, we are developing a system that can monitor driver status (e.g. distraction, fatigue), driving context (e.g. speed limits, weather) and driver behaviour (e.g. lane positioning, headway, speed choice) and algorithms are created to evaluate driving related risks in real-time. During a trip, warnings are given when safety drops below a critical threshold with the aim of keeping drivers within a 'safety tolerance zone'. The safety tolerance zone is a continuum that distinguishes three phases: the 'normal or safe' phase, a 'danger' phase where the risk of a collision increases and an 'avoidable accident' phase where action must be taken to prevent a collision. Our i-DREAMS system detects when the driver enters the danger phase and issues a warning. When entering the "avoidable accident phase" an instruction to act is given. In addition to these warnings in the vehicle, the driver also receives coaching information after the trip. Via the i-DREAMS smartphone app, the driver can look back on the trips made and the dangerous situations that were identified. In addition, tailor-made advice is given on the safety performance achieved while driving. Finally, the driver can take up challenges in order to further improve his own performance.

HOW TO BRING i-DREAMS TO THE MARKET AND SOCIETY?

The goal of work package 8 is to bring the research results to the market and society. We had a talk with Geert Wets (WP leader), Klaus Machata (task leader) and Amir Poyan Afghari (task leader), to see how we try to realise this ambition within i-DREAMS.

Geert Wets, Hasselt University

Finding a place for i-DREAMS within the market and society seems to be a challenging task. What is the first thing you have done in this regard?

Geert: “We started by drawing up a framework agreement between all the partners. This agreement clarifies the exploitation rights between all partners so that everyone can play their part in the best possible way. On the one hand, the three commercial partners (CARDIOID, OSEVEN PC and DSS) will be able to valorise the project results at the end of the project.

On the other hand, the data, for which a data centre was set up, can still be used by the research partners in such a way that new things can be realised in the research field. All this, of course, with respect for the European GDPR legislation."

And what was your strategy to approach the market?

Geert: "The entire i-DREAMS product that we have developed is actually quite complex. That is why we looked at the existing components in it. We then performed a mapping between all those components and what the markets demand. On the one hand, we then looked at what the possible submarkets are, for example delivery vans, the training sector, buses, etc. A business model canvas was drawn up for these different submarkets, and on this basis, we looked at what a first product or component could be that you could launch in such a submarket. We looked for the best fit between the needs of the market and the existing components. For example, in the case of delivery vans, it is important that the product is simple and easy to install. So, there we mainly looked at the smartphone component. For buses, a more complex solution is realistic. There we can offer the complete i-DREAMS product. It comes down to achieving a good market fit."

How did you go about selecting certain submarkets?

Geert: "By talking to the market in particular. For example, we had a lot of discussions with the insurance sector to see what the specific challenges are. One of the things that emerged was that insuring delivery vans is a major problem. The clear increase in e-commerce has led to an equally clear increase in damages. To get some control over that issue, a solution like i-DREAMS (or some part of it) can make sense. But you have to be able to introduce that in a low-threshold way, because you are approaching relatively small companies. Sometimes even one-man businesses. The ideal situation would then be that when an insurance contract is closed, an i-DREAMS solution (or a component of it) is included in the package."

Are there any concrete leads to further roll out the valorisation of i-DREAMS?

Geert: "There are a number of potential leads that we are following up. For example, there is a truck company that also participated in the field trial and that would like to continue the activities. By following up in this way, we can further refine the product-market fit. The valorisation partners (CARDIOID, OSEVEN PC and DSS) are currently looking into the modalities of how this further valorisation can be rolled out after the project. In addition, a test is currently running with the staff of an insurance broker. They want to explore the possibilities of the smartphone app with to find out if a possible commercial collaboration after the project is desirable. In the best case, this could lead in the future to an insurance broker recommending the app to companies who want to insure their fleets. These are all leads that we are now trying to follow-up in order to commercialise i-DREAMS technologies after the project ends."

Where would we like to be in terms of valorisation within five years, within the limits of what is feasible of course?

Geert: “The project's ambition has always been to bring about a safety culture in a sector where there are many challenges in terms of safety. Think of the transport sector, delivery vans (in the context of e-commerce) ... where there is often the feeling that there is too little focus on road safety, but rather on economic profitability and speedy service to the customer. If we succeed in using our technology to install a safety culture in such a company, so that drivers are more aware of their behaviour and adapt where necessary, then we can say that our project has had a significant added value for companies.”

