



A black and white photograph of a desert landscape with undulating sand dunes. A red line with circular markers at each point traces a path across the dunes, starting from the left and moving towards the right. The path consists of five red circles connected by red lines. The text 'Shortcut to knowledge.' is overlaid in white on the right side of the image.

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TecScan Journal > Editorial

Liebe Leserinnen und Leser,

Sie informieren sich mit dem TecScan-Journal regelmäßig über Neuzugänge zu Ihrem Thema aus unseren Datenbanken. So bleiben Sie stets auf dem Laufenden und erschließen sich nützliche und relevante Wissensquellen. Vielleicht interessieren Sie sich für weitere Themen: Neben klassischen Technikbereichen wie z.B. Maschinenbau, Medizintechnik, Werkstoffe und Textiltechnologie decken die TecScan-Journale auch brandaktuelle, gesellschaftspolitisch relevante Querschnittsthemen, wie Industrie 4.0, IT-Sicherheit, Elektromobilität oder Neue Mobilität – Auf dem Weg zum autonomen Fahren ab.

Die Automobilwelt ist auf dem Weg in ein neues Zeitalter. Elektromobilität und die digitale Vernetzung sowie das autonome Fahren stehen im Fokus des gegenwärtigen Technologiesprungs. „Autonomous or self-driving vehicles are becoming a consolidate reality that involves both industrial and academic fields also for its impact in social and governmental communities“ betonen Wissenschaftler aus Turin und Columbus auf dem Workshop RAAD im Sommer 2017 in Turin.

Es stellen sich Fragen zur innerstädtischen Gestaltung von Straßen, die Energieversorgung von elektrisch angetriebenen LKWs auf Autobahnen. Die Automobilindustrie entwickelt neue Geschäftsmodelle für den Gelegenheitsnutzer. Wie zuverlässig ist die Datenkommunikation zwischen den Fahrzeugen und wie werden Fußgänger und andere Verkehrsteilnehmer im Sinne der Verkehrssicherheit in jeder Situation richtig erkannt? Was passiert mit den Bewegungsdaten der Fahrzeuginsassen? In welcher Hinsicht sind Schuldfragen bei Verkehrsunfällen juristisch schon geklärt. Gibt es erkennbare Grenzen der autonomen Mobile und wie werden diese den Insassen während der Fahrt mitgeteilt?

Viele Antworten und Inhalte zu diesen Fragestellungen finden Sie in der von WTI Frankfurt ab 01.01.2018 vom Verein Deutsche Krafftfahrzeugtechnik DKF e.V. übernommenen Datenbanken DKF Krafftfahrzeugtechnik und DKF Automobilindustrie (Archiv). Die für die deutsche Automobil- und Zulieferindustrie ab 1974 ausgewerteten Quellen der internationalen Zeitschriften (48%), Konferenzen (25%), Reports (27%) und Dissertationen zum überwiegenden Teil in englischer, deutscher und französischer Sprache liefern viele Lösungsansätze zur aktuellen Diskussion um das fahrerlose Automobil. Einige kurze Auszüge aus den aktuellen Publikationen finden Sie hier: <http://bit.ly/2BbXpxc> .

Mit den besten Grüßen



(Peter Tandetzky)
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- 001 -

Modeling connected and autonomous vehicles in heterogeneous traffic flow.

Ye, Lanhang; Yamamoto, Toshiyuki

In: Physica A, Statistical Mechanics and its Applications * Band 490 (2018) Seite 269-277 (9 Seiten, 17 Quellen)

<http://dx.doi.org/10.1016/j.physa.2017.08.015>

The objective of this study was to develop a heterogeneous traffic-flow model to study the possible impact of connected and autonomous vehicles (CAVs) on the traffic flow. Based on a recently proposed two-state safe-speed model (TSM), a two-lane cellular automaton (CA) model was developed, wherein both the CAVs and conventional vehicles were incorporated in the heterogeneous traffic flow. In particular, operation rules for CAVs are established considering the new characteristics of this emerging technology, including autonomous driving through the adaptive cruise control and inter-vehicle connection via short-range communication. Simulations were conducted under various CAV-penetration rates in the heterogeneous flow. The impact of CAVs on the road capacity was numerically investigated. The simulation results indicate that the road capacity increases with an increase in the CAV-penetration rate within the heterogeneous flow. Up to a CAV-penetration rate of 30%, the road capacity increases gradually; the effect of the difference in the CAV capability on the growth rate is insignificant. When the CAV-penetration rate exceeds 30%, the growth rate is largely decided by the capability of the CAV. The greater the capability, the higher the road-capacity growth rate. The relationship between the CAV-penetration rate and the road capacity is numerically analyzed, providing some insights into the possible impact of the CAVs on traffic systems.

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- 002 -

Autonomous Drift Parking using a Switched Control Strategy with Onboard Sensors.

Jelavic, E.; Gonzales, J.; Borrelli, F.

In: World Congress of the International Federation of Automatic Control, IFAC World Congress, 20, in: IFAC-PapersOnLine * Band 50 (2017) Heft 1, Seite 3714-3719 (6 Seiten, 17 Quellen)

<http://dx.doi.org/10.1016/j.ifacol.2017.08.568>

Drift parking represents an extreme maneuver that is beyond the skill set of the average driver, requiring adept use and timing of the handbrake, pedal brake, and steering wheel. The maneuver causes the vehicle to rotate rapidly and slide, nearly sideways (i.e. high side slip angle), into the desired parking spot. In this paper we propose a control strategy to quickly park a vehicle in a narrow space using a high side slip angle maneuver, or 'drift parking' maneuver. The proposed control scheme switches between nonlinear model predictive control and a linear feedforward-feedback policy. For experimental validation, we use an open source, low cost 1/10 scale RC vehicle called the Berkeley Autonomous Race Car developed at UC Berkeley.

- 003 -

Current challenges in autonomous driving.

Barabas, I.; Todorut, A.; Cordos, N.; Molea, A.

In: CAR, International Congress of Automotive and Transport Engineering - Mobility Engineering and Environment, 2017, in: IOP Conference Series: Materials Science and Engineering (Online) * Band 252 (2017) Seite 012096/1-6 (6 Seiten, 11 Quellen)

<http://dx.doi.org/10.1088/1757-899X/252/1/012096>

Nowadays the automotive industry makes a quantum shift to a future, where the driver will have smaller and smaller role in driving his or her vehicle ending up being totally excluded. In this paper, we have investigated the different levels of driving automatization, the prospective effects of these new technologies on the environment and traffic safety, the importance of regulations and their current state, the moral aspects of introducing these technologies and the possible scenarios of deploying the autonomous vehicles. We have found that the self-driving technologies are facing many challenges: a) They must make decisions faster in very diverse conditions which can include many moral dilemmas as well; b) They have an important potential in reducing the environmental pollution by optimizing their routes, driving styles by communicating with other vehicles, infrastructures and their environment; c) There is a considerable gap between the self-drive technology level and the current regulations; fortunately, this gap shows a continuously decreasing trend; d) In case of many types of imminent accidents management there are many concerns about the ability of making the right decision. Considering that this field has an extraordinary speed of development, our study is up to date at the submission deadline. Self-driving technologies become increasingly sophisticated and technically accessible, and in some cases, they can be deployed for commercial vehicles as well. According to the current stage of research and development, it is still unclear how the self-driving technologies will be able to handle extreme and unexpected events including their moral aspects. Since most of the traffic accidents are caused by human error or omission, it is expected that the emergence of the autonomous technologies will reduce these accidents in their number and gravity, but the very few currently available test results have not been able to scientifically underpin this issue yet. The increasing trend in automation of vehicles will radically change the composition of car industry players, as mechatronics will not only be a complementary part of the automobile industry but an indispensable part of it. There is a reasonable expectation that automated cars will perform the same or better in all respects than their conventional counterparts. However, it seems that the current regulations do not keep up with the development of technology and sometimes hinder the development and testing of autonomous technologies.

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- 004 -

Concept Car Audi Aicon - autonom auf Zukunftskurs.

In: eMove Magazin 360 Grad. Mobilität 4.0 - elektrisch - vernetzt - autonom * (2017) Heft 4, Seite 14-18 (5 Seiten)
München: e-monday

Mit der viertürigen Design-Vision Audi Aicon stellt die Marke mit den Vier Ringen einen völlig autonom fahrenden Audi der Zukunft vor - ohne Lenkrad, ohne Pedalerie. Als Designkonzept wagt der viertürige 2+2-Sitzer sowohl beim Exterieur als auch im Interieur einen weiten Sprung in die Formgebung der nächsten Jahrzehnte. Der Technikträger vereint auf visionäre Weise Innovationen bei Antrieb und Fahrwerk, bei Digitalisierung und Nachhaltigkeit. Auch der Aicon ist für rein elektrischen Betrieb ausgelegt, und er soll Distanzen zwischen 700 und 800 Kilometern mit einer Batterieladung zurücklegen können. Klar wird auf den ersten Blick: Anders als ein Roboter-Taxi, das auf pure Funktionalität reduziert ist, zieht das autonome Konzeptfahrzeug Audi Aicon alle Register. Seine Präsenz ist unübersehbar und deutet von außen den Raumkomfort der Passagiere und den gehobenen technischen Anspruch an. Der Audi Aicon ist der Ausblick auf ein Prestige-Automobil von Morgen, für anspruchsvolle Kunden. Der viel zitierte Paradigmenwechsel in der automobilen Welt - im Audi Aicon wird er sichtbar. Denn es fehlen auf den ersten Blick alle Bedien- und Anzeigenelemente. Lenkrad, Pedale, Batterien von Tasten und Anzeigeelementen - Fehlanzeige. Stattdessen: ruhige, weite Flächen. Die Passagiere werden umfasst von der sanft geschwungenen, nach vorn leicht ansteigenden Armauflage entlang der Türen. Vor ihnen findet sich statt eines Armaturenbretts eine großzügige Ablagefläche und das Zentralsdisplay unterhalb der Frontscheibe. So zeigt sich der Audi Aicon als Multitalent für seine Hauptaufgabe vorbereitet: auf der Langstrecke ein Maximum an Komfort, Kommunikationstechnologie und Freiraum für seine Insassen anzubieten. Er verbindet die Einsatzspektren für das autonome Fahren im urbanen Umfeld und auf dem Highway mit einer noch nicht gekannten Reichweite des elektrischen Antriebs. Weitere Audi-Mehrkämpfer mit je eigener Spezialdisziplin werden folgen und damit das Fahrzeugprogramm der Marke mit den Vier Ringen auch in der Zukunft so vielseitig wie faszinierend gestalten.

- 005 -

First Step into Visceral Interaction with Autonomous Vehicles.

