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A monitoring method based on ADS-B messages and terrestrial radio spectrum data fusion

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Radio monitoring is a prerequisite for ensuring the safety of wireless communications, especially in the field of aviation. Illegal FM broadcast signals might interfere with civil aviation communications, but it is difficult to find these signals, since an airline route involves a wide geographical range. This paper proposes a radio monitoring method that integrates the ADS-B (Automatic Dependent Surveillance - Broadcast) messages with terrestrial radio monitoring spectrum data in order to detect potential interference signals along airline routes timely. The system consists of three key modules: the sensor node, the cloud-based data fusion and analysis server, and the web user interface (Web UI). The monitoring data is uploaded to the cloud for processing and display. Users can interact with the system through the Web UI. This cross-domain data fusion application not only benefits civil aviation safety, but also provides effective data support and important decision-making reference for radio monitoring managers to analyze potential radio interference.

Radio monitoring is the basis of network electromagnetic space security. Due to the rapid increase of wireless applications, some new spectrum monitoring schemes have been proposed in order to better manage the radio spectrum. For example, Cooklev et al. proposed a cloud-based approach for spectrum monitoring[1], in which the spectrum monitoring network is viewed as a system-of-systems that collects and stores the compressed I/Q data. Baltiiskiet al. [2] presented a cloud based cognitive radio architecture and exploited the big data and machine learning techniques to handle the long-term spectrum monitoring data for spectrum allocation and management. In a previous work [3], we also proposed a cloud-based IoT approach for radio spectrum monitoring. Here, we propose a radio monitoring method that uses sensor nodes to receive ADS-B messages and monitor radio spectrum simultaneously, in order to find potential interference signals along airline routes timely. The system architecture diagram is shown in Figure 1. The sensor node adopts an ADS-B module to obtain real-time flight data including flight number (ITAT/ICAO number), call number, longitude, latitude, flight altitude and flight speed, and a receiver module to obtain the radio spectrum of the surrounding environment in real time. All data is uploaded to the data fusion and analysis server of the cloud for processing. A web user interface is provided for users to access the system.

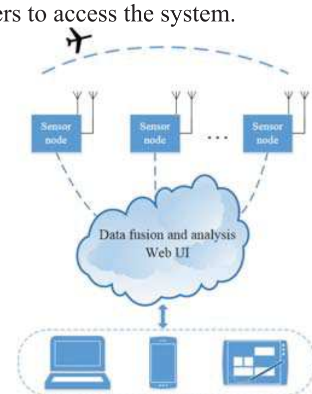

Figure 1. The system architecture diagram.

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