Editorial

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Driverless Vehicles (DV) have been in the spotlight for quite some time. Hardly a day goes by without news about Driverless Cars, Autonomous Vehicles (AVs) or Connected Autonomous Vehicles (CAVs) – these terms will be used generally interchangeably below. No doubt, they will impact on our future strongly and quickly. This themed issue on driverless cars is our contribution from the *Municipal Engineer* to the debate.

In the first paper of this publication, Sousa *et al.* (2018) tackle the difficult task of bringing together vast research topics with a good list of references for a comprehensive review of the state of the art of autonomous vehicles, including technology, levels of automation, regulation requirements, social-economic and traffic impacts, energy consumption and emission, land use implications, urban environment and parking, and risks and challenges. The paper is concisely summarised with a SWOT analysis table about the major elements autonomous vehicles could impact upon and some thoughts on further research.

Parkin *et al.* (2018) follow with a fascinating account of social-technical issues one faces with the emergence of AVs. If the commonly referenced SAE classification about AVs distinguishes degrees of human interaction or levels of automation, this paper differentiates four types of urban street environments in which the AVs will operate, and examines various issues in their operation in these environments, resulting in a list of research questions. It is undesirable to dictate the behaviour of human drivers. With AVs not being human and their behaviour programmable, would there be pressure to subject their behaviours to regulatory control? Would their emergence give pedestrians and cyclists or even the law makers a sense of superiority that may tempt them to behave in such a way as to treat AVs as subclass? This question is one to be shared with the AI research community. As Parkin *et al.* (2018) state, ‘there is the potential for us to design systems in which AVs have a fundamentally different relationship with remaining non-autonomous traffic (be that human-driven motor traffic, cycle users or pedestrians). Transport engineering and planning professions will shape those future relationships and indeed the shape of the urban public realm.’

Is door-to-door travel desirable, even if practical, for mass travel, if all the expected efficiency gains can be realised? Is it possible to build a system in which AVs promote vehicle sharing and active travel? What should be the role of AVs and of mass transport in the future transport system? Can AV technology be assimilated into the existing system and enhance it? How can the end state be reached smoothly and economically? Watkins (2018) conceptualises a total mobility system of stations and links which gives his answers to the questions above. Furthermore, the advantage of a system so constructed, according to the author, is that its building can commence immediately, without AVs, by converting some of the existing road space into hotlanes for guided buses, trains and taxis. AVs can then gradually be introduced to provide door-to-station or door-to-door services to passengers and journeys in need.

Harrow *et al.* (2018) begin with the people rather than the operational capability of AVs or the streets in which they will operate. The paper gives a detailed account of public engagement to gauge their attitudes towards AVs and to explore what the future might look like by responding to their concerns by way of co-design. The results include an extensive list of hope and fears about AVs and their services, together with a summary of design challenges. A number of interesting propositions are brought out, including that future AVs could be more ‘mobile homes, workplaces and hotels than cars, buses and trains’; that there is a general desire for a safer, more inclusive, cleaner and calmer city, where streets and places are designed for people rather than for vehicles; that AVs could transform how cities develop both spatially and economically; and that opportunities exist for a complete remodelling of road-based transport systems from the ground up and the way people use transport.

Transport planning and city planning are moving on their own with one major trend being car-free design. The paper by Loo (2018) presents her investigation into the history of a large car-free development in Hong Kong and the features that make it successful. It should be noted that this development is private and of high quality, housing over 12,000 residents. It stands to demonstrate that significant car-free developments

can be successfully realised in large cities once the right features are in place. It should be further noted that car-free zones or developments seek all the positive outcomes that AVs are expected to bring, including emission, safety, health, active mobility and quality of urban environment. An interesting question arises in how the emergence of AVs will reconcile with the car-free movement.

The penultimate paper of this issue by Hillcoat (2018) introduces a novel way of using vehicle number plate recognition technology to analyse drivers' behavioural responses to road works and to the quantity of information received. Furthermore, it uses information gathered from two different sites to smooth out peculiarities and compare the results. Although this paper is not specifically about autonomous vehicles, it speaks out that AVs will need to be able to deal with an environment which could change in a short time, or in a sudden due to unexpected events such as flooding, electrical outage or possible terrorist attack. It should be a concern if all AVs are programmed to similar behaviour in responding to these changes.

Driverless vehicles are a disruptive technology. Through these papers, one can see the uncertainties ahead, perhaps not so much on the technologies of autonomous vehicles, but the impacts on our society, how the city might evolve and how our way of life might adapt to this technology. A question I would raise at this point is that, as there are 'fundamental hopes for a safer, more inclusive, cleaner and calmer city where streets and places are designed for people rather than for vehicles' (Harrow *et al.*, 2018), and we have also seen the success of car free areas at city centres and significant residential

developments (Loo, 2018), what will or should be the role of autonomous vehicles and their services in, and what will be their impacts to, our future mobility and our cities? The last brief paper by Zhang (2018) calls for further studies on shared mobility and its wide-ranging impacts.

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