

CONNECTED AUTOMATED DRIVING: FINAL RESULTS AND FUTURE STEPS

In this issue:

Results of CARTRE Project:

- Data and Knowledge to Speed up Automation
- Trilateral Impact Assessment
- Future Research & Innovation Needs
- Knowledgebase
- FESTA for Automation
- Events

EDITORIAL



Dear Reader

This newsletter focusses on the achievements of the EC funded Coordination of Automated Road Transport Deployment for Europe (CARTRE).

CARTRE has been strongly supporting the ambition of the Commission to make Europe a world leader for fully automated and connected mobility systems, a vision which has been realised with an EU strategy on automated mobility recently published as part of the 3rd Mobility Package.

To support the faster deployment of Connected and Automated Driving (CAD) in Europe, CARTRE has been focussing on 3 main pillars: the development of a network of stakeholders to share experiences and advance towards a consensus building on challenges and needs for CAD in Europe, the consolidation of knowledge on CAD initiatives in an online Knowledgebase and finally the contribution to an updated research and innovation roadmap for automated mobility, as part of the Strategic Transport Research and Innovation Agenda (STRIA).

By bringing together a total of 51 organisations who joined the initial consortium of 36 partners as associated partners, CARTRE has created a wide network of CAD stakeholders from industry, public sector and research who met on a regular basis to share project results and best practices. Thematic Working Groups have produced position papers on 10 major challenge areas, including for example Safety Validation and Roadworthiness Testing, User Awareness, Societal Acceptance and Ethics, Digital and Physical Infrastructure. All position papers are publicly available on the connectedautomateddriving.eu website. The future research needs that have been identified in these Working Groups have been lately feeding the development of the STRIA Roadmap prepared by the European Commission with active involvement of the CARTRE partners.

The CARTRE consortium has successfully organised several stakeholder meetings to discuss future research needs and workshops on connected and automated driving pilots, with the last one scheduled on 11 - 12 September 2018 in Brussels. These workshops have given opportunities to share knowledge and experiences between European and national demonstration pilots and to formalise concrete actions for cooperation, in areas such as data sharing or impact assessment.

This newsletter presents the following final results and achievements of CARTRE:

- Data sharing framework
- Impact assessment framework developed by the Trilateral (EU, US, Japan) Working Group on Automation in Road Transport (ART WG)
- Future research and innovation needs
- CAD Knowledgebase
- Updated FESTA methodology for automation

These results will also be presented at the ITS World Congress at the ERTICO exhibition stand on Tuesday, 18 September at 10:00 CARTRE will have a strong general presence at the Congress with a total of 11 SIS sessions co-organised by or involving CARTRE partners. The list of sessions is included in this Newsletter.

Finally, I am glad to announce that most of the CARTRE activities will continue in the follow-up Coordination and Support Action, called ARCADE. This project, which will start later this year, will focus even more on international cooperation. ARCADE aims at extending the international stakeholder network to new countries outside EU and it will look more into important aspects related to regulations, standardisation and freight. A main objective will remain the contribution to the definition of future research and innovation priorities in Europe.

Ludger Rogge
(European Commission - DG RTD)

CARTRE

Coordination of Automated Road Transport Deployment for Europe

Project name: Coordination of Automated Road Transport Deployment for Europe

Project type: Coordination and Support Action (CSA)

Call: H2020-ART06-2016

Starting date: 01.10.2016

Project duration: 24 Months

Total budget: 3 M€

Coordinator: Stéphane Dreher
ERTICO – ITS Europe

Partners: 36 direct partners

Project objectives:

- Establish European leadership through public-private collaboration for development and deployment of ART
- Support international cooperation activities in the area of road automation at global level, in particular with the US and Japan
- Support Strategic alignment of national action plans for automated driving
- Ensure that stakeholders are well informed of past, current and future ART activities through a comprehensive knowledge base on project results
- Actively support ART pilots and test beds
- Report on progress of ART projects on enablers and thematic areas
- Facilitate exchange of data, experience and knowledge for comparing and deploying results from pilots
- Foster a common evaluation framework across ART projects
- Describe possible deployment alternatives and evaluate their impacts
- Reach out to stakeholders, decision makers and wider public
- Establish annual international conferences, and workshops in Europe



Data and Knowledge to Speed up Automation

Since a few years back, automated vehicles are evaluated in an array of pilots on both national and international level worldwide. The purpose has been to investigate how these automated vehicles function in real traffic, what potential societal impact they could have and how users perceive and experience the vehicles. The impact of automated vehicles is foreseen to be substantial on the whole society.

