

Hybrid indoor/outdoor localisation system to support aeronautical maintenance activities

Nelly de Bonnefoy, Yohann Dugua, Toriki Samir, Jean-Pierre Jessel

“Visual Objects: from Reality To EXpression” Team
Computer science research institute of Toulouse (IRIT)
Paul Sabatier University, Toulouse, France

nelly.de-bonnefoy@irit.fr, yohann.dugua@gmail.com, torki@irit.fr, jessel@irit.fr

Bernard Ordy

Research and Technology
AIRBUS
Saint-Martin du Touch, France
bernard.ordy@airbus.com

ABSTRACT

This research work is carried out in the framework of a project focusing on the future of aeronautical maintenance. One of our main objectives is to localise continuously technicians in relation to the aircraft on which they intervene during maintenance session. This module will be part of a context-aware application that will deliver several services to maintainers. The challenge is hard, the expected precision is around a centimetre and constraints are numerous. As for examples, the system must work inside and outside a hangar, inside and outside the aircraft, whatever the hangar configuration, the weather, the luminosity are.

This paper presents the early stages of our research methodology. It first provides initial steps that were dedicated to a state of art of available technologies for localisation and a study of the operational context. They allowed us to concentrate our choices on a Hybrid Localisation System (HLS) combining an Inertial Measurement Unit (IMU), a 3D model of the aircraft and a third technology to evaluate: optical or radio wave.

Next, this document depicts prototypes that have been implemented and tested. The first one helped us to acquire data in operational conditions and to test diverse positions of the IMU on the technician. After a results study, the second prototype was designed using a combination of an IMU placed on the operator's heel and a 3D model of the aircraft.

Depending on the way covered by the technician during the maintenance session, the obtained error rate is around 5-10%. The 3D registration offers an interesting gain inside the aircraft or in the vicinity of binding elements. In this difficult context, the research path taken to design the HLS looks already promising, and localisation will be improved when the vision module, on which we are still working, will be integrated.

KEYWORDS: Hybrid localisation system, IMU pedestrian navigation, zero-velocity update, 3D registration, context aware application.