Connected autonomous vehicles promise travel freedom for older adults in the future

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An interdisciplinary team from the University of the West of England (UWE Bristol) and the Bristol Robotics Laboratory is playing a key role in development of connected autonomous vehicles(CAVs) that have the potential to transform the lives of isolated older adults through creation of independent travel options.

The 'Flourish' project announced today is co-funded by Innovate UK and

involves partners from across the South West who will work together to develop a CAV that integrates the mobility needs of [older adults](link) with a secure and connected infrastructure.

The development has the potential to revolutionise mobility for older adults, reducing loneliness and giving people who do not drive the freedom to make spontaneous choices without relying on others.

The work also promises to lead to thousands of new jobs in the South West, in supply chain and product development.

Associate Professor Praminda Caleb-Solly from Bristol Robotics Laboratory explains, "Ageing brings a host of physical and cognitive impairments, together with long-term conditions, resulting in the need for added support. Maintaining health and independence, and participating as active members of society, requires people to be mobile.

"Studies show that cessation of driving can lead to reduced social activity, poor health and depression. In the UK, over one million older adults say they always, or often, feel lonely. This research would mean that people in this situation wouldn't have to depend on others for transportation and would have the ability to make spontaneous choices.

"UWE researchers with expertise in applied psychology and human factors, assistive technology and understanding people's transport requirements, will work with older adults with a range of needs and expectations.

"This will result in the development of a set of key scenarios considering people's travel needs and barriers and constraints related to the participants' accessibility needs. Our research findings will further support inclusive public service design and policymaking."

The team will also contribute to the design and development (through ongoing human factors testing) of adaptable Human-Machine interfaces (HMIs) which are responsive to people's different accessibility needs. Target-user groups will have a complex range of co-morbidities which can result in impaired vision, loss of hearing, painful or restricted mobility, poor movement control and issues with balance and difficulties with speech, memory and attention, including occasional confusion.

Enabling these user groups to communicate intuitively, confidently and safely with an autonomous vehicle requires sophisticated multi-modal interaction capability, and intelligent sensing and responsiveness, which mainstream autonomous vehicles won't necessarily support. The research will address these challenges by building on the teams' world class experience of human factors, assistive technology design and psychology.

Associate Professor Caleb-Solly continues, "We will develop a driving simulator that will be integrated into a pod shell and trialled with end-users as part of an iterative design process. This will enable us to optimise the designs of the vehicle interfaces to make them intuitive and easy to use, providing useful journey information and enhancing the journey experience."

The findings from working on the simulator development and testing will be transferred to designing the actual physical interfaces which will be integrated into a real pod. A series of physical trials in a range of contexts to test usability and integration with other information sources will then be conducted. Real-world trials with older adults will also assess user experience and user interaction with the human-machine interfaces, focussing on subjective, performance and physiological response measures. Experience of running the trials will enable the development of a standard assessment framework to determine HMI and vehicle adaptations needed for different types of disability needs. This

will give car manufacturers incorporating this technology a competitive edge in the market, attracting a wider range of customers and increasing market penetration.

The UWE contribution to FLOURISH continues 'the pathway to Driverless Cars' (Department for Transport Feb 2015) building on the platform provided by the VENTURER project and moving closer to the realisation of connected autonomous vehicles(CAVs) sharing roads with current manually driven vehicles and other road users. In FLOURISH, co-designing with people with some level of cognitive and physical age-related impairments, the resulting simulator test environment and adaptable user interface for CAV operation will also be suitable for others with special needs as well as the wider public.

As part of their research on assistive robotics for independent living, the Bristol Robotics Laboratory (BRL) at UWE collaborate closely with Designability, who have expertise in developing assistive technologies for older adults, and working with researchers in applied psychology and human factors, will extend their expertise in this area.

The UWE Bristol and Bristol Robotics Laboratory team (BRL) comprises:

Professor Tony Pipe from BRL who will research the security systems used to drive the vehicle.

Professor Pipe said, "Security of the systems driving the vehicles is absolutely essential. We don't want the cars to be hacked. Systems anticipate total connectivity to real time traffic conditions so that routes can be controlled and monitored."

Associate Professor Praminda Caleb-Solly from BRL will contribute to

the design of the adaptable Human-Machine Interfaces and evaluation studies, investigating innovate ways for visualising data from multiple sources to provide contextually relevant and engaging information to the person in the vehicle, through a range of modalities.

Professor Graham Parkhurst and Dr Ian Shergold from UWE Bristol's Centre for Transport and Society will contribute their expertise on older citizens' mobility needs and the importance of being mobile both for practical reasons but also due to the wellbeing benefits of being socially connected through movement.

Professor Parkhurst said, "It is important that the products developed by Flourish work effectively alongside the existing services for supporting older citizen's travel. The CTS input will focus on ensuring that successful integration."

Professor Chris Alford and Dr Phil Morgan from UWE Bristol Department of Psychology will be leading the applied psychology and human factors aspects of the project.

Professor Chris Alford adds: "We will be looking at human factors aspects by devising an adaptive human-machine interface connected to various in-car systems using simulated tests that emulate journeys so that we can be sure that people feel confident and comfortable. For example this might include making the instruments like speedometers larger so that people with visual impairments can view speeds easily."

Dr Phil Morgan adds: "AVs are the future of driving and are already developing at a galloping pace. Through FLOURISH, we have the perfect opportunity to influence the design of interfaces that people will interact with when using AVs and CAVs. We will optimise the design and usability of these interfaces through psychology and human factors testing and multiple rounds of user-trials so that design is informed by,

for example, human needs, expectations, and cognitive ability. We recognise that it is not simply the case of designing a one-size-fits-all interface, especially as the sample we will be designing for during this project are likely to have varying requirements. For example, whereas one person may benefit from larger and less crowded displays, another may benefit more from more audible information. Bespoke solutions are crucial and cutting-edge CAV interfaces for use by older adults should be adaptable based upon individual requirements. We also need to get the balance of interface information right, such that people have access to enough information (e.g., vehicle related, external conditions related) without feeling over-loaded or indeed under-loaded. The FLOURISH project and partnership will allow us to achieve all of this and more."

Provided by University of the West of England