Klaus Machata
Kuratorium für Verkehrssicherheit

There are many other actors that play an important role besides commercial companies, such as governments and interest groups. How do we go about approaching them?

Klaus: “It is of course also the intention that the i-DREAMS results help these groups in their activities to improve road safety. A matrix is currently being drawn up within the consortium. In it, we are mapping out which of these stakeholders could be interested in what i-DREAMS has to offer. In the first instance, this will be the European Commission itself. The exercise is set out very broadly, so that stakeholders can even be identified at the local level. It is now up to all partners to use their knowledge and networks to put forward those target groups.”

Which of these target audiences do we want to approach within the course of the project? Aiming directly at everything and everyone does not seem feasible.

Klaus: "That is true, but working with a layered system is also possible and perhaps even advisable. By aiming at the larger parties, you will also indirectly reach their members and expand your reach like an ink stain. It will be impossible for the consortium itself to directly address every identified target group.“

Once the groups are selected that we want to approach ourselves, how do we proceed?

Klaus: "We will look at which channels we can use to reach these target groups as efficiently as possible. One possibility is even to add a third dimension. Whereby you tune the choice of your communication channels to the project output that you want to communicate to a specific target group. So, it mainly comes down to mapping out who you want to reach, what you are going to communicate and how you are going to do it.We will have to estimate what each target group might be interested in, because that determines the content of your message. Once the matrix is in place, we will have to do an important selection exercise as well. After all, realising everything will not be feasible. It is crucial to clearly define what we are going to focus on and to motivate why we do so. In this exercise, we obviously try to make choices that will allow us to achieve the greatest possible impact.“

What are the concrete ambitions regarding this social valorisation that we want to realise within this project?

Klaus: "I think that the path to successful social valorisation must be made concrete. And in my opinion, this can be done primarily by working out a number of specific examples. For instance, you choose five target groups from the matrix on which to focus. These are the five target groups where we expect to achieve the most impact. For each of these five target groups, you work out a tailor-made valorisation track. This implies that you work out what you want to communicate to each of these 5 target groups, how you are going to do it and what your intended result is. On the basis of feedback from these target groups, you can then check whether the intended result has been achieved.”

Amir Poyan Afghari
Technical University Delft

What can all this newly acquired knowledge mean for other modes? What can aviation, maritime and rail traffic learn from our experiences and what can we learn from theirs?

Amir: "Although our conceptual framework and technologies are road focused, we believe that they can be applied to other sectors too because there are common factors underlying risk in all of these sectors. We map what their modus operandi is on safety research and intervention.

We do that on the basis of literature review and in-depth interviews with safety experts who are network managers, safety trainers, and fleet operators. The interviews are currently being processed. A qualitative thematic analysis will then be carried out.“

Are there already some things that stand out after the literature review and after the interviews?

Amir: "Certainly, on the one hand we can see some similarities between the sectors. Fatigue, sleepiness, spatial disorientation, stress, and situational awareness are common risk factors in all of the sectors. But there are fundamental differences between sectors too. In the maritime sector, for example, speeds are much lower and distances are much higher than those on the road. The right decisions must be taken much earlier, often when the ships are still kilometres apart. A tanker is not something you can just stop and turn easily. The best-known example of this, of course, is the Titanic. When they saw the iceberg, it was already far too late and the worst could not be avoided. In aviation too, the monetary and societal cost of aircraft collisions are much higher than that of cars on the road. The aim, therefore, is to prevent control errors which occur much earlier than collisions.”

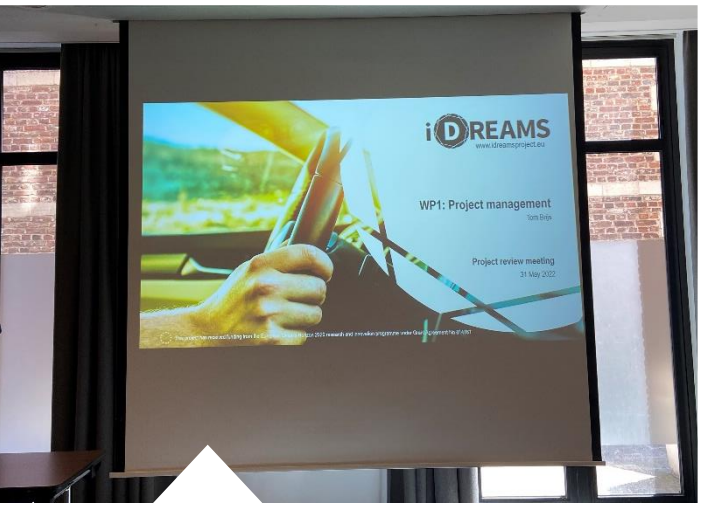
How comparable is the safety issue between maritime, aviation and road transport?

