

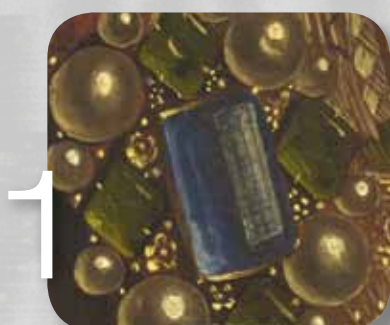


# newsletter

# 2

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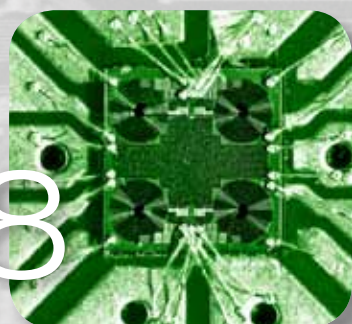
## In this issue



1



6



8



10

### Preface

4

### Technology Flash

1

- ▶ Closer to Van Eyck - an Artwork in Digital Image Processing 1
- ▶ Septentrio and QinetiQ Partnership Delivers First Galileo PRS Signal Reception 2
- ▶ EVP: a vector DSP for smartphones by ST-Ericsson Eindhoven 4

### In the Spotlights

6

- ▶ Howest opens EMC laboratory 6
- ▶ AnSem successfully participated in MedTec, Europe's leading medical technology trade fair 7
- ▶ MINDCET receives ISO9001:2008 certification 8
- ▶ ICT Solutions for Energy-Efficiency in the Smart Home 9

### Embedded Corner

10

- ▶ DSP Valley at the Embedded World 2012 Exhibition in Nürnberg 10

### Upcoming Events

10

### Contact Information

12

## Closer to Van Eyck - an Artwork in Digital Image Processing

The website "Closer to Van Eyck - Rediscovering the Ghent Altarpiece" presents the Ghent Altarpiece (1432) in visual light macrophotography, infrared macrophotography, infrared reflectography and X-radiography. Additionally, multiple extreme close-ups of selected details are available in the first two modalities. In total, the website contains more than 100 billion pixels of image data, hence processing and presenting such a huge amount of data posed significant challenges. The Department of Electronics and Informatics (ETRO) of the Vrije Universiteit Brussel (VUB) performed the digital image processing, while VUB-spinoff Universum Digitalis (UD) developed the web application to admire the painting anywhere and anytime.



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The panels were photographed in a regular overlapping grid, with the number of columns and rows varying from panel to panel. Each image block is a 200 MB large photograph of 4992x6668 pixel resolution, capturing a 22.4x16.7cm surface area of the painting.

ETRO handled the complex task of *image stitching*, which is the process of auto-

matically combining multiple image blocks with overlapping fields of view to produce a single high-resolution image. Studying the overlap, the structural deformation (e.g. shift, rotation, etc) between two neighbouring blocks is determined through automatically matching *feature points*. However, to obtain a smooth transition from one block to another in the stitched panel, several image artifacts

have to be taken into account (e.g. focus, lighting, etc). This process was followed by *registration*, which is automatic alignment of the different modalities.

Thanks to the algorithmic approach the tedious, if not impossible, task of stitching and registering thousands of image blocks was automated and the developed workflow can be readily applied to any new material obtained during the upcoming restoration of the painting and, furthermore, it enables a direct "before" and "after" restoration comparison.

The next challenge was to present these extremely high resolution images to the public. Universum Digitalis built a web application that allows visitors to navigate through the images, zoom in on details, compare modalities and share any detail with friends or colleagues. The minimalist design of the web application concentrates on user friendliness whilst emphasizing the content. The site perfectly scales from small netbook screens to 30inch screens and up. In the viewer, every single pixel of the screen can be used for image visualization. In contrast to many other interactive websites, no



