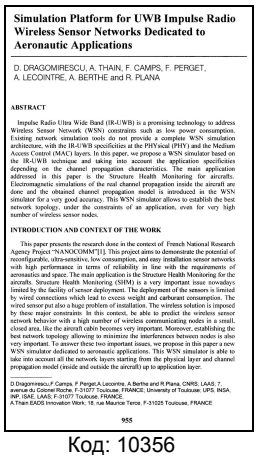

Simulation Platform for UWB Impulse Radio Wireless Sensor Networks Dedicated to Aeronautic Applications

D. DRAGOMIRESCU, A. THAIN, F. CAMPS, F. PERGET, A. LECOINTRE, A. BERTHE and R. PLANA

ABSTRACT

Impulse Radio Ultra Wide Band (IR-UWB) is a promising technology to address Wireless Sensor Network (WSN) constraints such as low power consumption. Existing network simulation tools do not provide a complete WSN simulation architecture, with the IR-UWB specificities at the PHYsical (PHY) and the Medium Access Control (MAC) layers. In this paper, we propose a WSN simulator based on the IR-UWB technique and taking into account the application specificities depending on the channel propagation characteristics. The main application addressed in this paper is the Structure Health Monitoring for aircrafts. Electromagnetic simulations of the real channel propagation inside the aircraft are done and the obtained channel propagation model is introduced in the WSN simulator for a very good accuracy. This WSN simulator allows to establish the best network topology, under the constraints of an application, even for very high number of wireless sensor nodes.

INTRODUCTION AND CONTEXT OF THE WORK

This paper presents the research done in the context of French National Research Agency Project "NANOCOMM"[1]. This project aims to demonstrate the potential of reconfigurable, ultra-sensitive, low consumption, and easy installation sensor networks with high performance in terms of reliability in line with the requirements of aeronautics and space. The main application is the Structure Health Monitoring for the aircrafts. Structure Health Monitoring (SHM) is a very important issue nowadays limited by the facility of sensor deployment. The deployment of the sensors is limited by wired connections which lead to excess weight and carburant consumption. The wired sensor put also a huge problem of installation. The wireless solution is imposed by these major constraints. In this context, be able to predict the wireless sensor network behavior with a high number of wireless communicating nodes in a small, closed area, like the aircraft cabin becomes very important. Moreover, establishing the best network topology allowing to minimize the interferences between nodes is also very important. To answer these two important issues, we propose in this paper a new WSN simulator dedicated to aeronautic applications. This WSN simulator is able to take into account all the network layers starting from the physical layer and channel propagation model (inside and outside the aircraft) up to application layer.

D.Dragomirescu,F.Camps, F.Perget,A.Lecointre, A.Berthe and R.Plana, CNRS; LAAS; 7, avenue du Colonel Roche, F-31077 Toulouse, FRANCE; University of Toulouse; UPS, INSA, INP, ISAE; LAAS; F-31077 Toulouse, FRANCE;
A.Thain,EADS Innovation Work; 18, rue Maurice Terce, F-31025 Toulouse, FRANCE

955

Код: 10356

D. Dragomirescu, A. Thain, F. Camps, F. Perget, A. Lecointre, A. Berthe, R. Plana

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Ключевые слова:

Содержание.