Zimmermann, Raphael; Wettach, Reto

In: AutomotiveUI, International Conference on Automotive User Interfaces and Interactive Vehicular Applications, 9 * (2017) Seite 58-64 (7 Seiten) New York: ACM - Association for Computing Machinery

<http://dx.doi.org/10.1145/3122986.3122988>

Autonomous vehicles (AVs) seem to be the next big step into the future of mobility solutions. Various research institutions in the automobile industry and academic sectors are striving to come out with the most futuristic concept. This paper focuses on the interaction between AVs and pedestrians. Furthermore, the paper aims to explore if complex communication needs can be signaled to pedestrians through motion behavior of the vehicle. In order to learn how other road users feel surrounded by self-driving cars, participants were confronted with different drivability of a self-programmed vehicle during our evaluation. As the results show, the vehicle's motion behavior is able to evoke certain emotions, which in turn lead to rational decisions within the participants. This can be seen as a form of mutual communication.

- 006 -

Which Factors Influence Attitudes Towards Using Autonomous Vehicles?.

Böhm, Patricia; Kocur, Martin; Firat, Murat; Isemann, Daniel

In: AutomotiveUI, International Conference on Automotive User Interfaces and Interactive Vehicular Applications, 9 * (2017) Seite 141-145 (5 Seiten) New York: ACM - Association for Computing Machinery

<http://dx.doi.org/10.1145/3131726.3131751>

In recent years, autonomous driving has emerged as an explicit technological objective of many players in the automobile market. How will these novel developments be accepted and which factors may determine their acceptance? In an exploratory study we investigated the impact of a number of possible predictors on the attitudes towards using one particular fully autonomous driving paradigm. In a survey with 70 participants we measured these attitudes using items from the "Car Technology Acceptance Model" (CTAM). Among other things we looked at driving experience, previous experience with in-car automation technology and attitudes towards driving violations (measured by the "Driver Attitude Questionnaire", DAQ). Subsequent regression analysis showed a high (DAQ) score (indicative of a less "by the rules" attitude) to be a significant predictor for a positive attitude towards autonomous vehicles as well as a non-significant tendency that women may be less accepting of the autonomous driving paradigm under scrutiny.

- 007 -

Auf dem Weg zum autonomen Fahrzeug - Radar-basierte Fahrzeugtechnologien.

Schulz, Werner

In: PLUS. Produktion von Leiterplatten und Systemen * Band 19 (2017) Heft 12, Seite 2175-2184 (10 Seiten)

Auf dem hauseigenen "Oktober Tech 2017 Technology Collaboration Forum" hat Infineon Anfang Oktober im kalifornischen Palo Alto mit Innovationspartnern wie Google, Visa, LG, Metawave und anderen eine interessante Chipset-Lösung für die Radarsensorik in Fahrzeugen vorgestellt. Infineons neuer RadarChipsatz umfasst einen 77/79-GHz-MMIC-Sensor (Microwave Integrated Circuit), einen 32-bit-Multicore-Mikrocontroller der zweiten AURIX-Generation

und eine Safety-Stromversorgung.

At its "Oktober Tech 2017 Technology Collaboration Forum" in Palo Alto, California, Infineon, together with innovator partners Google, Visa, LG, Metawave and others, introduced a very interesting chip-set solution tackling Radar sensors for road vehicles. Infineon's new Radar chip set contains a 77/79 GHz MMIC sensor (Microwave Integrated Circuit), a 32-bit multi-core-microcontroller of the second AURIX generation and a safety power supply.

- 008 -

Assistenzsystem für automatisierte Fahrzeugpositionierung bei induktiven Ladesystemen.

Assistance system for automated vehicle positioning at inductive charging Systems.

Hisung, Matthias; Martinovic, Dean; Grimm, Michael; Reuss, Hans-Christian

In: Automatisiertes Fahren und vernetzte Mobilität, AUTOREG, VDI/VDE-Fachtagung, 8, in: VDI-Berichte * Band 2292 (2017) Seite 309-318 (10 Seiten, 9 Quellen)

In diesem Beitrag wird ein Konzept für ein Assistenzsystem zum automatisierten Positionieren von Elektrofahrzeugen auf Ladespulen vorgestellt. Es basiert auf einem am Institut für Verbrennungsmotoren und Kraftfahrwesen (IVK) entwickelten und patentierten Positionierungssystem (MPPS - Magnetic Pulse Positioning System), das erstmals ein magnetisches Pulssignal zur Ortung der Ladespule nutzt. Es erreicht eine Präzision im Millimeterbereich bei einem Radius von bis zu 3,5 m zum Spulenmittelpunkt. Hierdurch kann der Fahrer das Fahrzeug manuell präzise über die Ladespule abstellen und es induktiv laden. Eine Probandenstudie mit 60 Probanden, die in Kooperation mit dem Institut für Wirtschaftsinformatik und Dienstleistungen (WID) der TU Ilmenau am IVK durchgeführt wurde, zeigte, dass durch das Positionierungssystem die Akzeptanz von induktiven Ladesystemen jetzt deutlich höher als beim Kabelladen ist. Um den Komfort und damit die Akzeptanz noch weiter zu erhöhen, wird hier ein Konzept für ein Assistenzsystem vorgestellt. Das Konzept sieht vor, dass durch zusätzlich montierte Laserscanner der Raum vor und hinter dem Fahrzeug überwacht wird, um mittels einer Sensorfusion Kollisionen mit anderen Objekten und Personenschäden zu vermeiden. Darüber hinaus wird eine grid-basierte 2D-Karte der aktuellen Parksituation erstellt. Diese dient dem Planungsalgorithmus als Ausgangsbasis. Im Mittelpunkt des Konzepts steht der Planungsalgorithmus, durch den die Präzision im Millimeterbereich für die Positionierung des Fahrzeugs erreicht wird. Es werden für die Berechnung der Trajektorie unterschiedliche Planungsstrategien in Abhängigkeit der Entfernung, der Umgebung und der Ausrichtung des Fahrzeugs zur Ladespule herangezogen. Dabei gilt es zu jeder Zeit eine Kollisionsprüfung durchzuführen und bei der Ausführung zu überwachen. Ein weiterer Anforderungspunkt an die Planungsstrategien ist die Echtzeitfähigkeit. Da keine Sichtverbindung zwischen Sensoren und Signalquelle benötigt wird, ist das Assistenzsystem anders als kamerabasierte Systeme unabhängig von witterungsbedingten Sichtverhältnissen wie Schnee oder Regen. Aus diesem Grund ist der Ansatz sowohl für den Einsatz in der heimischen Garage, als auch im Außenbereich geeignet und in jedes Fahrzeug integrierbar. Zudem erhöht es den Komfort und die Akzeptanz von induktiven Ladesystemen.

This paper presents a concept for an assistance system with the aim to autonomously positioning electric vehicles on charge coil. It is based on a patented positioning system (MPPS - Magnetic Pulse Positioning System) from the Institute of Internal Combustion Engines and Automotive Engineering (IVK), which uses a magnetic pulse signal to locate the charge coil. It achieves a precision in millimeter range with a radius of up to 3.5 m to the coil center. This allows the driver to manually place the vehicle precisely over the charge coil and charge it inductively. The IVK in cooperation with the Institute for Business Informatics and Services (WID) of the TU Ilmenau showed in a study with 60 volunteers that the acceptance of inductive charging systems is now significantly higher than the cable charging system. In order to further increase the comfort and the acceptance of inductive charging system, a concept for an assistance system is presented here that performs and automates the exact positioning of the vehicle for inductive charging. The concept provides that the space in front of and behind the vehicle is monitored by additionally mounted laser scanners in order to avoid collision with other objects and personal injury. In addition, a grid-based 2D map of the current park situation is created. This serves as a starting point for the planning algorithm. At the center of the concept is the planning algorithm, which achieves the precision in millimeter range for the positioning of the vehicle. For the calculation of the trajectory, different planning strategies are used depending on the distance, the environment and the orientation of the vehicle to the loading coil. At all times a collision check must be carried out and monitored during execution. A further requirement point for the planning strategies is the real-time capability. Because no visual connection between sensors and signal source is necessary, the assistance system is different from camera-based systems and is independently of weather-related conditions such as snow or rain. Therefore, the approach is suitable for use in the domestic garage as well as outdoor and can be integrated into any vehicle. It also increases the comfort and acceptance of inductive charging systems.

- 009 -

The Impact of Vehicle Appearance and Vehicle Behavior on Pedestrian Interaction with Autonomous Vehicles.

Dey, Debargha; Martens, Marieke; Eggen, Berry; Terken, Jacques

In: AutomotiveUI, International Conference on Automotive User Interfaces and Interactive Vehicular Applications, 9 * (2017) Seite 158-162 (5 Seiten) New York: ACM - Association for Computing Machinery

<http://dx.doi.org/10.1145/3131726.3131750>

In this paper, we present the preliminary results of a study that aims to investigate the role of an approaching vehicle's behavior and outer appearance in determining pedestrians' decisions while crossing a street. Concerning appearance, some vehicles are designed to look more assertive than others, and it is believed that vehicle appearance

may reflect the driver's social behavior in traffic. In the case of autonomous vehicles, since the human driver no longer controls the vehicle's action, the question arises whether pedestrians treat autonomous and manually-driven vehicles differently when deciding to cross the street. We devised an experiment to determine the impact of the behavioral and physical attributes of a vehicle on pedestrians' road-crossing decisions, both for manually-driven and autonomous vehicles. Preliminary results show that in both cases, distance and speed play a dominant role in pedestrians' decision to cross a road when compared to the vehicle's size and appearance.

- 010 -

Autonomous or driver-less vehicles: Implementation strategies and operational concerns.

Masoud, Neda; Jayakrishnan, R.

In: Transportation Research. Part E: Logistics and Transportation Review * Band 108 (2017) Seite 179-194 (16 Seiten, 36 Quellen)

<http://dx.doi.org/10.1016/j.tre.2017.10.011>

Autonomous vehicles are expected to shift not only the driving paradigms but also the notion of vehicle ownership. Although autonomous vehicles are believed to introduce many safety, mobility, and environmental benefits, they will be initially priced relatively highly. This paper assesses the potential for circumventing this barrier by promoting a shared ownership program in which households form clusters that share the ownership and ridership of a set of autonomous vehicles. Such a program will increase the utilization rate of vehicles, making ownership of autonomous vehicles more economical. We study parameters that affect the benefits expected from autonomous vehicles, and introduce policy directions that can boost these benefits.

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- 011 -

Workshop on Human Machine Interaction in Autonomous Vehicles: the Perspective of the Two Current HORIZON 2020 Projects ADAS&ME and AUTOMATE.

