

Dream-like simulation abilities for automated cars



DREAMS4CARS

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Executive Summary

Dissemination and Communication on Dreams4Cars has been strategically planned from the outset of the project. The aim was to get in contact with potential end-users raising awareness in the projects interim and final results supporting Dreams4Cars exploitation activities. Instead of organising one final event to showcase the developed technologies we followed the approach to hold some workshops and seminars carried out at the headquarters of each potential adopters of the technology. This document describes the two most industry-oriented and economical-exploitation-oriented activities carried out in Dreams4Cars. Because of confidentiality restrictions not all details related to one event can be made available to the public. In addition, the document describes three other workshops and meetings as well as one activity planned for May 2020 addressing potential adopters of the Dreams4Cars solutions.

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1 Introduction

The original workplan of Dreams4Cars had planned a “Final Event” to showcase the developed technologies in particular to potential adopters. The idea of the final event was indeed driven by our ambition to exploit the final results of Dreams4Cars, mainly towards the automotive community.

Following the project developments, we have revised our approach towards dissemination strategies, which also involve this event.

From the start of Dreams4Cars, many new initiatives aimed at developing various levels of automated driving have been initiated by industry. Dreams4Cars is not aimed at developing a complete AD system in itself, but rather to develop and demonstrate *a number of robotics technologies* that can *help* to develop automated driving. In other words, Dreams4Cars is not going to propose an automated driving system, but methods and tools to develop better functions in AD (this idea was already present in the proposal –namely products 2 and 3 listed in section 2.2.5 page 87 of the DoA– and has been further strengthened during the work and by the comments received by reviewers).

We have hence realized that one final event gathering potential users in one place at the end of the project may not be the most effective solution: the companies involved in developing AD systems would have likely sent only one person to the event, which is not sufficient to influence the internal decisions later. Hence, we refocused our strategy in order to reach many and various kinds of people within pre-selected companies. This strategy is important also because we have to disseminate a radical change in the approach (from hardcoded designs to cognition technologies) that requires communications to teams, not individuals.

We have thus elaborated a new strategy for the final dissemination event, in the form workshops and seminars carried out at the headquarters of each potential adopter of the technology.

Two such events, particularly suited to Dreams4Cars, have been carried out, which are described below. Ancillary events have also been carried out with a more generic intent. They are mentioned in the end.

2 Ambarella

Ambarella is a Silicon Valley company developing hardware for AI (<https://www.ambarella.com>), in particular ASIC (application specific integrated circuit) processors for various kinds of artificial vision applications.

Ambarella has an Automotive branch located in Parma (Italy), which was formerly a spin-off of the University of Parma known as Vislab (<http://www.vislab.it>); that was among the pioneers in Autonomous driving.

The business model of Ambarella is developing systems-on-chip for Automated driving “for OEMs and Tier-1 suppliers”. One definite advantage of these devices is their very low power consumption, of the order of a few watts. As part of this business model, Ambarella is demonstrating quality automated driving with experimental vehicles.

The systems-on-chip units are particularly thought and efficient for running deep neural networks (for example they run semantic segmentation networks in real time at 4K resolution). Hence, the neural networks for behaviours developed by Dreams4Cars appeared as an ideal complement and a ground of cooperation and possibly exploitation.

2.1 Workshop

The workshop in Ambarella, took place in Parma (at Vislab/Ambarella site, Parco Area delle Scienze, 49, 43124 Parma PR, Italy) on November 11, 2019.

Dreams4Cars findings were presented by the coordinator (Mauro Da Lio) with support from Francesco Biral (UNITN). There were 20 people attending including the head of the unit (Alberto Broggi) which are the majority of the teams working on the definition of the processor capabilities and the demonstration of its application in autonomous driving.

The presentation of Dreams4Cars focused on topics that could become a cooperation area (in particular in the view of neuralization of the motor behaviours).

The synopsis of the workshop is the following (a confidential copy of the presentation is available to the reviewers).

1. Overview of motivations and challenges of Automated Driving
2. The traditional engineered approach, limitations and issues.
3. Artificial Driving Agent cognitive architectures
4. Explainable safe and scalable AI
5. Learning by self-instantiated simulations

In particular, under topics 3-5 the main findings and strengths of Dreams4Cars have been explained (roughly corresponding to D2.2 section 2 and D3.2 sections 3 and 4).

