Innovate UK

Results of Competition: Connected and Autonomous Vehicles 2 - Stream 3 FS
Competition Code: 1608_FS_TRANS_CAV2S3

Total available funding is £15m (across Stream 2 & 3) from CCAV

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Oxbotica Ltd Ford Motor Company Ltd	Anytime, Anywhere Low Cost Localisation	£174,210 £75,290	£121,947 £37,645
Project description - provided by applicants			
Being able to precisely answer the question of "Where am I?" is critical for autonomous vehicle navigation - a function known as "localisation". There are a number of ways that a vehicle can localise: while GPS is an example of a localisation system, it is insufficiently accurate for autonomous driving systems, as well intermittently available and susceptible to jamming and interference. Lidar, a laser-based scanning technique, is commonly used to provide estimates of localisation to driverless cars, but lidar sensors are too costly for mass market vehicles. Cameras are significantly cheaper than lasers, but image-based localisation is challenging because of changes in lighting, weather, and scene structure. Taking into account the pros and cons of each of the above methods, this joint Ford-Oxbotica project utilises a suite of innovative techniques to perform camera-only localisation in spite of these environmental changes. The project will trial the software using low cost hardware to demonstrate the performance of affordable technology for mass market adoption.			

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Oxbotica Ltd United Kingdom Atomic Energy Authority	Vote3Deep - Transferring technology from lab to vehicle for high performance, real-time object detection	£175,325 £73,870	£122,728 £73,870

Project description - provided by applicants

Next-generation connected and autonomous vehicles (CAV) hold huge potential gains and benefits for the transport industry and are fundamental to realising smart mobility and cities of the future.
It is predicted that the CAV market could deliver cumulative benefits to the UK of £51bn by 2030, but there is significant development to be completed before this can be realised. More accurate and efficient lidar solutions are needed for object perception and planning and will directly contribute to the substantial reductions of fatal accidents with an estimated 2500 lives saved by 2030. However these same lidar solutions can be used effectively before full autonomy to prevent accidents, both on cars and in other environments. To achieve a commercially viable solution, software must be able to run in real-time with extremely high accuracy, on low cost hardware. The Vote3Deep project intends to assess the feasibility of transferring a research solution that meets this brief from server-grade to portable systems ready for integration in CAV. The translation of this research solution into a commercially viable product will be enabled through a detailed test programme at RACE (UKAEA) Culham where it will be trialed extensively both statically and in-car in a secure environment.

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AutoTrip Ltd E-Car Club Ltd	Non-Intrusive Vehicle Monitoring System NiVMS	£196,349 £48,322	£137,444 £24,161
Project description - provided by applicants			
The Non-intrusive vehicle monitoring system (NiVMS) project is a collaboration between E-Car Club, the UK's first fully electric vehicle car club and member of the Europcar Group, and AutoTrip, an innovative UK start up specialising in automated business mileage reproting at industry leading accuracy (97%). Collectively the consortium bring a combined decade's worth of experience in the automotive and fleet sector, and boast a strong track record in delivering technical innovation projects. espeically with regard to delivery of novel software projects. Drawing on consortium members' shared experience of suboptimal asset utilisation in the vehicle rental and leasing sector, this 18 month techncial feasibility study seeks to establish the technical and commercial potential of harnessing machine learning intelligence to improve operational efficiencies, and where possible achieve cost savings in the UK's vehicle rental and leasing sector.			

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Amey Group Information Services Limited	Connected Autonomous Sensing Service Delivery Vehicle (CASS-DV) feasibility study	£125,972	£62,986
United Kingdom Atomic Energy Authority		£119,868	£119,868
Project description - provided by applicants			
The Connected Autonomous Sensing Service Delivery Vehicles (CASS- DV) technical feasibility study project seeks to address a number of challenges facing local authorities and those companies who deliver services on their behalf, namely reducing margins and continued austerity. The feasibility study will develop an autonomous vehicle prototype which can complete a number of tasks ranging from grounds maintenance (e.g. grass cutting) to street cleaning (street sweeping) whilst collecting information about the surrounding assets as it drives around. This asset information will be used by local authorities to improve the way in which they maintain the assets they are responsible for. The findings of the project will be shared widely with vehicle companies and service providers to encourage the former to offer AVs as a commercial solution and the latter as a means to transform the way in which they deliver services. The consortium, comprised of Amey and RACE, believe CASS-DV is the future of service delivery.			

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CGA Simulation Ltd University of Liverpool	Using Machine Learning and AI to explore potential systems for costing and managing Mobility as a Service and Transport Infrastructure	£196,120 £48,971	£137,284 £48,971

Project description - provided by applicants

Transport and in particular city congestion are huge issues in the 21st Century, with gridlock and pollution costing global economies billions annually. Using data sets around congestion, pollution and road safety it is possible to calculate the real cost of driving, and its impact on the environment, pedestrians, cyclists and other commuters. The project will assess the technical feasibility of a Holistic Transport Costing (HTC) Model of intelligent "pay-per-mile" micro-transactions where vehicles have to pay more to access busy or dangerous roads but are rewarded for taking more environmentally friendly routes, or carrying more passengers. The system would use machine learning (ML) and artificial intelligence(AI) to continually intelligently negotiate road usage costs between autonomous agents on behalf of the city and cars then later autonomous vehicles. The system would be capable of continual evolution to reflect priorities and behaviours in a single city, 'evolving' it to become less congested, more efficient, safer and cleaner. The platform would also be adaptable to multi-modal transport journeys, integrating different transport options as data around times, pricing and access became available.