Amir: "It is true that there is already a real safety culture in the aviation and maritime sectors, whereas this culture is not yet equally well established in road transport. In a number of areas, aviation and maritime are already much further ahead than passenger and freight traffic on the road. But on the other hand, the complexity of the problems is also much higher on the road. This is simply due to the number of factors involved in road risk. For example, everybody is a driver on the road; roadway design affects the behaviour of these drivers too. You cannot compare the interaction between these factors with the number of risk factors in aviation. This means that, to some extent, the problems are different.”

Which aspect of i-DREAMS research do you think has the most potential within aviation and maritime?

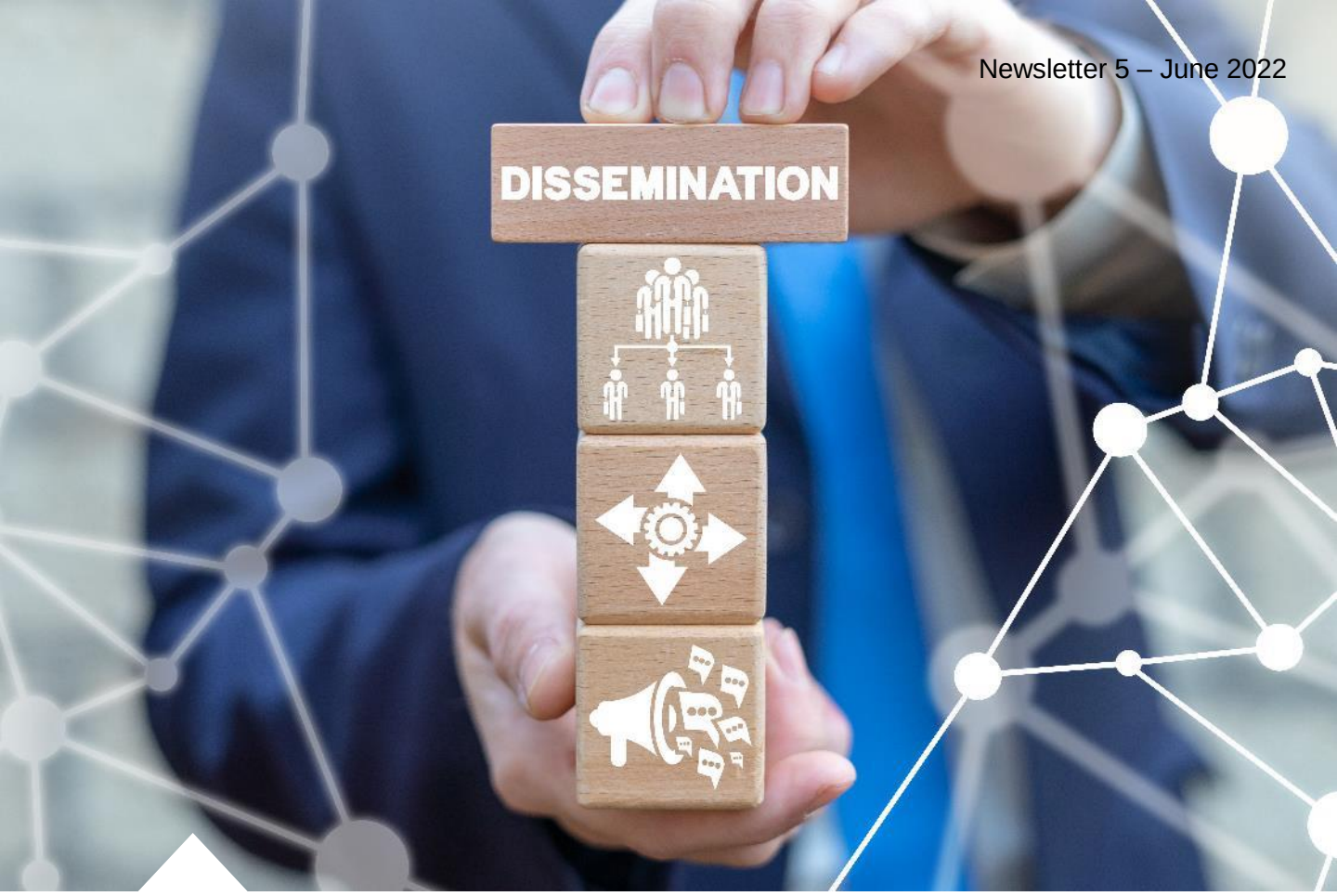
Amir: "What is a very interesting avenue to explore for aviation and maritime is the whole post-trip intervention approach. We are doing thorough research into this, and it is an area that has hardly been explored in these other sectors. In aviation and maritime, safety interventions take place either before or during the journey. The whole notion of providing feedback to operators in a post-trip intervention approach is definitely an aspect that could provide additional benefits. I believe it is at least worthwhile to explore it in aviation and maritime.”