Most of the pilots testing automated vehicles are small in size and therefore, it is essential that the knowledge and experience together with the limited amount of data collected, is shared as openly as possible, taking personal integrity and immaterial property rights into consideration. There are many benefits in information and data sharing, as it gives a larger combined platform of data and experience and thereby the possibility to draw better conclusions on the progress of automation and its impact. It is important also to acknowledge that experiences and data collected in earlier field operational tests (FOT) are important assets for automation, as it is being used for automated related tasks, such as developing driver models and extracting training data for automated vehicles algorithms.

Still, the field is extremely competitive with lower-level automation coming to the market in just a few years. This is a factor that limits the possibilities to share data together with the discussion regarding the vehicle manufacturers' potential liability in a crash if the vehicle is in automation mode.

CARTRE has reached out to the automation community and has collected the thoughts and suggestions regarding how data, once collected, could be managed. CARTRE has also investigated what are the new requirements on type of the data, are there new collection methods needed, and especially focused on the evaluation of the data. What do we need to know?

To facilitate the progress of sharing experiences and data, the CARTRE project has formulated a data exchange framework consisting of three pillars; methodology, dissemination, storage and access, building on earlier work done in the FOT-Net projects. The FOT-Net Data Sharing Framework together with the Data Catalogue has been found to be very well suited to be used also for automation pilots with some minor additions and an update due to the new General Data Protection Regulation in Europe. Available automation datasets and successful data sharing initiatives are documented and used as good examples for the way forward.

Finally, CARTRE suggests a data sharing objective and a strategy to get there. Starting from an investigation looking at the data sharing strategy of the on-going projects and the documented current status of sharing experiences, knowledge and data in general, a wanted position is elaborated. Recommendations for a strategy on how to reach the wanted position are then presented.

It involves hands-on recommendations, such as gathering major stakeholders to discuss what data is needed to answer the most important topics to progress automation and in what form could this data be provided. It also suggests to provide funding programmes for making open anonymized datasets from collected data, funding for data providers and programmes for re-using already collected data.

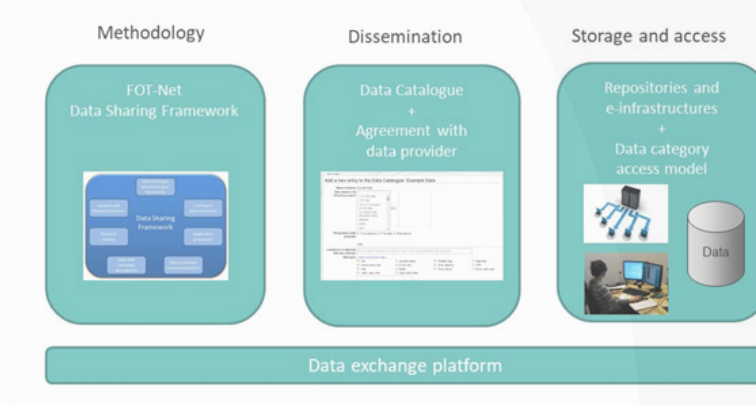
It is important to share all the knowledge and experience gained in the new automation pilots going on.

A recommendation how to share this data is explained, where for instance knowledge regarding research questions, surveys and analysis methods are addressed.

The new EU project ARCADE is continuing the work started in CARTRE. A knowledge base will be set up, as a one-stop shop, where researchers and companies starting new automation projects can get a kick-start and avoid repeating former pilots' mistakes and also find information on available datasets.