Tango, Fabio; Montanari, Roberto; Luedtke, Andreas; Baumann, Martin; Diederichs, Frederik; Anund, Anna; Castellano, Andrea; Vacca, Stefania

In: AutomotiveUI, International Conference on Automotive User Interfaces and Interactive Vehicular Applications, 9 * (2017) Seite 33-38 (6 Seiten) New York: ACM - Association for Computing Machinery

<http://dx.doi.org/10.1145/3131726.3131730>

The challenges related to the development of automated vehicles are not only of a technical nature, but also affect the quality of on-board interaction. The role of the HMI is crucial to manage unexpected events and ensure a safe and smooth transition of control. The workshop will promote and discuss the approach used in the HMI design for autonomous vehicles realized from the European projects ADAS&ME and AutoMate. ADAS&ME is dedicated to the creation of new driver state adaptive ADAS that incorporate driver/rider state, the situational and environmental context, as well as the adaptive interaction to automatically transfer control. AutoMate will enhance safety by using the strength of both the automation and driver in a dynamic situation dependent way. In the workshop the main challenges emerged in the projects will be discussed with the audience, to obtain feedbacks and enhancements, and to highlight themes and strategies not yet emerged.

- 012 -

Reinventing the Wheel: Transforming Steering Wheel Systems for Autonomous Vehicles.

Mok, Brian; Johns, Mishel; Yang, Stephen; Ju, Wendy

In: UIST, Annual ACM Symposium on User Interface Software and Technology, 30 * (2017) Seite 229-241 (13 Seiten) New York: ACM - Association for Computing Machinery

<http://dx.doi.org/10.1145/3126594.3126655>

In this paper, we introduce two different transforming steering wheel systems that can be utilized to augment user experience for future partially autonomous and fully autonomous vehicles. The first one is a robotic steering wheel that can mechanically transform by using its actuators to move the various components into different positions. The second system is a LED steering wheel that can visually transform by using LEDs embedded along the rim of wheel to change colors. Both steering wheel systems contain onboard microcontrollers developed to interface with our driving simulator. The main function of these two systems is to provide emergency warnings to drivers in a variety of safety critical scenarios, although the design space that we propose for these steering wheel systems also includes the use as interactive user interfaces. To evaluate the effectiveness of the emergency alerts, we conducted a driving simulator study examining the performance of participants (N=56) after an abrupt loss of autonomous vehicle control. Drivers who experienced the robotic steering wheel performed significantly better than those who experienced the LED steering wheel. The results of this study suggest that alerts utilizing mechanical movement are more effective than purely visual warnings.

- 013 -

Putting the Joy in Driving: Investigating the Use of a Joystick as an Alternative to Traditional Controls within Future Autonomous Vehicles.

Large, David R.; Banks, Victoria; Burnett, Gary; Margaritis, Neofytos

In: AutomotiveUI, International Conference on Automotive User Interfaces and Interactive Vehicular Applications, 9 * (2017) Seite 31-39 (9 Seiten) New York: ACM - Association for Computing Machinery

<http://dx.doi.org/10.1145/3122986.3122996>

Unencumbered by the need to provide permanent manual control, future autonomous vehicles may be absent of traditional driving elements, such as a steering wheel and foot-pedals. While this provides additional space/comfort for drivers, an alternative device/s, that enables quick and effective manual control recovery, may still be required.

Twenty participants, comprising an equal number of 'Drivers' and 'Non-Drivers', undertook two drives utilising a medium-fidelity simulator in which the original steering wheel and pedal-set were removed/deactivated. Participants controlled the vehicle using a centrally-mounted joystick in 2 scenarios: following an unexpected take-over request and during an extended period of manual driving. Results show that both groups rated the technology positively and were generally capable of manoeuvring the vehicle. Nevertheless, the groups differed in the way that performance was effected. For example, significant differences were evident in visual behaviour, resulting in 50% (n=5) of Non-Drivers colliding with another vehicle following transfer of control.

- 014 -

The neglected demands that autonomous driving and consumer expectations required from brake design.

Gonzalez Rocha, Mauricio

In: Internationale VDI-Tagung Reifen-Fahrwerk-Fahrbahn mit Fachausstellung, 16, VDI-Fachkonferenz Innovative Bremstechnik, 5, in: VDI-Berichte * Band 2296 (2017) Seite 347-358 (12 Seiten)

The automotive industry is facing an adverse reality with autonomous and connected vehicles. The industry has grown complacent; and a myopic view of consumers' needs and wants has been exposed. This reality also shows the poor evolution brake systems have undergone for the past century and the harmful effect on our own capabilities to compete against new entrants with alternative tools which allow them to be more agile and able to capture consumer shifts and capitalize new business models. Consumer expectations for autonomous and connected cars align with consumer electronics products where every other year manufacturers release a new gadget with enhanced capabilities. On top, we have a new entrant like Tesla, capable of reshuffling the car concept by releasing areas in the body structure typically occupied by powertrain components and incorporating a slim IP with all types of functionality that update overnight. On the other hand, we have a legacy manufacturer that just released, with fanfare, an electric vehicle keeping the old mindset of filling the hood with "stuff" Smart brake systems need to be part of the vehicle evolution with unique safety protocols to enhance functionality and vehicle simplicity.

- 015 -

Autonomous Cooperative Multi-Convoy Control for Off-Road-Scenarios.

Heinrich, Benjamin C.; Fassbender, Dennis; Wuensche, Hans-Joachim

In: Automatisiertes Fahren und vernetzte Mobilität, AUTOREG, VDI/VDE-Fachtagung, 8, in: VDI-Berichte * Band 2292 (2017) Seite 365-376 (12 Seiten, 10 Quellen)

While platooning for highway applications has been under research since the mid-eighties, the field of off-road platooning for multiple vehicles has been largely neglected. Additional challenges in this field comprise, amongst others, the lack of road markings for lane keeping and base stations for Vehicle-to-Infrastructure communication or GNSS correction signals. We propose a decentralized framework for stabilizing a multi convoy, i.e., multiple single-convoy capable vehicles, equipped with low-bandwidth radio transmitters, forming a platoon. Tests have been conducted both in simulation and with our autonomous vehicles.

- 016 -

Networked Driving Simulation for Future Autonomous and Cooperative Vehicle Systems. Development of a Modular Platform for Networked Driving Simulation Based on High-Level Architecture.

Abdelgawad, Kareem; Henning, Sven; Biemelt, Patrick; Gausemeier, Sandra; Trachtler, Ansgar

In: Automatisiertes Fahren und vernetzte Mobilität, AUTOREG, VDI/VDE-Fachtagung, 8, in: VDI-Berichte * Band 2292 (2017) Seite 539-550 (12 Seiten, 28 Quellen)

Vernetzte Fahrsimulation bietet eine realitätsgetreuere Nachbildung des realen Straßenverkehrs und seiner eingeschränkten Präzifizierbarkeit. Dieser Beitrag stellt die Struktur einer modularen Plattform für vernetzte Fahrsimulation auf Basis des IEEE Standards High-Level Architecture (HLA) vor. Die Plattform dient als Werkzeug für das virtuelle Prototyping für zukünftige autonome und vernetzte Fahrzeugsysteme. Zwei Fahrsimulatoren, ein Verkehrssimulator, ein Datenlogger und eine zentrale Station repräsentieren die Hauptkomponenten der entwickelten Plattform. Zur Validierung wurde ein Simulationsmodell für das autonome Fahren entwickelt und in die Simulationsumgebung der beteiligten Fahrsimulatoren integriert. Außerdem wurden die Bedienbarkeit und die Akzeptanz der aufgebauten Plattform für vernetzte Fahrsimulation anhand von Probandenversuchen geprüft.

In networked driving simulation, two or more human drivers interact in a common virtual environment and form a much closer approximation of real-world traffic with its unpredictability. This paper presents the structure of a modular

platform for networked driving simulation based on the IEEE standard High-level architecture (HLA). The platform serves as a virtual prototyping tool for development, test, and training purposes with respect to future autonomous and connected vehicle systems. Two driving simulators, a traffic simulator, a data logger, and a central station represent the primary components of the developed platform. A simulation model of an autonomous driving system was utilized and a group of test persons was involved to show the usability and validity of the developed platform.

- 017 -

Approach Methods for Autonomous Precision Aerial Drop from a Small Unmanned Aerial Vehicle.

Mathisen, Siri H.; Grindheim, Vegard; Johansen, Tor A.

In: World Congress of the International Federation of Automatic Control, IFAC World Congress, 20, in: IFAC-PapersOnLine * Band 50 (2017) Heft 1, Seite 3566-3573 (8 Seiten, 22 Quellen)

<http://dx.doi.org/10.1016/j.ifacol.2017.08.624>

One of the many basic operations that a fixed-wing unmanned aerial vehicle (UAV) should master autonomously is to deliver an object to a precise position. Among several possible delivery approaches, this paper chooses to focus on releasing the object from the UAV, at a carefully calculated state, and let it fall freely to the selected landing location. In such an operation, the computation of suitable release positions, velocity and attitude is essential. Due to time-varying disturbances like wind, a previously calculated release state may not be suitable once it has been reached by the aircraft. On account of these challenges, this paper suggests a dynamic calculation of the release state with respect to the wind velocity and current state of the UAV, with a sufficient re-optimization frequency. This is tested in simulation and with field tests, and compared with results from a static calculation approach.

- 018 -

Adaptive Cruise Control with Safety Guarantees for Autonomous Vehicles.

Magdici, Silvia; Althoff, Matthias

In: World Congress of the International Federation of Automatic Control, IFAC World Congress, 20, in: IFAC-PapersOnLine * Band 50 (2017) Heft 1, Seite 5774-5781 (8 Seiten, 36 Quellen)

<http://dx.doi.org/10.1016/j.ifacol.2017.08.418>

This paper addresses the problem of following a vehicle with varying acceleration in a comfortable and safe manner. Our architecture consists of a nominal controller (here: model predictive control) and a safety controller. Although model predictive control attempts to keep a safe distance, it cannot formally guarantee it, due to the assumptions on the behavior of the leading vehicle. We address this problem by holding a formally verified safety controller available. Our novel mechanism gradually engages the safety maneuver since most critical situations resolve quickly. The overall approach is evaluated against real traffic data. The results show good position and velocity tracking performance, while safety and comfort are guaranteed.

- 019 -

Optimal Velocity Profile Generation for Semi-Autonomous Vehicles.