EDITH DONDERS
DISCOM MANAGER i-DREAMS



SECOND SUCCESSFUL REVIEW MEETING ON MAY 31

A second review meeting was organised on May 31, 2022. The plan was to finally meet again in person in Hasselt. This time not corona, but public transport strikes disrupted those plans. We therefore met in a hybrid setting, some us gathering at the Holiday Inn in Hasselt, the rest of the consortium and the project officer joining remotely. Luckily the presentations and the discussions did not suffer from this setback. All the activities, realisations and challenges from the second period were thoroughly discussed with the project officer. The conclusion was that the project officer congratulated us on our efforts and results achieved so far. Some positively constructive reviews were formulated and were taken to heart by the consortium. We are looking forward to putting them in practice during the last 12 months of the project.



i-DREAMS DISSEMINATION ACTIVITIES

Participation in conferences and workshops

22 Feb 2022

Katrakazas C., Michelaraki E., Garefallakis T., Adnan M., Yannis G. "Driver-vehicle-environment interactions and the safety tolerance zone – i-Dreams". for the Telematics and Improvement of Driver Behavior **Workshop organised by NTUA**, Athens, Greece.

7 Jun 2022

i-DREAMS workshop (09:00-13:00) as part of the **'8th Road Safety & Simulation International Conference**'.

(More info: https://www.nrso.ntua.gr/rss2022/)

8 - 10 Jun 2022

Participation in the '8th Road Safety & Simulation International Conference', Athens, Greece – With several presentations of the i-DREAMS consortium and Prof. dr. Tom Brijs as keynote speaker (More info: https://www.nrso.ntua.gr/rss2022/)

Scientific publications

Papers and presentations, resulting from the RSS conference (June 2022)

- Methodology for the Evaluation of Safety Interventions
  (Eva Michelaraki, Christos Katrakazas, Ashleigh Filtness, Rachel Talbot, Graham Hancox, Chiara Gruden, Ariane Cuenen, Kris Brijs, Tom Brijs and George Yannis)
  Paper – Presentation
- Real-Time Monitoring of Driver Distraction: State-of-the-art and future insights
  (Eva Michelaraki, Christos Katrakazas, Susanne Kaiser, Tom Brijs and George Yannis)
  Paper
- Modeling the concept of a Safety Tolerance Zone: State-of-the-art and proposed alternatives
  (Eva Michelaraki, Christos Katrakazas, Amir Pooyan Afghari, Eleonora Papadimitriou, Christelle Al Haddad, Kui Yang, Constantinos Antoniou, Tom Brijs and George Yannis)
  Paper – Presentation
- Analyzing driver eye movements to investigate the impact of distraction on driving behaviour
  (Roja Ezzati Amini, Christelle Al Haddad, Debapreet Batabyal, Alyssa Ryan, Isidora Gkena, Bart De Vos, Ariane Cuenen, Tom Brijs and Constantinos Antoniou)
  Paper – Presentation
- Analysis of an advanced driver-assistance system to improve safety of cyclists overtaking by driver characteristics
  (Filomena Mauriello, Tom Brijs, Alfonso Montella, Francesco Galante, Kris Brijs and Veerle Ross)
  Paper – Presentation
- Risk factors, monitoring techniques, and intervention strategies: experiences and lessons from different transport sectors
  (Amir Pooyan Afghari, Eleonora Papadimitriou, Sally Maynard, Rachel Talbot, Ashleigh Filtness and Geert Wets)
  Paper – Presentation
- The effectiveness of an intelligent speed assistance system with real-time speeding interventions for truck drivers: a Belgian simulator study
  (Bart De Vos, Ariane Cuenen, Veerle Ross, Hélène Dirix, Kris Brijs and Tom Brijs)
  Paper – Presentation