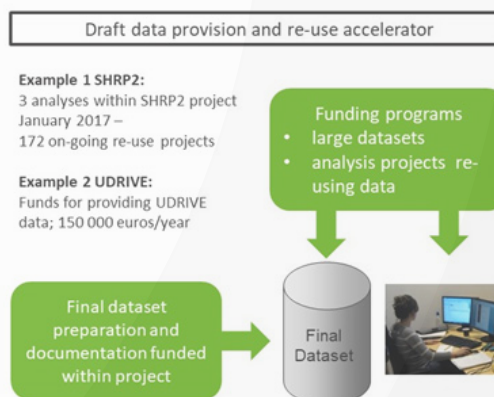
Read more about these results in the related CARTRE deliverable at <https://connectedautomateddriving.eu/>

Data exchange platform – 3 main components



Sharing strategy of automation pilot data

- Strategy involving all stakeholders
- Data sharing discussions in pilots
 - Common format data
 - Privacy (GDPR) and IPR
 - Liability
 - Aggregated open datasets
- Data categories sets access model
 - Anonymized data – open access
 - In-depth data – conditioned access
- Research data exchange





Trilateral Impact Assessment Framework

Members of the Trilateral (EU, US, Japan) Working Group on Automation in Road Transportation (ART WG) have been working to address the complexity of impacts caused by automated driving. They have been setting up a high-level impact assessment framework to coordinate the impact assessments performed in the field of automated driving. The motivation was the realisation that, as field tests are expensive and mostly done on a small scale, international harmonization would be in everyone's interest. With an harmonised approach, tests and studies can be designed to maximise the insight obtained and to arrange complementary evaluation across the world. Harmonisation would also facilitate meta-analysis.

The framework aims for high-level harmonisation of impact assessment studies globally. It is the first attempt to do harmonisation by the three regions (EU, US and Japan). As there are so many concepts of automated driving, the framework does not give detailed methodological recommendations (i.e. methods to apply for calculating the impact) but it aims to facilitate meta-analysis across different studies. Therefore, the focus is on providing recommendations on how to describe the impact assessment study in a way that the user of the results understands what was evaluated and under which conditions.

The version 1.0 of the framework was published in January 2017. It was then realised that even though it is easy to see the value of using harmonised set of key performance indicators (KPIs) to measure and express the impacts of automation, it is challenging to provide of recommendations for them. To collect views on the importance of different KPIs, an international survey was conducted (see survey results in Innamaa & Kuisma 2018). The version 2.0 of the framework (Innamaa et al. 2018) was published in April 2018. KPI recommendations given in this version are based on the results of this survey. The framework update includes also other small changes made according to comments received from the experts in this field.

References

Innamaa S, Kuisma S (2018). Key performance indicators for assessing the impacts of automation in road transportation - Results of the Trilateral key performance indicator survey. Research Report VTT-R- 01054-18, VTT. https://connectedautomateddriving.eu/wp-content/uploads/2018/03/KPS-for-Assessing-Impact-CAD_VTT.pdf 36+1 p.

Innamaa S, Smith S, Barnard Y, Rainville L, Rakoff H, Horiguchi R, Gellerman H (2018). Trilateral Impact Assessment Framework for Automation in Road Transportation, version 2.0. https://connectedautomateddriving.eu/wp-content/uploads/2018/03/Trilateral_IA_Framework_April2018.pdf. 42 p.

Future Research & Innovation Needs

The final deliverable from CARTRE on future research and innovation needs has been built around the ETRAC Strategic Research Agenda topics (see below). It was used as a base for the coming update of the ETRAC Roadmap on Automated Driving.

- Deployment of automated passenger vehicles in mixed traffic for improved safety and efficient road transport
- Deployment of automated heavy commercial vehicles in mixed traffic for improved safety and efficient road transport
- Fully automated vehicles for urban use
- Societal benefits and user acceptance
- Fleet and traffic management of highly and fully automated vehicles under mixed traffic conditions

- Ensuring safe, secure and resilient CAD

- Policies and regulation support

- Connectivity and automation technologies for vehicles and infrastructure: sensors, software, systems-of-systems, high performance computing and Artificial Intelligence

- New services for people and goods enabled by connectivity and automation

The deliverable is also closely linked to the thematic areas identified in CARTRE and extracts from the related position papers have been used. The work in the different thematic areas has continued and further developments are reflected in respective position papers.



CARTRE Knowledgebase

CARTRE aims at ensuring that stakeholders are well informed of past, current and future ART activities through the development and maintenance of a comprehensive online Knowledgebase on European and international project information and results.

The main objective of the Knowledgebase is to share enough information about past and ongoing projects to avoid replicating efforts and allow identifying existing gaps and excellence areas for CAD R&D and deployment initiatives in Europe.

