The Ambient Mobility Lab (AML) is an innovative research initiative that builds upon natural synergies between MIT’s excellence in fundamental research and Fraunhofer’s expertise in application. Upon receiving seed funding from the Ministry of Economic Affairs, Labour and Housing of Baden-Württemberg, the AML initiative was launched in 2014. In a first phase between 2014 to 2016 catalyst projects were launched to develop and strengthen the innovative international cooperation. Since 2017 the legal framework allows for industrial partners to join the initiative based on a sponsorship approach.

Massachusetts Institute of Technology

The mission of the Massachusetts Institute of Technology (MIT) is to advance knowledge and educate students in science, technology and other areas of scholarship that will best serve the nation and the world in the twenty-first century. We are also driven to bring knowledge to bear on the world’s great challenges.

Situated at the intersection of architecture, urban design, engineering, human-computer interaction and the social sciences, the MIT Senseable City Lab addresses the relationship between cities, new technologies and people.

Fraunhofer

As Europe’s largest research organization for applied science, Fraunhofer’s research efforts are geared entirely to people’s needs: health, security, communication, energy and the environment. As a result, the work undertaken by researchers and developers has a significant impact on people’s lives. In shaping technology, designing products, improving methods and techniques, we open up new vistas and forge the future.

At the Fraunhofer IAO in Stuttgart an interdisciplinary team of researchers is working on technological, ecological and economical challenges to bring mobility innovations to life.
The mission of the Ambient Mobility Lab (AML) is to become a pioneering institution in smart mobility research and the global frontrunner in analyzing, designing, developing and testing sensible and sustainable mobility systems that complement other future urban systems.

What is Ambient Mobility?

Ambient Mobility operates in tomorrow’s new urban paradigm. The near-future of mobility will be radically transformed by the pervasive deployment of sensors, networked technology, and the big data they generate. These advances, along with self-driving technology, intelligent transportation systems, electric vehicles, as well as new forms of design and applications are poised to revolutionize urban flows. The distinction between individual and mass transportation systems will erode as the line between public and private mobility is further blurred. Ambient Mobility works towards a future in which extensive ride and vehicle sharing – enabled by dimensions of autonomous driving such as optimized vehicle relocation – will provide personalized, on-demand mobility using modular car concepts that address the specific requirements of cities. The parallel trend towards electric vehicles will re-shape urban energy needs and require innovative means of integrating vehicle fleets with the power grid, revealing potential opportunities to optimize, upgrade, and rethink energy consumption in cities. The broad spectrum of smart mobility applications and their implications will result in a drastic reduction of circulating vehicles, travel times, emissions, and parking infrastructure, presenting enormous benefits for urban communities. AML seeks to understand and impact these trends through the design of future urban mobility systems.
Advances in networking, algorithmic optimization, and onboard vehicle technology are converging to bring about a paradigm shift in urban mobility. Today’s mobility landscape is compartmentalized into distinct transportation modes: private cars, taxis, bikes, mass transportation – categories that are poised to erode. The application of digital control systems will realize sharable infrastructures that knit together and reconfigure these seemingly disparate mobility systems.

Of many future possibilities, electric systems (battery and fuel cell based) are the most promising means of significantly reducing vehicle emissions. However, widespread transition from gas to electric is predicated on the deployment of new charging infrastructure. There is a broad spectrum of associated challenges that includes optimizing the locations of individual charging stations, satisfying massive vehicle energy demands with the existing power grid, and ascertaining the impact of charging strategies on driver behavior.
Innovative mobility system design

Mobility systems are undergoing profound transformations led by advances in information and communication technology, as well as automotive and energy-related evolutions. Well established transportation modes such as private vehicle, taxi, bus, etc., will be increasingly challenged by responsive, on-demand urban mobility systems yet to be designed, prototyped and tested.

Autonomous and connected vehicles

The car is gradually transforming from a largely mechanical system to one that is electronic and connected. This transition is opening new opportunities to improve traffic management, road safety, and our ability to sense and monitor the urban environment, while simultaneously posing new challenges related to the collection, processing, exchange and securing of immense amount of car-collected data.
Projects

The Urban Driven Demonstrator combines different technologies and illustrates possible interaction scenarios at the interface between autonomous vehicles and human road users.

HubCab

This project explores New York City taxi trails to show how cities can share their way to a more sustainable urban future. With an ever-increasing trove of real-time urban data streams, researchers are able to see precisely where, how and at what times different parts of cities become hubs of mobility. By using pervasive, interconnected, and «smart» technologies, we can begin to unravel the complexity of travel patterns and identify how the social and environmental costs embedded in transportation systems can be reduced.

hubcab.org

Urban Driven

One of the most discussed research areas in the automotive industry is the continuing development of automated driving cars. But, the absence of a driver does not only require the vehicle to solve problems related to the operational part of the driving task by itself – it has also to be able to interact with other road users to cope with complex traffic scenarios, which can only be resolved by cooperation between the involved parties. This “social” interaction is an important part of driving, as many situations in everyday traffic call for a mutual exchange and comprehension of communication signals. The project addresses the question of how the interaction between autonomous vehicles and human road users can be designed.
Light Traffic

Researchers have developed slot-based intersections that could replace traditional traffic lights, significantly reducing queues and delays. This idea is based on a scenario where sensor-laden vehicles pass through intersections by communicating and remaining at a safe distance from each other, rather than grinding to a halt at traffic lights.

Urban Taxi

What does the taxi of the future look like? The Urban Taxi research project is rethinking the taxi from the bottom up: Which requirements do vehicles need to satisfy for individual mobility services? How can taxis be more efficiently integrated into a citywide mobility system? Which interfaces are needed for that? How can taxis be designed more sustainably and attractively for customers? These and many more questions are addressed within the project by means of innovative research approaches.

DrivingDNA

DriverDNA focuses on using signals extracted from the CAN bus data to extract characteristic features of driver’s driving style, that can be considered a veritable driver DNA.

CA$H CAR

Autonomous driving allows for completely new ways to address passengers with advertisement. We investigate to which extent private transportation can be subsidized by interior and exterior ads. The revenues in general and per trip are thereby estimated. The goal is to gather an understanding of what an individual trip is worth in terms of passenger attention, how this value is distributed and how it effects sustainability in mobility systems.
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