The presentation raised significant interest. Several questions followed concerning the specific mechanisms for bootstrapping motor behaviours and relation to Reinforcement Learning.

2.2 Conclusion

Potential cooperation has been found in the implementation of motor control and behaviours with neural network. It has been agreed to carry out a short initial investigation comparing control with inverse models (at all levels) with the more traditional algorithms for path planning and control, in view of possible implementations with the neural engine.

3 BMW-FCA Autonomous Driving project

BMW and FCA entered into a cooperation agreement for the development of Autonomous Driving System, focusing on Automation Level 3 for highway application. Inside this partnership, FCA engineers work embedded with BMW Teams at BMW's Autonomous Driving Campus near Munich.

Therefore, the Autonomous Driving Campus was considered as a good location to disseminate project results directly to engineers involved in the development of Autonomous Driving System.

Consequently, a workshop was held at the Campus on November 21, 2019, addressed to FCA and BMW experts.

3.1 Workshop

Four different presentations were given (confidential copies of the presentation are available to the reviewers):

- 1) Mauro Da Lio gave a presentation similar to the one given in Ambarella, in particular covering the findings related to explainable agent architecture (D2.2) and to the bootstrapping of sensorimotor abilities via learning and manipulation of models of the world (D3.2, excluding Reinforcement Learning).
- 2) Gastone Pietro Rosati Papini gave a talk presenting the integration of Reinforcement with the lower levels of sensorimotor control developed via bootstrapping. The pedestrian safe speed network was in particular illustrated.
- 3) Riccardo Donà, gave a talk illustrating the Dreams4Cars workflow and then focusing on adaptive control obtained via inverse/forward models adaptation.
- 4) Alice Plebe, finally, made a forward-looking presentation of the formation and manipulation of concepts using Convergence Divergence Zones implemented via autoencoders and how this can be used for mental imagery.

Because of confidentiality restrictions not all details related to this event can be made available to the public.

3.2 Conclusion

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4 Ancillary activities

4.1 Presentations at Waymo and NVIDIA

Presentations of the Dreams4Cars project were given to Waymo (February 13, 2019) and NVIDIA (February 12, 2019). The topics that were illustrated included the contents of D2.2 and earlier D3.1 but did not include the latest findings of D3.2.

The Waymo presentation was rather successful. It was chaired by Johan Engstrom (formerly at Volvo) and was attended by approximately 20 persons in the room and other people via remote video connection. There were several questions among which the recurrent question of how we use Reinforcement Learning (to which we answered anticipating the contents and considerations of D3.3 sections 3 and 4).

The presentation at NVIDIA, on the contrary, was rather disappointing. We were received by one sales manager and one person in the development department only. While the latter was interested in our arguments, the former did not show any interest.

4.2 Safer workshop

A workshop (follow up of one held in January 2018) has been done on June 17, 2019 in Gothenburg in Cooperation with SAFER, the Vehicle and Traffic Safety Centre at Chalmers, which is a competence centre where partners from the Swedish industry, academia and authorities co-operate to make a centre of excellence within the field of vehicle and traffic safety. SAFER is an open innovation arena where partners from the society, the academy and the industry can meet and share research and knowledge within safe mobility – a multi-disciplinary research hub that enables progress for its partners and for the society.

The event had 18 registrations. Among these there were participants from Volvo, Autoliv and Zenuity. There were several questions. As for the case of Waymo, the topics that were illustrated were aligned with the project state at the time and included the contents of D2.2 and earlier D3.1 but did not include (all of) the latest findings of D3.2.

5 Planned activities

5.1 L3Pilot Summer School

L3Pilot is a flagship EU funded project (<https://www.l3pilot.eu>) gathering the entire EU Automotive industry around a project for large-scale testing of automated vehicles at levels 3 and 4. The L3Pilot project organizes a summer school (<https://l3pilot.eu/news/events/news/l3pilot-summer-school/>) on May 13 and 14 to which Dreams4Cars has been invited to show potential future developments to the EU industry.