Other publications

- Kaiser, S., Katrakazas, C., Aigner-Breuss, E., Pilkington Cheyney, F., Ziakopoulos, A., Yannis, G. & Brijs, T. (2020). State of the art on measuring driver state and technology-based risk prevention and mitigation Findings from the i-DREAMS project. Proceedings of TRA2020, *the 8th Transport Research Arena Rethinking transport – towards clean and inclusive mobility*. (Repository link: https://hdl.handle.net/2134/11949252.v1)

- Yang, K., Zhao, W. & Antoniou, C. (2020). Utilizing Import Vector Machines to Identify Dangerous Pro-active Traffic Conditions. *23rd International Conference on Intelligent Transportation Systems (ITSC)*, IEEE, pp. 1-6.
  (DOI: 10.1109/ITSC45102.2020.9294284)
  (Repository link: https://arxiv.org/abs/2101.07683)

- Al Haddad, C., Yang, K., Yannis, G. & Antoniou, C. (2021). Exploring driving behavior as a latent variable in safety modeling. A preliminary analysis from a driving simulator study. *Online proceedings of the 9th Symposium of the European Association for Research in Transportation (hEART 2020).*
  (PDF: https://transp-or.epfl.ch/heart/2020/abstracts/HEART_2020_paper_167.pdf)

- Alam, R., Al Haddad, C., Antoniou, C., Carreiras, C., Vanrompay, Y. & Brijs, T. (2021). A big data-as-a-service architecture for naturalistic driving studies*. 7th International Conference on Models and Technologies for Intelligent Transportation Systems (MT-ITS)*, IEEE, pp. 1-6.
  (DOI: 10.1109/MT-ITS49943.2021.9529322)
  (Repository link: https://documentserver.uhasselt.be/handle/1942/36037)

- Amini, R.E., Michelaraki, E., Katrakazas, C., Al Haddad, C., De Vos, B., Cuenen, A., Yannis, G., Brijs, T. & Antoniou, C. (2021). Risk scenario designs for driving simulator experiments. *7th International Conference on Models and Technologies for Intelligent Transportation Systems (MT-ITS)*, IEEE, pp. 1-6.
  (DOI: 10.1109/MT-ITS49943.2021.9529268)
  (Repository link: https://documentserver.uhasselt.be//handle/1942/36038)

- Michelaraki, E., Katrakazas, C., Yannis, G., Filtness, A., Talbot, R., Hancox, G., Pilkington-Cheney, F., Brijs, K., Ross, V., Dirix, H., Neven, A., Paul, R., Brijs, T., Fortsakis, PK, Frantzola, E.K. & Taveira, R. (2021). Post-trip safety interventions: State-of-the-art, challenges, and practical implications. *Journal of Safety Research*, 77, p. 67-85. (DOI: 10.1016/j.jsr.2021.02.005)
  (Repository link: https://documentserver.uhasselt.be/handle/1942/34402)

- Michelaraki, E., Katrakazas, C., Yannis, G., Frantzola, E.K., Kalokathi, F., Kaiser, S., Brijs, K. & Brijs, T. (2021). A Review of Real-Time Safety Intervention Technologies. *Proceedings of the 7th Humanist Conference*, Rhodes Island, Greece, pp. 1-6.
  (PDF: https://www.nrso.ntua.gr/geyannis/wp-content/uploads/geyannis-pc432.pdf)

- Michelaraki, E., Katrakazas, C., Yannis, G., Filtness, A., Talbot, R., Hancox, G., Pilkington-Cheney, F., Brijs, T., Brijs, K., Ross, V., Dirix, H., Neven, A., Paul, R., Fortsakis, P., Frantzola, E.K. & Taveira, R. (2021). State-of-the-art Technologies for Post-Trip Safety Interventions. *Proceedings of the 7th Humanist Conference*, Rhodes Island, Greece, pp. 1-6.
  (PDF: https://www.nrso.ntua.gr/geyannis/wp-content/uploads/geyannis-pc431.pdf)

