Telematics and Road Safety

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***Abstract*—Road Safety is a major concern around the world. Telematic solutions have been available for more than a decade, and several studies have been done in the use of telematics data in road safety. However, these studies are scattered on different topics. There is a need to find the best possible ways of using telematics data for safe driving. This paper presents the review made with the aim of finding the evidence on the effective use of telematics data for road safety. Summary of the data collection devices, sensors, features, algorithms, feedback types used are discussed in this paper.**

Keywords—Telematics, Road Safety, Driving Behaviour, driver feedback

I. INTRODUCTION

Road safety is one of the major concerns around the world. Notably, in 2011, South Africa had the highest number of fatalities, according to the International Road Traffic and Accident Database (IRTAD) annual road safety report 2013 [1]. Governments, Vehicle Manufactures, and other stakeholders are constantly involved in ensuring the road safety by using several means. Vehicular telematics, also known as Flying Car Data (FCD), is one of the technological solutions available to ensure road safety. Telematic data, comprising the geolocation of vehicle, speed, acceleration, engine control unit information, and some other data, are used by some vehicle insurance and fleet management companies. Use of telematic devices is becoming mandatory in some countries. It is believed that every car in EU will be equipped with telematics sensors after the year 2018 [2]. Research on the use of telematics data to detect driving behaviour and road anomalies show great success in vehicle fleet and road infrastructure industries [1]. Telematic data are being collected by governmental and non-governmental organizations for various reasons, such as monitoring the road usage, driving behaviour, etc.

The intrusion of Usage-Based Insurance (UBI) is a milestone in the use of telematics data. It introduced Pay as You Drive (PAYD) scheme to attract customers. Risk-taking driving behaviour plays a major role in most of the accidents. According to [3], over speeding, sudden acceleration/breaking, hard cornering, not wearing seatbelts are some of the risk-taking driving behaviours. Specially designed data collection devices (Black-Box) or smartphones are used to collect vehicle telematics data. The gathered telematic data includes information about vehicle movements and control inputs, from which it is possible to gather information about driving styles and behaviours. UBI, using telematics devices, often offer incentives and feedback on driving behaviour [3]–[5]. Feeback is provided to end-users like drivers or other interested third parties via In-vehicle data recorders (IVDR) [6] or smartphones, using, electronic communication means such as text messages, emails and websites. Several Advanced Driver Assistant System (ADAS) are available to assist drivers to prevent and reduce accidents, but only on high-end model vehicles [7]. According [8] , there is an urgent need for researchers, designers and policymakers to consider how to evict the causes of distraction and capitalize on the potential benefits of the emerging technology. There is a need to research for the better cost-effective solutions available to assist drivers to reduce accident risks.

II. BACKGROUND

Tselentis, Yannis and Vlahogianni [9] in their review on UBI using telematics, discussed that most of the UBI applications use IVDRs such as On-Board-Diagnostics (OBD) modules and smartphones to gather and transmit driving data to the central databases. Further, they strongly believed that smartphones would be mainly used for data acquisition in the future due to its high penetration rates in households as well as the high hardware cost of IVDRs. The researchers also believed that, with drivers receiving feedback from monitoring devices, the crash risk would be reduced. Wahlstrom, Skog and Handel in [10] reviewed some notable academic and industrial studies considering, sensors and their energy efficiency. They discussed the methods to estimate smartphones orientation and position with respect to some given vehicle frame. They also categorized smartphone-based driver classification and road condition monitoring, based on sensors used and applied classification techniques. They stated that even though smartphones offer a low-cost implementation, there are often technical difficulties that have to be overcome due to the non-dedicated character of the device. They believed that improvements in sensor technology would be beneficial for the road condition and driving detection. Meiring and Myburgh in [1] investigated various driving style analysis solutions. Their review focused more on the relevant machine learning (ML) and artificial intelligence (AI) algorithms utilised in driver behaviour analysis systems. They found that Fuzzy Logic inference systems, Hidden Markov Models (HMM) and Support Vector Machines (SVM) would provide promising results if model complexity is reduced. Tong et al. in [4] conducted a review of existing evidence of how vehicle telematics can affect accident rates, and how countries across the world have introduced policies regarding the use of telematics. Their main objective was to find the evidence of the

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