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CODRIVE - COOPERATIVE DEVELOPMENT OF A ROADMAP FOR INITIAL V2X
IMPLEMENTATION IN EUROPE

Abstract

The CoDRIVE solution builds on the RD undertaken at Nottingham as part of UK and European Space Agency efforts in the development of key technologies for connected and autonomous vehicles (CAVs). The mainstay of the system is the low-cost high performance CoDRIVE GNSS receiver integrated with an MEMS grade inertial navigation system (INS) powered with CoDRIVE algorithms and high precision data processing software incorporating N-RTK corrections (CoDRIVE on-board unit (OBU)). The solution then integrates LiDAR localisation that is matched with information from high-definition 3D maps. This information aids the positioning solution by correcting the long-term drift of INS technology that occurs in the absence of GNSS. In addition, the CoDRIVE solution utilises other digital infrastructure (provided through e.g. DSRC, Wi-Fi, 4GLTE, RFID) alongside an exploration of future signals of opportunity, particularly 5G, to further aid positioning and localisation in GNSS denied environments. For the purposes of testing, a reference solution was produced using a Javad Triumph LS GNSS receiver, sharing a common antenna and split signal with the CoDRIVE receiver, and co-mounted POS-RS and MEMS IMUs. The trials were undertaken using the CoDRIVE test vehicle with the full system operational to define baseline results and gather testing data under different operational situations from the CoDRIVE OBU. The reference solution was then used to assess the performance of integrated CoDRIVE solution, INS only positioning and the RFID aided INS positioning. Initial results show that radionavigation combined with external aiding can achieve sub-decimetre positioning 99 per cent of the time in an ideal environment. Even in GNSS denied locations, the CoDRIVE solution is capable of restraining the maximum error to within 1 metre, and overall, 93.9The uncertainties surrounding positioning are still at a level that is unlikely to be acceptable for fully autonomous driving; however the CoDRIVE integrated solution combined with intelligence relating to the driving environment, is capable of providing robust and reliable localisation solutions in challenging scenarios. Each sensor has their own advantages and disadvantages for different environments. The key is to achieve the balance between each technology through a better understanding and anticipation of sensor, vehicle, and environmental characteristics. The future landscape of positioning and navigation for mass market applications based primarily on robust, resilient, and reliable GNSS is one we intend to exploit through the innovative provision of a low-cost but high performance dual-frequency carrier-phase device.