Winter, Christoph; Castro, Ricardo de

In: Automatisiertes Fahren und vernetzte Mobilität, AUTOREG, VDI/VDE-Fachtagung, 8, in: VDI-Berichte * Band 2292 (2017) Seite 129-141 (13 Seiten, 15 Quellen)

Diese Arbeit beschreibt die Optimierung von Geschwindigkeitsprofilen für (semi-) autonome Fahrzeuge. Der Fokus der Optimierung liegt auf dem Kompromiss zwischen zeit- und energieoptimalen Geschwindigkeitsprofilen. Dieser Kompromiss kann direkt durch den Fahrer gewählt werden. Mit Hilfe von dynamischer Programmierung wird das globale Optimum der komplexen Optimierung mit nichtlinearen Nebenbedingungen, die auf den physikalischen Beschränkungen des Fahrzeugs basieren, gefunden. Die Planung der Geschwindigkeitsprofile zusammen mit einem online Bahnplaner dient als Vorgabe für die Pfadfolge-Regelung des Fahrzeugs, welche automatisiertes Fahren ermöglicht. Die Effektivität des vorgestellten Ansatzes wird durch numerische Simulationen gezeigt.

This work describes the optimization of velocity profiles for the usage in (semi-) autonomous driving. The focus of the optimization lies on the trade-off between time and energy optimal velocity profiles. This trade-off can be directly chosen by the driver. With help of a dynamic programming framework the global optimum of the complex optimization with nonlinear constraints based on the vehicles physical limits is found. The velocity profile generation together with an online path planner serves as an input to the vehicle's path following control, allowing for automated driving. The effectiveness of the proposed approach is shown via numerical simulations.

- 020 -

Numerical analysis of stability and manoeuvrability of Autonomous Underwater Vehicles (AUV) with fishtail shape.

da Silva Costa, G.; Ruiz, A.; Reis, M.A.; da Cunha Lima, A.T.; de Almeida, M.P.; da Cunha Lima, I.C.

In: Ocean Engineering * Band 144 (2017) Seite 320-326 (7 Seiten, 17 Quellen)

<http://dx.doi.org/10.1016/j.oceaneng.2017.08.030>

This paper aims to understand the stability and the manoeuvrability of an Autonomous Underwater Vehicles (AUV) through the simulation of the drag, lift and torque acting on the hull by the passing seawater. These are important questions in deep water conditions where telecommand is impracticable. The present study is based on the behaviour of a stern shaped as a fishtail in three different ways, and considers several attack angles. The solutions of the Navier-Stokes equations are computed with the OpenFOAM library. An open source library based on the Finite Volume Method (FVM) using C++ language. An analysis of the effects of the fishtail shape on the resistance and stability is based on the calculation of the averages drag, lift and torque. A filtering on the Fourier transform of the torque is used to discuss the manoeuvrability in each case.

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- 021 -

A Comparison of Two Guidance Strategies for Autonomous Vehicles.

Boudali, Mohamed; Orjuela, Rodolfo; Basset, Michel

In: World Congress of the International Federation of Automatic Control, IFAC World Congress, 20, in: IFAC-PapersOnLine * Band 50 (2017) Heft 1, Seite 12539-12544 (6 Seiten, 13 Quellen)

<http://dx.doi.org/10.1016/j.ifacol.2017.08.2192>

This paper deals with guidance problem of autonomous vehicles. These guidance strategies are typically based on the lateral error of the center of gravity (CoG). Recently, the center of percussion (CoP) has been used to design a steering controllers, particularly in critical situations. However, no comparison using the CoG and the CoP has been done to the best of the authors' knowledge. This paper presents a comparison of two lateral guidance strategies based on the CoG and on the CoP using the same control strategy. This last consists in a feedforward coupled with a robust state-feedback. The performance of the strategies and the robustness of the controllers with respect to the variation of the speed are demonstrated by simulation tests.

- 022 -

Multimodal Heads Up Displays to Augment Autonomous Vehicle Supervision.

May, Keenan R.; Noah, Brittany E.; Walker, Bruce N.

In: AutomotiveUI, International Conference on Automotive User Interfaces and Interactive Vehicular Applications, 9 * (2017) Seite 246-246 (1 Seite) New York: ACM - Association for Computing Machinery

<http://dx.doi.org/10.1145/3131726.3131877>

Drivers using SAE level 2-4 systems are required to supervise the vehicle, and may need to take control when certain conditions arise. While awareness of general automation certainty is crucial, the attention of the supervisory driver could also be directed toward specific areas or objects that the automated system is uncertain about. This video is a mockup of a system that uses a combination of audio and heads-up-display elements to inform the driver of specific areas of uncertainty and allow them to decide whether to take control. This project will continue via participatory design activities followed by simulator research.

- 023 -

Autonomous vehicles: from paradigms to technology.

Ionita, Silviu

In: CAR, International Congress of Automotive and Transport Engineering - Mobility Engineering and Environment, 2017, in: IOP Conference Series: Materials Science and Engineering (Online) * Band 252 (2017) Seite 012098/1-8 (8 Seiten, 10 Quellen)

<http://dx.doi.org/10.1088/1757-899X/252/1/012098>

Mobility is a basic necessity of contemporary society and it is a key factor in global economic development. The basic requirements for the transport of people and goods are: safety and duration of travel, but also a number of additional criteria are very important: energy saving, pollution, passenger comfort. Due to advances in hardware and software, automation has penetrated massively in transport systems both on infrastructure and on vehicles, but man is still the key element in vehicle driving. However, the classic concept of 'human-in-the-loop' in terms of 'hands on' in driving the cars is competing aside from the self-driving startups working towards so-called 'Level 4 autonomy', which is defined as "a self-driving system that does not requires human intervention in most scenarios". In this paper, a conceptual synthesis of the autonomous vehicle issue is made in connection with the artificial intelligence paradigm. It presents a classification of the tasks that take place during the driving of the vehicle and its modeling from the perspective of traditional control engineering and artificial intelligence. The issue of autonomous vehicle management is addressed on three levels: navigation, movement in traffic, respectively effective maneuver and vehicle dynamics control. Each level is then described in terms of specific tasks, such as: route selection, planning and reconfiguration, recognition of traffic signs and reaction to signaling and traffic events, as well as control of effective speed, distance

and direction. The approach will lead to a better understanding of the way technology is moving when talking about autonomous cars, smart/intelligent cars or intelligent transport systems.
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- 024 -

Integriertes Bremssystem IBS (1-Box) versus e-Booster & ESP (2-Box). Anforderungen an zukünftige Bremssysteme bezüglich Funktionalität, Aufwand, Packaging bei allen Fahrzeugtypen und Fehlersicherheit bei autonomem Fahren.

Leiber, Thomas

In: Internationale VDI-Tagung Reifen-Fahrwerk-Fahrbahn mit Fachausstellung, 16, VDI-Fachkonferenz Innovative Bremstechnik, 5, in: VDI-Berichte * Band 2296 (2017) Seite 325-335 (davon 10 S. Folienpräsentation) (11 Seiten)

Nach der Einführung von ABS in 1978 erfolgten stetige Erweiterungen der Funktionen zur Sicherheit, mit ASR in 1987 und ein großer Schritt mit ESP in 1995, und Assistenzfunktionen in 1997. Baugröße, Gewicht und Kosten wurden stetig verbessert. Der Zwang zur Reduktion von CO₂-Emissionen führte zur Einführung des elektrischen Bremskraftverstärkers (e-Booster), zugleich konnte durch den Wegfall der Vakuumpumpe die Anzahl der Komponenten von 3 auf 2 reduziert werden (3-Box -> 2-Box). Parallel dazu lief die Entwicklung des voll integrierten Systems als sogenannte 1-Box Lösung. Im Jahr 2008 stellte der gleiche Vortragende erstmalig das integrierte System IBS vor, als sogenannte 1-Box Lösung mit vielen Innovationen, insbesondere in der Regelungstechnik, Fehlersicherheit, Pedalgefühl, Komfort und hoher Funktionsintegration. Die Sicherheitsanforderungen dieser Systeme entsprach Fail Safe oder Fail Silent, wobei bei Ausfall von ESP oder Assistenzfunktionen auf eine Rückfallebene, z.B. ABS, oder auf die Basisbremse umgeschaltet wurde. Die Einführung von automatisiertem Fahren, bekanntlich über verschiedene Stufen der Automatisierung, Stufe 1 - Stufe 5, vom fahrerunterstützten bis fahrerlosen Fahrzeug, stellt nun erheblich höhere Anforderungen an die Sicherheit bei autonomem Fahren (Stufe 5, fahrerlos), z.B. ist der Ausfall der Druckversorgung unzulässig. Die Einführung des elektrischen Bremskraftverstärkers zusammen mit ESP brachte den zusätzlichen Sicherheitsgewinn, indem bei Ausfall des elektrischen Bremskraftverstärkers, die Bremskraftverstärkung vom ESP übernommen wurde.

- 025 -

An Evaluation of Deep Water Navigation Systems for Autonomous Underwater Vehicles.

Costanzi, Riccardo; Fenucci, Davide; Giagnoni, Simone; Munafo, Andrea; Caiti, Andrea

In: World Congress of the International Federation of Automatic Control, IFAC World Congress, 20, in: IFAC-PapersOnLine * Band 50 (2017) Heft 1, Seite 13680-13685 (6 Seiten, 14 Quellen)

<http://dx.doi.org/10.1016/j.ifacol.2017.08.2532>

The navigation system is a crucial element of the control chain of an Autonomous Underwater Vehicle (AUV) because of the unavailability of a reliable positioning system such as the Global Positioning System (GPS). High performance navigation capabilities are ensured by equipping vehicles with high grade INS (Inertial Navigation System) aided by a Doppler Velocity Log (DVL) among other sensors. For its nature, a DVL can work only within a limited range from the bottom precluding its use for deep water applications. This work analyses two different approaches to address the problem of deep water navigation. The first one is based on measurements of relative distance between different nodes (cooperating vehicles and a static gateway buoy) that constitute an acoustic underwater network. The second one is based on the data from a positioning system (the HiPAP system by Kongsberg) that is mounted on the support ship and that has a limited operational range. Results from the two approaches are evaluated based on the data collected during the COLLAB NGAS14 experimental campaign and processed off-line. The results have to be intended as a preliminary work towards the integration of several complementary methods within a unique navigation system capable of exploiting the different technologies towards robust and reliable deep water navigation capabilities.

- 026 -

Autonomous Landing of a Multirotor Micro Air Vehicle on a High Velocity Ground Vehicle.