The Knowledgebase will be on the connectedautomateddriving.eu website and is being continuously updated and extended. The knowledgebase will ultimately include the following sections related to CAD, mostly based on public deliverables prepared by the CARTRE consortium partners:

- Testing (corridors, regulations, scenarios)
- Glossary & Terminology
- Impact assessment
- Who's who
- Roadmaps
- Thematic areas
- Data exchange
- Methodologies
- Research initiatives and Projects

Regarding the projects, a cooperation has been established with the database from the European Commission TRIMIS, which

already concentrates all EC-funded and many national projects. Additional and newest information collected by CARTRE will be published directly on TRIMIS*. CARTRE also supports TRIMIS by cross-checking existing information and ensuring that the most relevant information is included for CAD projects.

The Knowledgebase will be further developed in the follow-up Coordination and Support Action ARCADE which will start later this year. Similarly, to CARTRE, the consolidation and sharing of knowledge will constitute a main pillar in ARCADE and the focus will be extended to include for example policy & regulations, standardisation and freight, among other new topics which will be defined according to stakeholder needs.

*Visit: <https://trimis.ec.europa.eu>





FESTA for Automation

In the coming years, many field tests will be conducted to evaluate all kinds of road automation. Projects may profit from the experiences from former Field Operational Tests (FOTs) evaluating Intelligent Transport Systems (ITS).

Many projects, both at European and national levels, adopted the FESTA methodology as the basis for the planning and execution of FOTs. A common methodology has major advantages, allowing for comparison of results between FOTs, and providing a common vocabulary, enhancing communication between a wide variety of people involved in FOTs. For automation studies a common methodology is even more important, as we are not only interested in the findings from individual projects but also in gaining knowledge about the impacts automation on a large scale may have.

Since the original FESTA project in 2007, the methodology has been maintained and updated by the FOT-Net support actions (FOT-Net, FOT-Net 2 and FOT-Net Data) from 2008-2016. At the end of 2016 version 6 of the revised handbook was released. CARTRE has continued the FESTA work and will soon release an updated version addressing automated and connected driving (CAD).

The FESTA methodology follows a scientific evidence-based approach. It puts a strong emphasis on defining research questions and hypotheses, inspired by the traditional impact areas of safety, mobility, environment and efficiency. With the new developments, in technology but also in transport services, impact areas will be wider and sometimes new (e.g. land use), thereby multiplying the number of research questions that are of interest. And of course, new research questions will arise.

In automation FOTs, there are new challenges for the methodology, for example, in order to answer research questions, we usually compare the old situation (without a system) – the baseline – with the new situation (with the system). However, for many automated scenarios it is difficult to understand what the baseline should be. It is hard to find a comparison for vehicles and scenarios that completely break with the old situation.

