

# Testing of mobile apps intended for use while driving

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Today mobile apps intended for use while driving are available for Android and Apple platforms. Examples are TomTom GO Mobile, Car Tunes Music Player, Car Home Ultra, Efficiency, DriveGain, and goDriveGreen. Further, the idea of designing green driving apps as games is becoming more popular among developers. There are already some applications that are designed as games allowing drivers to compete against themselves (e.g. Automatic) and against others (e.g. FuelFit, and Go Green Auto Rally). This kind of serious gaming has shown potential to change people's attitudes and behaviour and can be a powerful means to promote green and safe driving. However, design of mobile applications intended for use in cars falls outside the standard procedures for car development with respect to legal issues, design methods and tests. This raises the question of how mobile apps should be developed and tested in order to make them safe and user-friendly. Two projects will be presented where the need for studies on test tracks has arisen:

**3D Sound Design**, a project developed by Luleå University of Technology and Volvo Car Corporation, financed by the FFI Vehicle and Traffic Safety programme, explores the use of sound in new driver assistance systems in cars. The project has shown good potential to provide information to the driver with lower distraction than conventional graphics based interfaces. Guidelines on how multisensory signals containing sound should be designed and used in order to create robust perception, low distraction and fast and accurate responses in driver assistance systems have been developed based on simulator studies. The next step involves testing in real cars.

**Safe and Sound Drive**, a project developed in cooperation between Anglia Ruskin University, Luleå University of Technology and Volvo Car Corporation, financed by Horizon 2020, will design a mobile app game encouraging the driver to lower the fuel consumption. The performance of the mobile app will be evaluated in user studies. For safety reasons, the first user studies cannot be made in traffic so they will be conducted on test tracks. The user studies will contain a quantitative part for measuring effects on fuel consumption and speed, and a qualitative part for assessing distraction and for further development of a safe user interface. Subjects will be monitored with respect to attention and unsafe behaviour. Risks will be identified and the user interfaces modified to resolve problems. When safe use has been ensured, the mobile app will be validated on road conditions. Thereafter, the application can be released for public download.

Both projects put special requirements on the test environment. Subjects representing typical users must be recruited and prepared for driving on test tracks. Procedures for user-centred design and methods for user studies must be developed.

**Keywords:** HMI, mobile apps, eco-driving, user-centred design, driver behaviour, test scenarios