Borowczyk, Alexandre; Nguyen, Duc-Tien; Phu-Van Nguyen, Andre; Nguyen, Dang-Quang; Saussie, David; Ny, Jerome Le

In: World Congress of the International Federation of Automatic Control, IFAC World Congress, 20, in: IFAC-PapersOnLine * Band 50 (2017) Heft 1, Seite 10488-10494 (7 Seiten, 19 Quellen)

<http://dx.doi.org/10.1016/j.ifacol.2017.08.1980>

While autonomous multirotor micro aerial vehicles (MAVs) are uniquely well suited for certain types of missions benefiting from stationary flight capabilities, their more widespread usage still faces many hurdles, due in particular to their limited range and the difficulty of fully automating the deployment and retrieval. In this paper we address these issues by solving the problem of the automated landing of a quadcopter on a ground vehicle moving at relatively high speed. We present our system architecture, including the structure of our Kalman filter for the estimation of the relative position and velocity between the quadcopter and the landing pad, as well as our controller design for the full rendezvous and landing maneuvers. The system is experimentally validated by successfully landing in multiple trials a commercial quadcopter on the roof of a car moving at speeds of up to 50 km/h.

Multi-Objective Evolutionary Optimization for Autonomous Intersection Management.

Ripon, Kazi Shah Nawaz; Solaas, Jostein; Dissen, Hakon

In: Simulated Evolution and Learning, SEAL, International Conference on Simulated Evolution and Learning, 11, in: Lecture Notes in Computer Science, Theoretical Computer Science and General Issues * Band 10593 (2017) Seite 297-308 (12 Seiten), Paper-Nr. Chapter 25, Evolutionary Multiobjective Optimisation

http://dx.doi.org/10.1007/978-3-319-68759-9_25

This paper investigates the real-time application of multi-objective evolutionary algorithm (MOEA) for managing traffic at an intersection with its focus on autonomous vehicles. Most of the existing works on intersection management emphasize using MOEAs to optimize parameters for traffic-light based intersections, or they target human drivers. However, the advent of autonomous vehicles has changed the field of intersection management. To maximize the use of autonomous vehicles, the intersections should be autonomous also. This paper proposes an autonomous intersection management (AIM) system that controls the speed for each vehicle approaching at an intersection by using MOEA. The proposed system first looks at splitting the continuous problem of intersection management into smaller independent scenarios. Then it utilizes the MOEA to find solutions for each scenario by optimizing multiple objectives with different goals in terms of overall performance. In order to give the MOEA low level control of traffic at intersections, the autonomous vehicles are modelled as travelling along a predefined path, with a speed determined by the MOEA.

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Privacy Risks in Vehicle Grids and Autonomous Cars.

Joy, Joshua; Gerla, Mario

In: ACM MobiCom, Annual International Conference on Mobile Computing and Networking, 23, CarSys, ACM International Workshop on Smart, Autonomous, and Connected Vehicular Systems and Service, 2 * (2017) Seite 19-23 (5 Seiten) New York: ACM - Association for Computing Machinery

<http://dx.doi.org/10.1145/3131944.3133938>

Traditionally, the vehicle has been the extension of the manual ambulatory system, docile to the drivers' commands. Recent advances in communications, controls and embedded systems have changed this model, paving the way to the Intelligent Vehicle Grid. The car is now a formidable sensor platform, absorbing information from the environment, from other cars (and from the driver) and feeding it to other cars and infrastructure to assist in safe navigation, pollution control and traffic management. The next step in this evolution is just around the corner: the Internet of Autonomous Vehicles. Like other important instantiations of the Internet of Things (e.g., the smart building, etc), the Internet of Vehicles will not only upload data to the Internet with V2I. It will also use V2V communications, storage, intelligence, and learning capabilities to anticipate the customers' intentions and learn from other peers. V2I and V2V are essential to the autonomous vehicle, but carry the risk of attacks. This paper will address the privacy attacks to which vehicles are exposed when they upload private data to Internet Servers. It will also outline efficient methods to preserve privacy.

Coupled Longitudinal and Lateral Control for an Autonomous Vehicle Dynamics Modeled Using a Robotics Formalism.

Chebly, A.; Talj, R.; Charara, A.

In: World Congress of the International Federation of Automatic Control, IFAC World Congress, 20, in: IFAC-PapersOnLine * Band 50 (2017) Heft 1, Seite 12526-12532 (7 Seiten, 22 Quellen)

<http://dx.doi.org/10.1016/j.ifacol.2017.08.2190>

The development of autonomous and intelligent vehicles is increasing continuously in the aim to reach a reliable and secured transportation system. Indeed, autonomous navigation include three main steps: perception and localization, planning and control. This work covers essentially the study of the vehicle modeling and the vehicle control. We present a coupled control algorithm for longitudinal and lateral dynamics of an autonomous vehicle. The control is realized using Lyapunov functions and aims to ensure a robust tracking of the reference trajectory especially in coupled longitudinal and lateral maneuvers such as lane-change maneuvers, obstacle avoidance maneuvers and combined lane-keeping and steering control during critical driving situations. The control is based on the vehicle model that is carried out using the robotics formalism. This modeling approach is considered here for the accuracy it presents, since multi-body models provide more information, which are usually neglected when using a closed-form model. It considers the vehicle as a multi-body poly-articulated system and uses the modified Denavit-Hartenberg geometric description to represent the vehicle. Newton-Euler algorithm is then used to compute the direct dynamical model of the vehicle. The developed model takes into consideration all the vehicle parts and their interconnections, that renders it more representative of the vehicle behavior especially in critical driving scenarios.

- 030 -

The Determination of Functional Safety Concept coupled with the definition of Logical Architecture: a framework of analysis from the automotive industry.

Mauborgne, Pierre; Deniaud, Samuel; Levrat, Eric; Bonjour, Eric; Micaelli, Jean-Pierre; Loise, Dominique

In: World Congress of the International Federation of Automatic Control, IFAC World Congress, 20, in: IFAC-PapersOnLine * Band 50 (2017) Heft 1, Seite 7278-7283 (6 Seiten, 20 Quellen)

<http://dx.doi.org/10.1016/j.ifacol.2017.08.1400>

In the nineties the growing integration of electronic components in mass products led to the introduction of systems engineering methods in the design offices. In the automotive industry this deployment has been accelerated due to the need for the reduction of polluting emissions and for safety concerns. Recently the introduction of safety standards such as ISO 26262 and the design of connected and autonomous vehicles required the development of new system modeling approaches, and particularly, model-based safety analysis methods (MBSA). In this article, we explain how Functional Safety Concept can be determined jointly with the definition of the logical architecture. This will be based on failure propagation mechanisms. This method is applied on an automotive case study.

- 031 -

Evaluation of a Processor Simulator Exemplified by a Radar Processing Algorithm.

Rachuj, Sebastian; Hartmann, Christian; Fey, Dietmar

In: Architecture of Computing Systems, ARCS, International Conference on Architecture of Computing Systems, 30 * (2017) Seite 1-5 (5 Seiten)

<http://www.vde-verlag.de/proceedings-de/564395013.html>

Simulation is an option to manage the complexity of heterogeneous systems which are more and more common in today's vehicles. To estimate the real runtime of an algorithm, such a system simulator has to rely on each processor simulator it is combined of. Since fast running simulators often have a bad quality regarding the determination of non-functional properties, we compared state-of-the-art ARM models with real hardware using an algorithm for processing raw radar data as it is already used in the automotive industry. It appears that there is still need to develop better methodologies for ascertaining the runtime of an algorithm in a simulation environment.

- 032 -

Ethik und Risiko. Zur Akzeptanz selbstfahrender Autos.

Grunwald, Armin

In: Automatisiertes Fahren und vernetzte Mobilität, AUTOREG, VDI/VDE-Fachtagung, 8, in: VDI-Berichte * Band 2292 (2017) Seite 21-31 (11 Seiten, Quellen)

Selbst fahrende Autos sind innerhalb kurzer Zeit zu einem großen gesellschaftlichen Thema geworden. Schien das autonome Fahren vor wenigen Jahren noch entfernte Zukunftsmusik zu sein, so haben Fortschritte der Technik und medienwirksame Inszenierungen, aber auch Unfälle mit mehr oder weniger autonomen Fahrzeugen demonstriert, dass wir an der Schwelle eines neuen Zeitalters der Mobilität stehen. Dass hier Bürger und Verbände hellhörig werden ist kein Wunder, ist doch das Autofahren seit Jahrzehnten ein zentrales Symbol des modernen Menschen und seiner Freiheit. Da wird jede mögliche Änderung vertrauter Gewohnheiten gleich zum Thema, und es werden Risiken und ethische Herausforderungen thematisiert. Das autonome Fahren stellt in vieler Hinsicht eine attraktive Innovation für die Zukunft der Mobilität dar. Mehr Sicherheit, ein Gewinn an Komfort, die Nutzung der für das Fahren benötigten Zeit für andere Zwecke und Effizienzgewinne auf Systemebene gehören zu den vielfach erwarteten Vorteilen (Maurer et al. 2015). In Systemen und Technologien autonomen Fahrens sind jedoch - wie ganz grundsätzlich bei Technik - Fehler nicht auszuschließen, die zu Unfällen mit Sach- oder Personenschäden führen können. Die zentrale Rolle von Software kann zu systemischen Risiken führen, wie aus der Internet- und Computerwelt hinlänglich bekannt. Auch an ökonomische Risiken ist zu denken, z.B. für die Automobilindustrie oder den Arbeitsmarkt, genauso wie an soziale Risiken etwa für Privatheit. Frühzeitige und umfassende Analyse und Bewertung möglicher Risiken des autonomen Fahrens sind unabdingbarer Bestandteil eines verantwortlichen Forschungs- und Innovationsprozesses und damit gleichermaßen notwendige Bedingungen einer individuellen wie auch allgemeinen gesellschaftlichen Akzeptanz.

- 033 -

Editorial: Electric vehicles provide opportunities for automotive textile manufacturers.