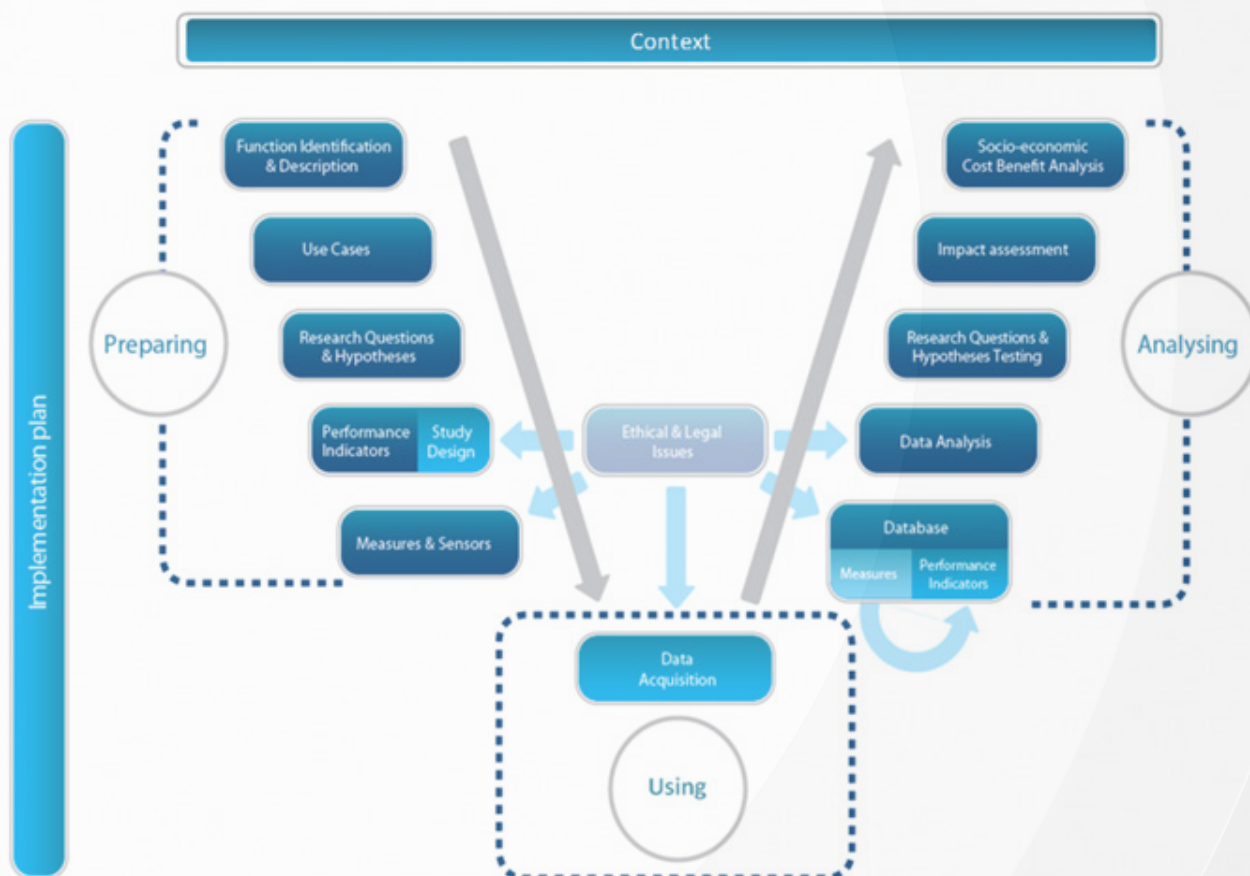
In assessing the impacts of ITS usually the findings from a FOT are scaled-up to the national or European level. This is already quite a complex process with many uncertainties.

However, with automation FOTs this is becoming very difficult. Automation comes in all kinds and is developing very fast. Traffic behaviour and mobility patterns may be very different depending on whether there are a few automated vehicles on the road or a large percentage. The Trilateral Working Group on Automation in Road Transportation have been working to address the complexity of impacts caused by automated driving, developing a high-level Impact Assessment Framework (available from the CAD website).

Several current automation projects (for example AUTOPILOT and L3Pilot) base their evaluation strategy on FESTA. We do not have answers to all challenges

but FESTA will remain an important basis for setting up evaluations, and the many details on practical issues will remain of value.

The new version of the handbook is not a complete re-write of earlier versions, but sections on automation are added. Developing a full methodology for CAD FOTs is not feasible at this point in time, and lessons will have to be learned from the ongoing CAD projects. That is why exchange of knowledge, experience and data will remain of the utmost importance to further our understanding of how FOTS can be conducted as effectively and efficiently as possible, and the ARCADE project will continue to provide a forum for this.



25th ITS World Congress - Copenhagen

 17-21 September 2018

Discover the CAD Sessions: <https://connectedautomateddriving.eu/event/world-congress-2018-copenhagen/>




FOT-Net International Workshop: Strategies for sharing data and knowledge Copenhagen

 17 September 2018 From 8.30 to 15.30

Register here: <https://www.eventbrite.com/e/fot-net-international-workshop-strategies-for-sharing-data-and-knowledge-tickets-48477892682>


AUTOPILOT Webinar on Hazard and Vulnerable Road Users Warnings for AVs

 24 September 2018 From 16.00 to 17.00

Register here: <http://autopilot-project.eu/register-now-third-autopilot-webinar-on-hazard-and-vru-warnings-for-avs/>




CAD Webinar Series (XII): Designing cooperating interactions of AVs with other road users (InterACT project)

 25 September 2018 From 14.00 to 15.00

More information here: <https://connectedautomateddriving.eu/event/cad-webinar-series-interact-project-ii/>

5th Small Congress on Big Data and 2nd Applied AI

 27 September 2018 From 12.00 to 17.30

Find out more: <https://connectedautomateddriving.eu/event/self-driving-vehicles-at-tno-big-data-meets-applied-ai-congress-2018/>





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