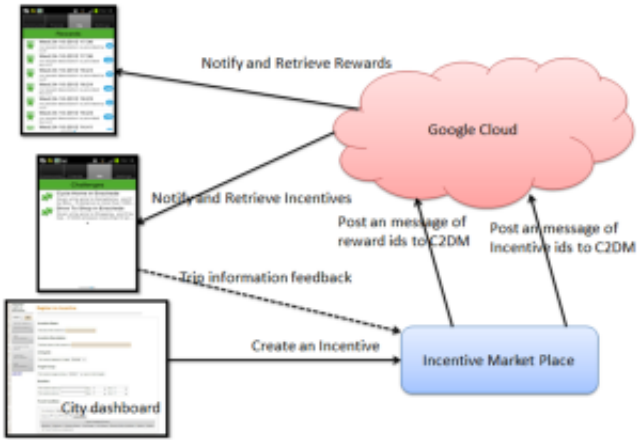
Can smart tech help incentivise and target shifts in mobility behaviour?

Motorised transport use causes 13% of all global GHG emissions, 23% of global carbon dioxide emissions and more than 80% of air pollution in developing countries, contributing to deaths arising from poor air quality. Hence, a main goal of many city and transport authorities is also to promote, cleaner and more sustainable travel. We investigated if user-centred smart technology could help target specific users to promote shifts in mobility behaviour and to deliver incentives to motivate individual travellers to change their travel behaviour so as to help achieve the overall authorities' and travellers' sustainability goals, e.g., to reduce car use during peak commute times.

A Web based Mobile Incentive Marketplace (MIM) service was developed for travellers, accessed via Android or Apple iOS phones. It uses the phone's sensors, mainly the phone's GPS, to classify common city transportation modes. Location tracks are also mapped to public transport routes to help identify if tracks could be classified as specific types of public transport routes. Two main types of incentives were supported: use of richer more personalised travel usage information (profiling) and use of a points-based reward system to promote travel as a game (gamification of travel). Information about both types of incentive could be shared using social networks. Examples of point-based travel are as follows. If you go by foot and travel more than 5 km, you will receive 100 points as a reward. If you take a bus and it costs less than 2 Euros and emits CO_2 less than 5 mg, you will receive 50 points as a reward. The MIM service, first, supports the creation of incentives by transport authorities and their release to notify mobile phone users. Second, it monitors and classifies travel behaviour in terms of travel cost, CO_2 emission, distance travelled and transport modality. Third, it compares traveller's behaviour with reward criteria and sends (points-based) reward notifications to the users that match (see the figure).



Distributing incentives and rewards where Android C2DM (Cloud to Device Messaging) is used to implement the incentive notification service

This system was tested in over 500 users in three European country cities during 6 months. Our main findings are as follows. Incentives based systems can be viewed as a rule-based, system. While it is possible to pre-determine some rules, the key stakeholders such as the transport authority rule setters often require rules to be flexible and condition aware to be able to prescribe new types of rules once the system is in operation. The potential for incentive rules to change behaviour exists but this needs to be personalised and relate to the transport use conditions. The level of personalisation is an important criterion for the effectiveness of an incentive. The level and use of non-tangible (points-based) reward rules does not seem to influence users much to shift their behaviour to act greener. It is feasible to make car drivers change departure time. It is feasible to induce public transport users to change to cycling. It is hard to induce car drivers to change to public transport. Sharing information and experiences via social networks does not seem to contribute to shifting travel behaviour. No single location-determination technology is accurate enough to determine locations pervasively and to classify transport track usage and modes. The accuracy of a unilateral GPS approach, even if combined with map support, is not high and it is not energy efficient. Many systems rely on the use of a remote, e.g., Cloud-based, data processing service to classify data, but this incurs a significant latency cost, energy-cost, and hinders time-critical transport mode and route recognition. It is exceedingly difficult to build and offer targeted incentives using a single source of information. The use of smart tech for incentive-driven mobility using accurate, personalised and location-ware information, in order to promote actionable sustainable transport mode shifts, is non-trivial.

Publication

Using a Smart City IoT to Incentivise and Target Shifts in Mobility Behaviour--Is It a Piece of Pie?
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