Anson, Robin

In: Technical Textile Markets * (2017) Heft 108, Seite 4-13 (10 Seiten)

<http://www.textilesintelligence.com/tisttm/>

Suppliers of technical textiles and related materials to the global automotive industry can expect major disruption in the coming years as a result of two significant developments: (1) recent initiatives which could result in the end of vehicles powered by internal combustion engines and their replacement with hybrid vehicles and electric vehicles (EVs); and (2) advances in autonomous or self-drive vehicles. A number of recent initiatives are pointing to the end of the internal combustion engine. At the beginning of June 2017, energy ministers and other high level delegates from the 24 member countries of the Clean Energy Ministerial (CEM) and the EU announced the new EV 30@30 campaign at the 8th Clean Energy Ministerial (CEM8), which was held in Beijing, China. The EV 30@30 campaign aims to speed up the deployment of electric vehicles (EVs) - including battery-electric types, plug-in hybrid types and fuel

cell types - to the extent that they account for at least 30% of all new vehicles sold globally by 2030. In July 2017 the Swedish car giant Volvo announced that it would make only electric or hybrid vehicles from 2019 onwards, and the French and UK governments said that they would ban the sale of petrol and diesel vehicles by 2040. In September 2017 Jaguar Land Rover (JLR) - which is owned by the Indian company Tata - announced that every model launched from 2020 would be electric or hybrid and that the first of the new models, a fully electric vehicle called the Jaguar I-Pace, would go on sale in 2018. In the same month, the chairman of BMW, Harald Krüger, announced that BMW would deliver 100,000 electrified vehicles to customers in 2017 and, as a result, there would be more than 200,000 BMW Group electrified vehicles on the road by the end of the year. Looking further ahead, Mr Krüger stated that BMW would offer 25 electrified vehicles by 2025, of which 12 will be fully electric. In the meantime, the company confirmed that it would showcase the first electric Mini at the 67th Internationale Automobil-Ausstellung (IAA - International Motor Show), which was staged during September 14-24, 2017, in Frankfurt, Germany. Fortunes are being invested in the development of autonomous or self-drive vehicles by the technology giants of Silicon Valley and established car manufacturers. The development of autonomous or self-drive vehicles has, in turn, been made easier - and is being accelerated - by the development of electric vehicles (EVs) although it is technically possible to produce autonomous or self-drive vehicles powered by internal combustion engines.

- 034 -

E-Antriebe und Rekuperation - Zu- oder abnehmende Anforderungen an die Radbremse?.

Bode, K.; Tiedemann, M.

In: Internationale VDI-Tagung Reifen-Fahrwerk-Fahrbahn mit Fachausstellung, 16, VDI-Fachkonferenz Innovative Bremstechnik, 5, in: VDI-Berichte * Band 2296 (2017) Seite 401-410 (10 Seiten, 5 Quellen)

Der aktuelle Umbruch in der Automobilindustrie, hin zu elektrischem und autonomem Fahren, suggeriert, dass Entwicklungsaufwendungen praktisch ausschließlich in diesen dominanten Technologiefeldern von Bedeutung sind. Tatsächlich erfordern auch die klassischen mechanischen Systeme zukünftig eine Weiterentwicklung und Optimierung. Dies ist erst recht der Fall, wenn diese in Wechselwirkung mit neuen Konzepten und Funktionen stehen. In diesem Artikel wird dargestellt, in welcher Weise sich Anforderungen an Radbremsen verändern. Ausgehend von einer Analyse der Lastkollektive und den besonderen akustischen Anforderungen in E-Fahrzeugen werden dabei Implikationen auf Komponentenebene, Prüfverfahren und den Entwicklungsprozess selbst aufgezeigt.

The current transition in automotive industry towards electric and autonomous driving appears to imply that future development efforts are only required in these prominent technological fields. However, also classical mechanical components call for further development and refinement, especially in those cases, where they directly interact with new concepts and functions. This article discusses changing requirements with respect to wheel brakes. Beginning with an analysis of changing load spectra and specific acoustic requirements in electric vehicles, implications on the subcomponent level, test procedures and the development process itself are outlined.

- 035 -

Das Audi AI Aktivfahrwerk im neuen Audi A8 - Ziele der Entwicklung, Funktions- und Systembeschreibung.

Schmitt, Joachim

In: Internationale VDI-Tagung Reifen-Fahrwerk-Fahrbahn mit Fachausstellung, 16, VDI-Fachkonferenz Innovative Bremstechnik, 5, in: VDI-Berichte * Band 2296 (2017) Seite 175-186 (12 Seiten, 5 Quellen)

Fahrkomfort und Fahrsicherheit sind in der Fahrwerktechnik ein klassischer Zielkonflikt. Vertikaldynamiksysteme ermöglichen diese Eigenschaften gleichzeitig zu verbessern und einen besseren Kompromiss zu finden. Das Audi AI Aktivfahrwerk im neuen Audi A8 erlaubt eine weitere Verbesserung von Fahrkomfort und Fahrsicherheit und löst den Zielkonflikt weitgehend auf. Das Aktivfahrwerk ist ein elektromechanisches Federungssystem, mit dem radspezifisch vertikale Kräfte zwischen dem Fahrzeugaufbau und Rädern gestellt werden. Es wird ein exzellenter Aufbaufederungskomfort durch eine aktive Aufbauberuhigung mit aktiver Nick- und Wankkontrolle erreicht. Die Systemarchitektur beruht auf einem Smart-Aktuator-Konzept an Vorder- und Hinterachse in Verbindung mit einem zentralen Fahrwerksteuergerät, welches die Gesamtfahrzeugregelung und zentrale Systemaufgaben übernimmt. In Verbindung mit autonomen Fahren werden aktive Vertikaldynamiksysteme in Zukunft auch in kleineren Fahrzeugklassen Einzug halten.

- 036 -

Entwicklung einer kooperativen Bremsstrategie als Reaktion auf Einscherer im dichten Verkehr auf der Autobahn.

Kauffmann, Nina; Raeth, Esther; Winkler, Franz; Vollrath, Mark

In: Der Mensch im Fokus technischer Innovationen, VDI-Tagung Der Fahrer im 21. Jahrhundert, 9, in: VDI-Berichte * Band 2311 (2017) Seite 193-206 (14 Seiten, 37 Quellen)

Die Zukunft der Automobilindustrie liegt im autonomen Fahren. Dieses verspricht vor allem Vorteile im Bereich Verkehrssicherheit, Reduktion von Emissionen und Komfort. Eine große Herausforderung stellt die Kommunikation bzw. Interaktion zwischen automatisierten Fahrzeugen und manuellen Fahrern im Mischverkehr dar. Ein automatisiertes Fahrzeug muss begreifen, wie Menschen im Straßenverkehr die Intention anderer Verkehrsteilnehmer wahrnehmen und verstehen, wie Sie miteinander kommunizieren, um Missverständnisse in der Kommunikation mit menschlichen Fahrern zu vermeiden. Bei der Modellierung des Folgeverhaltens eines automatisierten Fahrzeuges, stehen vor al-

lem der Komfort und die Sicherheit an oberster Stelle. Um maximalen Komfort zu garantieren, sollten laut Studien, die Verzögerungswerte so niedrig wie möglich gehalten werden. Hier stellt sich die Frage, was für ein Bremsverhalten ein sicherer Fahrer gegenüber ausreichend ist, um die Bereitschaft zu signalisieren, dass diese einfädeln dürfen. Bisherige Studien fokussieren sich auf die Erhebung des Komfortempfindens des Insassen und lassen dabei die Außenperspektive anderer Verkehrsteilnehmer unberücksichtigt, ab welchen Schwellenwerten Verzögerungen von außen wahrgenommen werden. Ziel dieser Arbeit ist es, basierend auf Probandenstudien im Fahrsimulator, einen Bremsalgorithmus als Reaktion auf Einscherer im dichten Verkehr im Niedriggeschwindigkeitsbereich vorzustellen, der proaktiv agiert und explizit die Außenwahrnehmung der umgebenden Fahrzeuge mitberücksichtigt. Dieser wurde mittels einer weiteren Probandenstudie evaluiert und gegen einen bereits bestehenden Algorithmus basierend auf Wiedemann getestet. Es konnte gezeigt werden, dass der neu entwickelte Bremsalgorithmus gegenüber der Strategie nach Wiedemann als kooperativer empfunden wurde.

- 037 -

Comparison of Different Battery Types for Electric Vehicles.

Iclodean, C.; Varga, B.; Burnete, N.; Cimerdean, D.; Jurchis, B.

In: CAR, International Congress of Automotive and Transport Engineering - Mobility Engineering and Environment, 2017, in: IOP Conference Series: Materials Science and Engineering (Online) * Band 252 (2017) Seite 012058/1-10 (10 Seiten, 40 Quellen)

<http://dx.doi.org/10.1088/1757-899X/252/1/012058>

Battery powered Electric Vehicles are starting to play a significant role in today's automotive industry. There are many types of batteries found in the construction of today's Electric Vehicles, being hard to decide which one fulfils best all the most important characteristics, from different viewpoints, such as energy storage efficiency, constructive characteristics, cost price, safety and utilization life. This study presents the autonomy of an Electric Vehicle that utilizes four different types of batteries: Lithium Ion (Li-Ion), Molten Salt (Na-NiCl₂), Nickel Metal Hydride (Ni-MH) and Lithium Sulphur (Li-S), all of them having the same electric energy storage capacity. The novelty of this scientific work is the implementation of four different types of batteries for Electric Vehicles on the same model to evaluate the vehicle's autonomy and the efficiency of these battery types on a driving cycle, in real time, digitized by computer simulation. © IOP Institute of Physics Publishing.

- 038 -

Real time monitoring system used in route planning for the electric vehicle.

Ionescu, L.M.; Mazare, A.; Serban, G.; Ionita, S.

In: CAR, International Congress of Automotive and Transport Engineering - Mobility Engineering and Environment, 2017, in: IOP Conference Series: Materials Science and Engineering (Online) * Band 252 (2017) Seite 012095/1-8 (8 Seiten, 10 Quellen)

<http://dx.doi.org/10.1088/1757-899X/252/1/012095>

The electric vehicle is a new consumer of electricity that is becoming more and more widespread. Under these circumstances, new strategies for optimizing power consumption and increasing vehicle autonomy must be designed. These must include route planning along with consumption, fuelling points and points of interest. The hardware and software solution proposed by us allows: non-invasive monitoring of power consumption, energy autonomy - it does not add any extra consumption, data transmission to a server and data fusion with the route, the points of interest of the route and the power supply points. As a result: an optimal route planning service will be provided to the driver, considering the route, the requirements of the electric vehicle and the consumer profile. The solution can be easily installed on any type of electric car - it does not involve any intervention on the equipment. © IOP Institute of Physics Publishing.

- 039 -

The IRT-Buggy - Vehicle Platform for Research and Education.

Reiter, Matthias; Wehr, Matthias; Sehr, Florian; Trzuskowsky, Andreas; Taborsky, Robin; Abel, Dirk

In: World Congress of the International Federation of Automatic Control, IFAC World Congress, 20, in: IFAC-PapersOnLine * Band 50 (2017) Heft 1, Seite 12588-12595 (8 Seiten, 14 Quellen)

<http://dx.doi.org/10.1016/j.ifacol.2017.08.2200>

This paper presents the "IRT-Buggy", a model vehicle that is designed as a platform for research and education and that is developed at RWTH Aachen University. With two steered front wheels and two powered rear wheels, it can reach speeds of approx. 45 km/h at a weight of slightly over 60 kg. The vehicle's non-holonomous 2D kinematics are very comparable to the ones of a typical passenger vehicle. It is equipped with sensors that in similar form are also found in passenger vehicles, such as wheel speed sensors, inertial sensors and a GNSS sensor. Throughout the development of the model vehicle, special attention is paid to making the vehicle as useful as possible for control engineering tasks. For example, the electronic interfaces are designed in such a way that easy and intuitive access to all essential vehicle functions is granted while at the same time flexibility is not compromised due to oversimplification. The vehicle's operational concept allows new users to quickly operate the vehicle safely and to begin experimenting. Mechanisms are implemented that provide certain protection from maloperation. At the same time, experienced users can have full access to the actuation capabilities of the vehicle at different levels. The IRT-Buggy is in-

tended to be usable by students in an educational context, but also to serve as a serious experimental platform for control engineering research, with no conceptual drawbacks compared to a "real" passenger vehicle other than the obvious limitations due to size, power or achievable speed.

