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Title

A holistic platform utilizing SDR for aiding automated airport and waterdrome inspections that utilize drones.

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Abstract

This paper proposes the use of a flying platform that is a combination of a payload called mRNAV mounted on a drone as a means of assisting automated aerodrome and waterdrome Navigation Aid Systems (NAVAIDS) inspections and calibrations. The purpose of the flying platform is to enhance the levels of security, safety, management, and operations that are present at airports and waterdromes. Manual labor is required at both the airport and the waterdrome in order to complete the necessary inspections and ground operations at the time. Since the year 2020, a European programme called 5D-AeroSafe that is part of the Horizon 2020 initiative and is sponsored by the European Union (EU) has been striving to alleviate such manual procedures while also boosting the speed and efficiency of operations.

We were able to invent and build an onboard computing platform thanks to our participation in the development of this European Union project. This platform makes use of Commercial Off-The-Shelf (COTS) technologies, such as Software Defined Radio (SDR), cameras, antennas, and so on, in order to capture, analyze, and assist in the inspection and calibration of NAVAIDS in an airport and/or a waterdrome. In addition, we are able to depict in live mode the analyzed data by constructing a human machine interface (HMI) and making use of various cloud infrastructures. This includes data from aircraft (via ADS-B signals), vessels (via AIS signals), inspection drones (via a 4G connection), and the NAVAIDS measurements after they have been processed by the previously mentioned custom-built on-board computing platform.

In addition, the findings of the foreign object detection (FOD) and analytics algorithms are made in near real-time and stored on a cloud server thanks to the onboard computer platform, many cameras, and specialized visual analytics algorithms. A cloud streaming server, Global System for Mobile Communications (GSM), and 4G connectivity allow us to transmit a live video feed from the drones while we are conducting an inspection. In addition, we are able to send a live video feed from the drones while we are performing an inspection.

The information that was recorded, evaluated, and stored is obtained using the HMI web user interface. This information, along with the video feed from the drones, is then projected on a map along with the inspection specifics, the obstructions that were found, and the drone information data. Both credentials and SSL/TLS certificates are used to protect any information that is stored on or retrieved from the cloud's servers. Credentials are used to protect information that is saved to the cloud, while certificates protect any communication with the cloud's servers. This paper is elaborated as part of the 5D-AeroSafe project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 861635 - SOCIETAL CHALLENGES - Smart, Green and Integrated Transport

References