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Richmond Design and Marketing Limited	The Cambridge Autonomous Bus System Feasibility Study	£129,860	£90,902
Cubic Transportation Systems Ltd		£39,997	£19,999
Genome Research Limited		£30,000	£30,000
Cambridgeshire County Council		£49,844	£49,844

Project description - provided by applicants

The Cambridge Autonomous Bus System Feasibility Study will examine the opportunity to use new, electric, autonomous mini-buses to provide much needed transport links between Cambridge's science campuses, park & ride locations and rail stations. These vehicles and special paths could provide a significant improvement in traffic congestion, improve air quality, and solve serious work commute difficulties for residents in the Cambridge region. The vehicles could use the Cambridge Guided Busway after hours when the buses are not running to provide transport to the thousands of people working night shifts at the Addenbrooke's and Cambridge Biomedical Campuses. Another possible multiuse pathway would allow pedestrians, bicycles and the automated mini-buses to safely share a new connection between the Wellcome Genome Campus and the Whittlesford Parkway rail station. The partners in the study are the RDM Group, Cubic Corporation, The Welcome Genome Campus and Cambridgeshire County Council. The study also has the support of the Addenbrooke's Hospital, Cambridge Biomedical Campus, Astra Zeneca and Stagecoach.

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Navtech Radar Ltd. Oxford Robotics Institute	Advancing UK Autonomous Vehicle Radar Sensing Technology	£136,145 £50,508	£95,302 £50,508
Project description - provided by applicants			
The investment by technology companies the world over into the research and development of autonomous vehicles has been extensive, and many automotive suppliers claim that fully autonomous urban vehicles will be on streets by 2021. As technology is developed and tested, additional problems surface and new solutions are required. This project will look to provide such a solution to one of the most recently discovered issues. Navtech Radar will work with Oxford Robotics Institute to develop an all weather sensor to provide adequate siutational awareness for significantly improving capabilities and safety of autonous driving pods, already deployed on trial in Milton Keynes.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
CyNation Limited	Secure CAN with Q-PUF	£117,877	£82,514
Quantum Base Ltd		£60,752	£42,526
Nabla Ventures Ltd		£71,054	£49,738
Project description - provided by applicants			
Spoof-proof, hardware-implemented secure CAN Protocol			

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Jaguar Land Rover Limited	5G Millimetre-Wave Connectivity to Cars	£54,787	£27,393
British Telecommunications plc		£19,880	£9,940
Blu Wireless Technology Ltd		£49,372	£34,500
University of Bristol		£124,959	£124,959

Project description - provided by applicants

This proposal considers testing, evaluating and enhancing the performance of 5G Vehicle to Infrastructure communications in a vehicular environment and in particular in a motorway-speed scenario. 5G mmWave communications will be explored for high data rate delivery and a feasibility study to evaluate the technology for mobility will be performed. Using Road Side Units (RSUs) spaced regularly along the motorway or road, data rates in the order of gigabits per second are anticipated. To overcome the high path loss at mmWave frequencies, adaptive beamforming will be used to focus signals to and from the vehicle. The project will perform real world radio channel measurements leading to data trials using a suitable demonstration system.

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Crypta Labs Ltd Coventry University	Quantum-based secure communications for CAVs	£79,282 £58,528	£55,497 £58,528
Project description - provided by applicants			
The security of confidential information relies upon strong encryption processes. The weakest link in existing encryption systems is their reliance on numbers which aren't truly random, which makes them vulnerable to hacking. Crypta Labs has developed a quantum random number generator (QRNG), which is based on randomness derived from light. A photon is an elementary particle of light (a "quantum") which acts in a totally random way. The behaviour of photons can be used to derive a true random number to underpin encryption. It has been widely documented that modern, highly connected, vehicles can be hijacked with just a laptop computer and publicly available software. This feasibility project aims to assesses the technical and commercial feasibility of applying Crypta Lab's QRNG technology to connected and autonomous vehicles, allowing Crypta Labs to start commercialising its technology post completion of this project.			

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UbiPOS UK Ltd The University of Nottingham	Requirement Evaluation of CAV Location Performance and Platform Development - RECAPD	£168,000 £79,827	£117,600 £79,827

Project description - provided by applicants

Location and sensing are two important components for Connected and Autonomous Vehicles (CAVs). Sensing techniques using LiDAR, camera, radar have limitations when driving environments change due to bad weather conditions. The mass-market location techniques utilising GNSS, dead reckoning are currently unable to meet the required CAV location performance such as accuracy, availability, robustness. RECAPD will focus on the R&D of affordable new location solutions through identification of location issues on a mix of UK roads using defined CAV location parameters as major indicators. An advanced survey vehicle capable of delivering high-rate centimetre positioning accuracy will be utilised to produce "ground truth" trajectories for assessing the performance of different combinations of potential CAV location sensors. A new CAV location platform that is empowered with the latest processing engine capable of smartly switching among different location solutions according to CAV environments will be developed. It will use the existing national geospatial infrastructure, GNSS carrier-phase signals, inertial data, embedded low-cost beacons (RFID), etc., for the provision of a ubiquitous location solution. The consortium will also work with RECAPD end users for its market opportunities.

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