- 040 -

NVH development strategies for suspensions - challenges and chances by autonomous driving.

Schilp, Andreas; Bathelt, Hartmut

In: Automotive Acoustics Conference 2017, International ATZ Conference Vehicle Acoustics, 4, Internationale ATZ-Fachtagung Fahrzeugakustik, 4 * (2017) Seite 1-28 (28 Seiten, 5 Quellen), Datei: paper19.pdf Wiesbaden: ATZlive

Planning for a future with electric vehicles will shift the emphasis of NVH development to suspension comfort.

Autonomous driving at its final state will change the customer from a driver to a passenger, whose benchmark for noise and shake on long distance trips is determined by the level of high speed trains and airplanes. This is the challenge that needs new ideas for future suspension concepts. The tool for improving road induced noise and shake is the measurement and analysis of the dynamic forces transmitted to the car body via suspension components. The highest precision in measuring these forces can be achieved by using piezo force transducers applied at the connection points of all suspension elements to the car body. The presented 'suspension force rig' - a special test stand developed in AZL - allows the comparison of different suspensions independent from body structure quality and the development of improving modifications in early stages when the final production car body is not yet available. Force rig analysis results of various German premium car front suspensions give a clear answer to the question, why in spite of the enormous investment in new suspensions, the interior level of road noise on rough surfaces seems to approach an insurmountable barrier. Comparing the front wheel guidance linkage of the upper middle-sized class models of Audi, BMW and Daimler, we can see a parallelogram built by a transverse wishbone and the track rod. These two links control the steering angle of the wheel and their elasticity determines the responsiveness of the steering. The importance of a cars handling for the market success and the competition of the car manufacturers in raising the agility of new models even despite bigger size and weight was the governing factor in suspension development in the last two decades. As a consequence the transverse stiffness has been raised by replacing the rubber mounted front subframe by a structural stiffener of the body front end. Measurements show that the transverse wishbone bush has no noise insulating function, just as track rod and steering gear. The direct transmission of structural road noise into the body of these two paths is masking any progress in the reduction of other transmission paths. The future chances by autonomous driving are the omission of the subjective handling feeling criteria using this mode. Therefore it seems likely that cars developed for both, active driving and autonomous ride, will provide two different suspension tunings each optimized for these completely different customer requirements. The necessary components like switchable rubber suspension bushes and fast control software for adaptive dampers basically are on the market. The expectable changes in suspension design are discussed at the example of the front subframe structure.

- 041 -

A platform for autonomous path control of unmanned airship.

Ribeiro, Constantino Goncalves; Raptopoulos, Luciano Constantin; Dutra, Max Suell

In: Journal of the Brazilian Society of Mechanical Sciences and Engineering * Band 39 (2017) Heft 11, Seite 4735-4747 (13 Seiten)

<http://dx.doi.org/10.1007/s40430-017-0891-9>

The applications of UAVs (unmanned aerial vehicles) have been increasing and becoming part of many daily tasks in numerous organizations. As matter of fact, the use of a UAV does not mean the decreasing of operational complexities and, consequently, the costs of performing its tasks. Sometimes, this high cost is related to the dependence of well-trained operators and huge remote control facilities to operate a sophisticated UAV. This work proposes an UAV that can perform its tasks as much independent of human interaction as possible, and with a minimum connection to its mission control facilities. This independence will be achieved by embedding the mission control into the UAV. As the mission control is embedded, the UAV will have less connection issues with its control center and will be less dependable of human interaction. To prove this concept, the kinematics and dynamics of a light air vehicle (blimp) were developed; a prototype of an embedded parallel-distributed computer was constructed; and new procedures to resolve navigations and collision evasions issues were proposed. The new evasion procedures were implemented into a simulator and a new parallel/distributed program for optimal path discover was developed to be used in the cluster prototype. All tests of the evasion procedures simulator were satisfactory and the speed up tests using the embedded cluster showed the best performance of the proposed framework.

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- 042 -

Autonomous Landing of UAVs under Unknown Disturbances using NDI Autopilot with L_1 Adaptive Augmentation.

Tripathi, Amit K.; Patel, Vijay V.; Padhi, Radhakant

In: World Congress of the International Federation of Automatic Control, IFAC World Congress, 20, in: IFAC-PapersOnLine * Band 50 (2017) Heft 1, Seite 3680-3684 (5 Seiten, 11 Quellen)

<http://dx.doi.org/10.1016/j.ifacol.2017.08.561>

This paper presents autonomous landing of Unmanned Aerial Vehicles (UAVs) under unknown external disturbances and internal plant parameter uncertainties. The external disturbances such as wind shear, wind gust and ground effects are considered. The plant parameters uncertainties are also considered due to aerodynamic force and moment coefficients random perturbation. L_1 adaptive controller with piece-wise-constant adaptation law is augmented over Nonlinear Dynamic Inversion (NDI) autopilot and implemented on Six Degree of Freedom (Six-DOF) model of a UAV. The NDI autopilot with two time scale separation is designed for the nominal plant. It tracks a reference trajectory computed from a path planning and guidance algorithm under undisturbed plant model with normal environment conditions. The L_1 adaptive controller takes into account the disturbances and computes the adaptive control command which enables the plant trajectory tracking closer to the desired reference trajectory. The state predictor is designed to track the plant states smoothly by incorporating proportional and integral error terms in the state predictor model. The piece-wise-constant adaptive law is designed to estimate the unknown disturbances. The unknown disturbance estimates are used to design the adaptive control law to nullify the effect of the disturbance on the plant performance. The algorithm is simulated to show the auto landing performance on a Six-DOF UAV model.

- 043 -

Transport Companies, Truck Drivers, and the Notion of Semi-Autonomous Trucks: A Contextual Examination.

Trösterer, Sandra; Meneweger, Thomas; Meschtscherjakov, Alexander; Tscheligi, Manfred

In: AutomotiveUI, International Conference on Automotive User Interfaces and Interactive Vehicular Applications, 9 * (2017) Seite 201-205 (5 Seiten) New York: ACM - Association for Computing Machinery

<http://dx.doi.org/10.1145/3131726.3131748>

Semi-autonomous driving is considered a particularly promising approach for truck drivers, as this special driver group spends almost their entire working time in a moving vehicle. Semi-autonomous driving could add to increased driving safety and relief of the truck driver. Apart from these general benefits, little is known about the concrete requirements of semi-autonomous trucks in order to be beneficial for both truck drivers and their employers, the transport companies. In this paper, we report on a contextual inquiry study conducted in six different transport companies, thereby investigating the embedment of the truck driver in the company, current workflows, as well as potentials and barriers of semi-autonomous driving from company perspective. Our initial findings indicate that there are several operation fields that need to be considered when it comes to semi-autonomous trucks of the future.

- 044 -

Cooperative Adaptive Cruise Control for Vehicle Following During Lane Changes.

Schmidt, Klaus W.

In: World Congress of the International Federation of Automatic Control, IFAC World Congress, 20, in: IFAC-PapersOnLine * Band 50 (2017) Heft 1, Seite 12582-12587 (6 Seiten, 17 Quellen)

<http://dx.doi.org/10.1016/j.ifacol.2017.08.2199>

This paper addresses the longitudinal vehicle behavior before and during lane changes. Hereby, it is desired that the lane-changing vehicle simultaneously follows its predecessors on the lanes before and after the lane change. Specifically, the lane changing vehicle should keep a safe distance to the rearmost predecessor vehicle, while maintaining a small inter-vehicle spacing and supporting driving comfort. To this end, the paper develops an extension of cooperative adaptive cruise control (CACC). Instead of following a single vehicle as in the classical realization of CACC, it is proposed to follow a virtual vehicle that is evaluated based on distance measurements and communicated state information from the predecessor vehicles. A simulation study demonstrates the practicability of the proposed method.

- 045 -

Pedestrian Interaction with Vehicles: Roles of Explicit and Implicit Communication.

Dey, Debargha; Terken, Jacques

In: AutomotiveUI, International Conference on Automotive User Interfaces and Interactive Vehicular Applications, 9 * (2017) Seite 109-113 (5 Seiten) New York: ACM - Association for Computing Machinery

<http://dx.doi.org/10.1145/3122986.3123009>

This paper presents a study that aimed to identify the importance of eye contact and gestures between pedestrians and drivers. A video-based observation and coding was undertaken to categorize the road-crossing and communication behavior of pedestrians and drivers in busy traffic situations where efficient negotiation is necessary. The evi

dence in the study suggests that eye contact does not play a major role in manual driving, that explicit communication is rare to non-existent, and that motion patterns and behaviors of vehicles play a more significant role for pedestrians in efficient traffic negotiations.

- 046 -

Reduced Complexity Safety Testing for ADAS & ADF.

Zhou, Jinwei; Re, Luigi del

In: World Congress of the International Federation of Automatic Control, IFAC World Congress, 20, in: IFAC-PapersOnLine * Band 50 (2017) Heft 1, Seite 5985-5990 (6 Seiten, 12 Quellen)

<http://dx.doi.org/10.1016/j.ifacol.2017.08.1261>

This paper focuses on systematical evaluation of Advanced Driver Assistance Systems and Automated Driving Functions. To overcome the curse of dimensionality we propose to use a test case catalogue, which is proven to have a good coverage of critical traffic situation. Secondly, a method for assessment of safety performance is introduced. It is based on evaluating the performance limit of automated vehicle in a given test case and relating it to its overall exposure rate in real world traffic situations. Through a case study, the parametrization and generation of test scenarios and evaluation for an ADAS(ACC) system is presented.

- 047 -

A Design Space for External Displays on Cars.