- Pilkington-Cheney, F., Afghari, A.P., Filtness, A., Papadimitriou, E., Lourenço, A. & Brijs, T. (2021). The i-DREAMS intervention strategies to reduce driver fatigue and sleepiness for different transport modes. *7th International Conference on Models and Technologies for Intelligent Transportation Systems (MT-ITS)*, IEEE, pp. 1-6. (DOI: 10.1109/MT-ITS49943.2021.9529340) (Repository link: https://documentserver.uhasselt.be/handle/1942/36068)

- Brijs, T., Brijs, K., Kaser, S., Talbot, R., Lourenço, A., Antoniou, C., Yannis, G., Avenoso, A. & Wets, G. (2020). i-DREAMS: an Intelligent Driver and Road Environment Assessment and Monitoring System. *Proceedings of 8th Transport Research Arena TRA 2020*, pp.1-5. (Repository link: https://documentserver.uhasselt.be/handle/1942/34028)

- Brijs, T., Mauriello, F., Montella, A., Galante, F., Brijs, K. & Ross, V. (2021). Driving simulator evaluation of an advance warning system for safe cyclist overtaking. *International Cycling Safety Conference*, Lund, Sweden. (PDF: https://www.icsc-2021.net/wp-content/uploads/Abstracts/ICSC-2021-00108.pdf)

- Michelaraki, E., Katrakazas, C., Brijs, T. & Yannis, G. (2021). Modelling the Safety Tolerance Zone: Recommendations from the i-DREAMS project. *Electronic proceedings of the 10th International Congress on Transportation Research*, pp. 1-18. (PDF: https://www.nrso.ntua.gr/geyannis/wp-content/uploads/geyannis-pc398.pdf)

- Qing-Long, L., Yang, K. & Antoniou, C. (2021). Crash risk analysis for the mixed traffic flow with human-driven and connected and autonomous vehicles. *International Intelligent Transportation Systems Conference (ITSC)*, IEEE, pp. 1-6. (DOI: 10.1109/ITSC48978.2021.9564897)

- Al Haddad, C., Yannis, G. & Antoniou, C. (2021). Driving Behavior Safety Levels: Classification and Evaluation. *7th International Conference on Models and Technologies for Intelligent Transportation Systems (MT-ITS)*, IEEE, pp. 1-6 (DOI: 10.1109/MT-ITS49943.2021.9529309)

- Amini, R.E., Al Haddad, C., Batabyal, D. & Ryan, A. (2022). Analyzing Driver Eye Movements to Investigate the Impact of Distraction on Driving Behavior. *Online proceeding of the Road Safety and Digitalization Conference*, Athens, Greec, pp.1-11. (DOI: 10.13140/RG.2.2.20460.44169)

- Yang, K., Al Haddad, C., Yannis, G. & Antioniou, C. (2022), Classification and Evaluation of Driving Behavior Safety Levels: A Driving Simulation Study. *IEEE Open Journal of Intelligent Transportation Systems*, 3. (DOI: 10.1109/ojits.2022.3149474)

- Yang, K. & Antoniou, C. (2022). Utilizing Reinforcement Learning Tree to Develop the Real-time Traffic Safety Management Framework on Urban Expressways. *Transportation Research Board 101th Annual Meeting*, Washington D.C., USA,0. (Link: https://mediatum.ub.tum.de/1328396?nodes_per_page=10&show_id=1637855&result_nav=next&change_language=en)

i-DREAMS CONSORTIUM CALENDAR

Internal activities

19 Jan 2022	**i-DREAMS General Assembly meeting / Data & Knowledge Management Committee** Online
6 Apr 2022	**i-DREAMS Ninth Steering Committee meeting** Online
31 May 2022	**i-DREAMS Second Periodic Review meeting** Hybrid (online + Holiday Inn Hotel)
6 Jun 2022	**i-DREAMS General Assembly meeting** Hybrid (online + NTUA Campus Zografou, Traffic Engineering Laboratory)

Planned activities

26 Sep 2022
i-DREAMS User Advisory Board meeting
Brussels, Belgium

5 Oct 2022
i-DREAMS Expert Advisory Board meeting
Online

14 - 17 Nov 2022
Transportation Research Arena, Lisbon, Portugal
https://traconference.eu/

30 - 1 Nov/Dec '22
Annual Polis Conference, Brussels, Belgium
https://www.polisnetwork.eu/2022-annual-polis-conference/

Published by

Hasselt University
Transportation Research Institute (IMOB)
Wetenschapspark 5 bus 6
3590 Diepenbeek
Belgium
On behalf of the i-DREAMS consortium

Contact

idreams-admin@uhasselt.be
www.idreamsproject.eu