

Technology Transfer Demonstrators 2013

Cornis SAS

Rocket motor vibration analysis algorithms for wind turbine blade monitoring

The goal of the technology demonstrator was to prove the feasibility of real-time wind turbine blade monitoring using vibration analysis algorithms developed to analyse rocket motor vibrations. Four turbines (one more than originally planned) on two sites were equipped with a combination of accelerometers and fibre optic deformation gauges and data collected over a three-month period for two turbines, and a six-month period for the remaining two. Data were collected and processed, and algorithms developed that were capable of detecting anomalies in the turbine vibration signature that minimised false positives while giving no false negatives and being sized to run on portable computing equipment that could in future be deployed on individual turbines. Short tests were conducted when physical anomalies were deliberately introduced to a turbine blade. The algorithm was able to detect an artificially introduced aerodynamic imbalance on one of the three turbine blades. However it was not able to detect the addition of mass to the blade, simulating icing for example. This in part may be due to the conservative nature of the test, to protect the turbine blades.

Arquimea

URISMA: Urological Implants based on Shape Memory Alloy actuators

The purpose of this demonstrator was to produce and test a new concept for an extra-urethral implant based on shape memory alloy designed to address urinary incontinence. The SMA technology allows the placement of very small mechanical devices into the urinary system, avoiding or minimizing invasive surgery. An artificial bladder and urethra has been constructed to mimic the function of human organs and this has been fitted with the shape memory alloy implant. The system has been equipped with sensors to monitor the operation of the system and achieve realistic operational conditions.

Miramap

FIELDSCAN – Real-time mobile passive microwave radiometry for soil moisture monitoring in agriculture

The aim of this demonstrator was to install a passive microwave radiometer, developed for remote sensing of the Earth from space, on an agricultural vehicle, such as a tractor, and use it to make detailed real-time soil moisture measurements which can be use to automatically control the amount of pesticide or fertilizer sprayed on the ground.



Heriot-Watt University

Helical Resonator Filters

The purpose of this demonstrator was to identify and study opportunities for exploiting helical resonator filter technology in the ground-based mobile telephony network. Helical resonator filters have been employed in diplexers on-board satellite systems that operate UHF links for a broad range of applications that include; meteorology; telecommunications; space research; radionavigation; Earth exploration; defence. They offer advantageous trade-off between size and electrical performance (quality factor) and have therefore been primarily employed at UHF frequencies (~ 300 MHz), where the large size of the wavelength makes competing solutions unfavourable. Helical resonator filters can provide competitive solutions for Remote Radio Heads (RRHs) which are an integral component of emerging mobile telephony architectures. This project has assessed the electrical performance and manufacturability of helical resonators at cellular frequencies. In particular, the quality factor of helical resonators in the aforementioned band has been assessed by means of experimental testing and the results used to predict the performance of filters.

IberEspacio

Hybrid photovoltaic thermodynamic passive (PVTd-p) solar collector for electricity and DHW generation

The aim of this demonstrator was to use Heat Pipes developed for the thermal control of spacecraft to cool solar panels, thereby increasing their efficiency. In order to demonstrate the concept, tests have been carried out on the (pair of) heat pipes alone to verify their performance under the required conditions, and of the heat pipes integrated with the solar cells. The heat pipes meet the power dissipation requirements with some margin, and deliver uniform temperature along the useful length in contact with the solar panels. Problems with the lamination process for the solar cells needed to accommodate the heat pipes have been addressed, and after several trials where problems were encountered because of cracking of the cells, a satisfactory prototype was produced to allow the complete system to be tested. This demonstrates an electrical gain compared to uncooled cells of around 11%.

Orbital

UAV-RTEMS

RTEMS Improvement is a certified Real-Time Operating System (RTOS), which has been used widely in Space projects. This is a qualified version that does not include BSD Net Stack or Drivers for peripherals. The demonstrator implemented a basic certifiable HMS for a UAV Ground Control Station. In order to get a close-to-market, realistic environment, the HMS application was designed to be driven by flight-proven telemetry transmitted from an industrial UAV. EADS-CASSIDIAN (now Airbus) provided a simulation record of ATLANTE aircraft STANAG telemetry, ensuring that the software is totally aligned with a real-life, medium-sized unmanned aircraft application. The RTEMS Improvement does not include drivers for any peripheral or the BSD TCP/IP stack, so the ETHERNET driver and UDP/IP stack were created from scratch.



Stevenson Astrosat Ltd

RoadTASK – Hyperspectral M2M System

The aim of this demonstrator was to evaluate the effectiveness of mounting hyperspectral imagers developed for Earth Observation from space on road vehicles, and to assess their utility for monitoring the state of the road surface and the surrounding environment. The hyperspectral imager is designed for use on Cubesats and therefore small, lightweight and robust. It can potentially be mass-produced cheaply, in which case it could be deployed widely.

The work performed consisted of a study of a range of potential applications of the technology, focusing on the practicalities of mounting the instrumentation on road vehicles. A series of field tests using sensors mounted on a road vehicle were also conducted. Field tests from a UAV were also conducted.