Colley, Ashley; Häkkinen, Jonna; Pfleging, Bastian; Alt, Florian

In: AutomotiveUI, International Conference on Automotive User Interfaces and Interactive Vehicular Applications, 9 * (2017) Seite 146-151 (6 Seiten) New York: ACM - Association for Computing Machinery

<http://dx.doi.org/10.1145/3131726.3131760>

The exterior surfaces of cars provide so far unutilized opportunities for information display. The exploitation of this space is enabled by current advances in display technologies combined with increased sensor integration, computing power, and connectivity in vehicles. With this motivation, we present a framework, mapping the design space for external vehicle displays. The audience for the displayed information may be other road users, pedestrians, or autonomous systems. This design direction is particularly interesting in the future, as the current direction towards driverless vehicles may be an enabler for increased separation, redesign, and repurposing of vehicle interior and exterior surfaces.

- 048 -

Beyond Liability: Legal Issues of Human-Machine Interaction for Automated Vehicles.

Inners, Michael; Kun, Andrew L.

In: AutomotiveUI, International Conference on Automotive User Interfaces and Interactive Vehicular Applications, 9 * (2017) Seite 245-253 (9 Seiten) New York: ACM - Association for Computing Machinery

<http://dx.doi.org/10.1145/3122986.3123005>

Many automated vehicles are already on our roads, and we can expect that many more will follow soon. Yet, the legal frameworks that govern the deployment and operation of these vehicles are still under development. This paper explores legal issues related to the human-machine interaction for automated vehicles. The paper reviews the current legal landscape, with a focus on the United States, and presents some of the issues that will be of interest to researchers, developers, and regulators as the new legal frameworks take shape.

- 049 -

Learning-by-Doing: Using Near Infrared Spectroscopy to Detect Habituation and Adaptation in Automated Driving.

Balters, Stephanie; Sibi, Srinath; Johns, Mishel; Steinert, Martin; Ju, Wendy

In: AutomotiveUI, International Conference on Automotive User Interfaces and Interactive Vehicular Applications, 9 * (2017) Seite 134-143 (10 Seiten) New York: ACM - Association for Computing Machinery

<http://dx.doi.org/10.1145/3122986.3123006>

The advent of automated features in modern vehicles requires human factors researchers to find measures other than driving behavior to anticipate the response of drivers in various contexts. Functional near-infrared spectroscopy (fNIRS) is one research tool that allows us to quantify the driver's mental state. However, the underlying mechanisms of fNIRS technology can limit the possible contexts for its application. The pervasive question arises, whether the measurement device at hand is suitable for the research topic in question and is it capable of detecting the phenomenon under investigation? We provide a proof of concept study demonstrating that significant habituation is present when drivers operate new automated driving systems and that fNIRS technology is suitable to detect said driver habituation effects. The study presented here was conducted in a driving simulator and investigated the drivers' cortical activation in three different modes of automation: manual, partially autonomous, and fully autonomous modes.

- 050 -

Control Transition Workshop: Handover and Takeover Procedures in Highly Automated Driving.

Borojeni, Shadan Sadeghian; Meschtscherjakov, Alexander; Mirnig, Alexander G.; Boll, Susanne; Naujoks, Frederik; Politis, Ioannis; Alvarez, Ignacio

In: AutomotiveUI, International Conference on Automotive User Interfaces and Interactive Vehicular Applications, 9 * (2017) Seite 39-46 (8 Seiten) New York: ACM - Association for Computing Machinery

<http://dx.doi.org/10.1145/3131726.3131732>

This workshop focuses on the problem of designing effective control transition interfaces in highly automated vehicles. This includes the handover of control from the driver to the autonomous vehicle, as well as takeover procedures from the vehicle to the driver. The workshop aims at consolidating existing knowledge and identifying remaining issues together with paths towards resolving these issues. Concrete focus points concern tasks and actors involved, presentation modalities, gradual versus sudden transition requests, situation and driving mode awareness, the temporal dimension, and engagement in driving and non-driving tasks.

- 051 -

Path Tracking Control for Autonomous Driving Applications.

Tota, Antonio; Velardocchia, Mauro; Güvenc, Levent

In: Advances in Service and Industrial Robotics, RAAD, International Workshop on Robotics in Alpe-Adria-Danube Region, 26, in: Mechanisms and Machine Science * Band 49 (2018) Seite 456-467 (12 Seiten), Paper-Nr. Chapter 49, Automation and Robotics for Vehicles

http://dx.doi.org/10.1007/978-3-319-61276-8_49

Autonomous or self-driving vehicles are becoming a consolidate reality that involves both industrial and academic fields also for its impact in social and governmental communities, well far from automotive engineering. The intent of the present paper is to design an automatic steering control for an autonomous vehicle equipped with steer-by-wire and drive-by-wire technologies. The steering action is calculated to let the vehicle follow a reference path which is stored in a Digital Map properly built to be available in real-time. A Proportional + Derivative (PD) control strategy is deigned based on the Parameter State Approach (PSA) and it is coupled with a Feedforward (FF) term for improving the path tracking control in cornering maneuvers. Some experimental results are shown to demonstrates the efficacy of the controller presented.

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- 052 -

Research of Localization Method Based on Virtual Reference Points in Robot Auditory System.

Wang, Shuopeng; Yang, Peng; Sun, Hao; Xu, Jing; Zhang, Xiaomeng

In: CIAC, Chinese Intelligent Automation Conference, 2017, in: Lecture Notes in Electrical Engineering * Band 458 (2018) Seite 681-688 (8 Seiten), Paper-Nr. Chapter 75

http://dx.doi.org/10.1007/978-981-10-6445-6_75

Scene analysis positioning method can effectively solve the problem of high model dependence in mobile robot auditory localization, and location fingerprint database is the foundation of scene analysis method. However, for precise location by fingerprint positioning, mass reference points are always needed. A sound source localization method based on virtual reference points is proposed to meet the drawback of positioning accuracy on account of low density fingerprint, without taking up the database storage space nor increasing the matching computation. Simulation and experimental results show that the novel method can effectively reduce the number of location reference points for location accuracy needed. Compared with the conventional auditory localization method, method based on virtual reference points has better efficiency in sound source target positioning, and significantly enhance the applicability of the robot auditory system.

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- 053 -

Trajectory Tracking Control for Omnidirectional Mobile Robots with Full-State Constraints.

Zheng, Wenhao; Jia, Yingmin

In: CIAC, Chinese Intelligent Automation Conference, 2017, in: Lecture Notes in Electrical Engineering * Band 458 (2018) Seite 605-612 (8 Seiten), Paper-Nr. Chapter 66

http://dx.doi.org/10.1007/978-981-10-6445-6_66

This paper presents an adaptive tracking controller for a class of omnidirectional mobile robots with full-state constraints, model uncertainties and external disturbances. Kinematics and dynamics of three-wheel omnidirectional mobile robots are considered in the paper. And the adaptive estimation law is designed to deal with disturbances where the bounds of disturbances are unknown. Meanwhile, the control method based on barrier Lyapunov function is applied to prevent the states from violating restrictive conditions. All signals in tracking system are proved to be uniformly bounded with the proposed controller. The tracking performance will be guaranteed and the tracking errors will be sufficiently small by choosing suitable controller parameters. Simulation results validate the effectiveness and the robustness of the proposed control method.

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Estimation of the Traversal Time for a Fleet of Industrial Transport Robots.

Mühlbacher, Clemens; Gspandl, Stefan; Reip, Micheal; Steinbauer, Gerald

In: Advances in Service and Industrial Robotics, RAAD, International Workshop on Robotics in Alpe-Adria-Danube Region, 26, in: Mechanisms and Machine Science * Band 49 (2018) Seite 363-371 (9 Seiten), Paper-Nr. Chapter 40, Mobile Robots and Path Planning

http://dx.doi.org/10.1007/978-3-319-61276-8_40

Transportation tasks within warehouses are nowadays more and more solved using of fleets of autonomous robots. A fleet allows coordinating the different robots in such a way that it balance the load caused by transportation tasks.

This allows the robot fleet to be a cost-efficient solution for moderate and changing loads compared to fixed conveyor belts. To allow such a flexible load balancing it is necessary to estimate the time it may take to perform a certain transportation. This is of interest if different transportation tasks can be assigned to an individual robot and the order may have an impact on the time spent to perform a transportation task. In this paper, we will present a method which can learn to estimate the time spent on certain transportation tasks. The method is evaluated per its prediction accuracy on a different set of data which were obtained from the deployment of a robotic fleet in an industrial environment. © Springer-Verlag.

An innovative information fusion method with adaptive Kalman filter for integrated INS/GPS navigation of autonomous vehicles.

Liu, Yahui; Fan, Xiaoqian; Lv, Chen; Wu, Jian; Li, Liang; Ding, Dawei

In: Mechanical Systems and Signal Processing (MSSP) * Band 100 (2018) Seite 605-616 (12 Seiten, 31 Quellen)

<http://dx.doi.org/10.1016/j.ymssp.2017.07.051>

Information fusion method of INS/GPS navigation system based on filtering technology is a research focus at present. In order to improve the precision of navigation information, a navigation technology based on Adaptive Kalman Filter with attenuation factor is proposed to restrain noise in this paper. The algorithm continuously updates the measurement noise variance and processes noise variance of the system by collecting the estimated and measured values, and this method can suppress white noise. Because a measured value closer to the current time would more accurately reflect the characteristics of the noise, an attenuation factor is introduced to increase the weight of the current value, in order to deal with the noise variance caused by environment disturbance. To validate the effectiveness of the proposed algorithm, a series of road tests are carried out in urban environment. The GPS and IMU data of the experiments were collected and processed by dSPACE and MATLAB/Simulink. Based on the test results, the accuracy of the proposed algorithm is 20% higher than that of a traditional Adaptive Kalman Filter. It also shows that the precision of the integrated navigation can be improved due to the reduction of the influence of environment noise. © Elsevier B.V.

Dynamic path planning for autonomous driving on various roads with avoidance of static and moving obstacles.

Hu, xuemin; Chen, Long; Tang, Bo; Cao, Dongpu; He, Haibo

In: Mechanical Systems and Signal Processing (MSSP) * Band 100 (2018) Seite 482-500 (19 Seiten, 44 Quellen)

<http://dx.doi.org/10.1016/j.ymssp.2017.07.019>

This paper presents a real-time dynamic path planning method for autonomous driving that avoids both static and moving obstacles. The proposed path planning method determines not only an optimal path, but also the appropriate acceleration and speed for a vehicle. In this method, we first construct a center line from a set of predefined waypoints, which are usually obtained from a lane-level map. A series of path candidates are generated by the arc length and offset to the center line in the s-r coordinate system. Then, all of these candidates are converted into Cartesian coordinates. The optimal path is selected considering the total cost of static safety, comfortability, and dynamic safety; meanwhile, the appropriate acceleration and speed for the optimal path are also identified. Various types of roads, including single-lane roads and multi-lane roads with static and moving obstacles, are designed to test the proposed method. The simulation results demonstrate the effectiveness of the proposed method, and indicate its wide practical application to autonomous driving.

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