Grand Challenge

Smart mobility in a smart campus
**Smart mobility in a smart campus**

**Communication between autonomous cars and pedestrians**

As self-driving cars start operating in densely populated areas that require them to interact with pedestrians and cyclists (Vulnerable Road Users – VRUs) on a regular basis, it becomes important to set the criteria for effective communication. In the absence of a human "driver", we will miss typical communication methods like eye contact and gestures. It is thus crucial to explore how a self-driving car can communicate its intention to the surrounding VRUs.

In the dynamic and fast environment of traffic interactions, it is important that such communications are effective, efficient, and unambiguous. Such communication should work in all conditions (irrespective of weather, ambient light, noise, etc.), and should not overwhelm VRUs with information. Additionally, this kind of communication needs to be scalable: while it is fairly straightforward for a car to communicate with one pedestrian, the problem is magnified quickly when it is in a busy traffic environment, sharing road space with many pedestrians, cyclists, and other human-driven cars, such as within a university campus.

This communication must also be intuitive. How can a self-driving car then effectively inspire enough trust among all VRUs regarding the car’s ability to gauge any traffic situation correctly and also clearly communicate its own intention? Is there any way infrastructure can be modified to assist this interaction?

Trust in a self-driving car can be invoked by imparting the knowledge that the self-driving car is aware of its surroundings, and what it intends to do. Self-driving cars might address this by conveying their own "situational awareness" and their intention to the VRUs in a clear manner. Researchers, both in academia and industry, are coming to an agreement that a self-driving car should fundamentally show information about 3 different activities: the car is about to start driving, the car is driving continuously in an automated manner, and the car is about to come to a stop. However, in order to give VRUs the full picture, these basic pieces of information need to be further augmented by information such as "how long until the car is about to come to a stop", "where exactly does the car plan to a stop", and "how long will it stay stopped"?

All these questions crucially need answers before self-driving cars can be socially acceptable in traffic, which it must do in order to be viable as a means of smart mobility in the future. At the end of the day, VRUs are trying to get this simple question answered: "Is it safe for me to cross the road (in the presence of self-driving cars)?" How can self-driving cars and smart infrastructure facilitate this decision-making?

**Challenge**

In the smart campus, there is no protocol for the interaction between autonomous vehicles and pedestrians (students). Conceptualize a system that will allow self-driving cars to communicate with pedestrians, cyclists, and other vulnerable road users regarding the cars’ intention, and consequently, allow the latter to decide if it is safe to cross a road around the cars.

**Question**

How can autonomous cars communicate with vulnerable road users to facilitate movement within a smart campus?

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**What is a good solution?**

There is no one “correct solution” to this problem. We are looking for ideas that address the challenges discussed in this problem space in a clear, original way. Given the limited time frame, we do not expect a robust solution that caters to every issue in the field. However, we will look for the depth and merit of the students’ ideas in terms of relevance to the problems of the domain, and the ability to realistically and practically implement them within current technological constraints in the short term. We expect solutions to be innovative and feasible. Solutions provided can be with respect to adding technology to the vehicle, to pedestrians and cyclists, or to the existing campus infrastructure.

Furthermore, the submissions will be judged according to the following criteria: innovation, social impact, contribution to Smart Campus and quality of presentation. Visit the Google Drive for explanation of these criteria.

**Deadlines & Requirements**

**Preliminary submission**

**Deadline:** Tuesday August 29 18:00  
**Location:** Google Drive > Smart Mobility > Preliminary submissions  
**Filename:** Team[number]_[Concept name]_Draft (e.g. Team42_PowerPlan_Draft.pdf)  
**Requirements:** In PDF format, max. 5MB

1 A4 with a short description of your concept of max. 100 words and an explaining visual (e.g. a sketch, scheme or scenario).

**Final submission**

**Deadline:** Wednesday August 30 15:00  
**Location:** Google Drive > Smart Mobility > Final submissions  
**Filename:** Team[number]_[Concept name]_Final (e.g. Team42_PowerPlan_Final.pdf)  
**Requirements:** presentation in PDF format, max. 50MB or link to video in .txt format

A presentation of max. 5 slides OR a video of max. 3 minutes that explains your solution. Make sure your presentation or video is clear without presenting. The first slide or shot should contain: team number, team captain, names, ‘Smart Mobility’ and the name of your solution.

**Finale**

**Time:** Wednesday August 30 17:00  
**Location:** AUD 1

The judges will assess the presentations and videos and make a selection of three finalists. At 16.30 the team captains of the selected teams will be called. Afterwards, the finalists will present their solution for the judges and other students. The winning team will be announced at the award ceremony during the network barbecue.

**Tips**

To gather more background information and inspiration, take a look in the Google Drive and visit the expert booth at KOE-field.
Visit the Expert Booth!

Do you have questions, are you a bit stuck or are you looking for inspiration? Visit the Expert Booth at KOE-field*! Experts from the student teams and companies will answer all your questions, show their projects or give you an inspiration boost.

Open:
• Tuesday 10.30-12.00
• Tuesday 15.00-18.00
• Wednesday 11.00-15.00

Good luck!

* The grass field in front of Auditorium. In case of bad weather, the Expert Booth will be at the canteen of Auditorium.