# Septentrio and QinetiQ Partnership Delivers First Galileo PRS Signal Reception

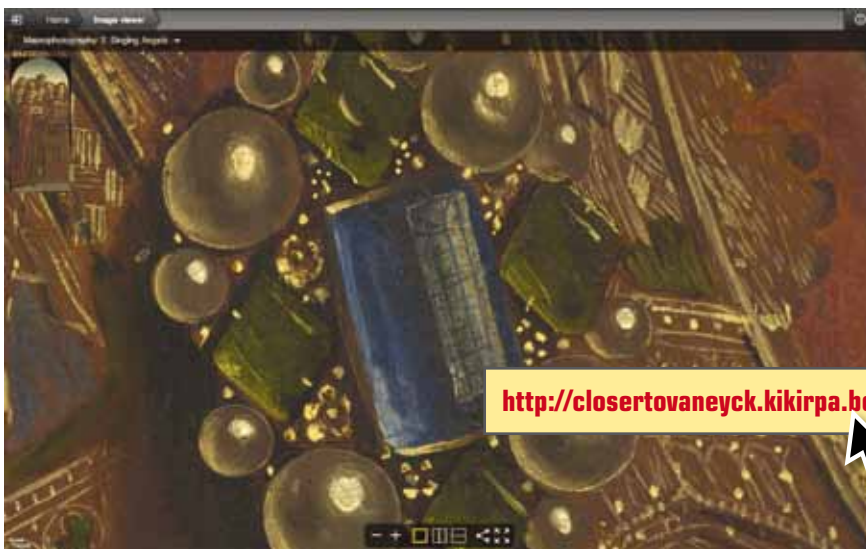
Another major milestone in the Galileo European Navigation Satellite System's development and deployment program has been achieved. Septentrio and QinetiQ, working in close partnership with the European Space Agency (ESA) and their industrial partners, achieved the world's first successful reception of the encrypted Galileo Public Regulated Service (PRS) signal from the first Galileo satellites (launched in November 2011).

The signal was received on the Galileo PRS Test User Receiver (PRS-TUR) jointly developed by Septentrio and QinetiQ under an ESA contract. For the reception test, the receiver was installed in

the Galileo Control Center in Fucino, Italy and operated by technical experts from ESA. This milestone builds on a number of previous major Septentrio/QinetiQ achievements including:



- First ever laboratory demonstration of the PRS signal acquisition and tracking in QinetiQ (Malvern, UK, 2006)
- Successful RF compatibility test between a Galileo payload and the PRS-TUR (Portsmouth, UK, 2010)
- Successful Galileo end-to-end system test including the Galileo Ground Mission Segment (GMS) and its key management facilities, satellite and PRS-TUR (Rome, Italy, 2011)



third party plugins, such as Flash or Silverlight are used. The site relies entirely upon contemporary web standards, including HTML5, CCS3 and JavaScript.

UD makes use of two distinct server parts: a typical web application and a dedicated image server that stools on the Internet Imaging Protocol (<http://iipimage.sourceforge.net/>). The latter allows transferring image tiles, which is essential when dealing with giga pixel images. The JPEG2000 image file format is used to significantly reduce the required disk space, without loss of quality. Multiple image servers can be used in parallel, increasing the amount of visitors that can be served simultaneously.

In the first two weeks after launch visitors spent 37 minutes on the site, with peaks up to a 1 hour average during the weekend. ■

#### Acknowledgements:

The authors, Frederik Temmermans (UD), Bruno Cornelis (ETRO), Iris Vanhamel (UD), Gabor Fodor (ETRO), Prof. Dr. Ann Dooms (ETRO-IBBT) would like to thank Prof. Dr. Ron Spronk, the Getty Foundation and NWO for the support obtained through the Lasting Support and Web application Ghent Altarpiece projects.

Septentrio and QinetiQ are proud to be a key, long-term contributor to the Galileo Program, working closely with ESA, the European GNSS Agency (GSA) and European industrial partners since 2003.

Peter Grogard, Founder and CEO of Septentrio Satellite Navigation, said: *"Septentrio is extremely proud of this historic milestone for the Galileo program. This is the most important milestone for Septentrio since the reception of the world's first Galileo signal from space on January 12, 2006 with a Septentrio receiver. We are honoured and grateful for the excellent collaboration with ESA. Septentrio is marking another industry-first on the Galileo program, and will continue playing a key role in this exciting and ambitious*

Galileo, one of Europe's largest high-technology cooperative infrastructure program, will provide Europe with a sovereign global satellite navigation system ensuring the availability of reliable navigation services for a wide range of different users. The Galileo system will deliver a number of navigation services including an open service, a commercial service and the Public Regulated Service (PRS). The PRS is an encrypted service for Government authorised users who have an enhanced security need (such as police, security services etc). For more information on Galileo please see the ESA website ([www.esa.int](http://www.esa.int)) and european GNSS Agency (GSA) website ([www.gsa.europa.eu](http://www.gsa.europa.eu)).

*European project. Today, together with our partners, we take a decisive step in the early availability of commercial PRS receivers to foster user acceptance and market success of this Galileo service."*

Leo Quinn, CEO of QinetiQ, said: *"I am very proud of the part QinetiQ is playing*

*in the Galileo program. Working closely with ESA and our industrial partners, we are delighted to have been able to deliver real value to the program as seen by today's milestone success. This achievement, together with Europe's recent commitment to a full Galileo constellation, has been a necessary step*

continuation on page 5

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With the European Commission's Key Enabling Technologies (KET) recommendations now published, work needs to focus on implementation. We need concrete measures put in place, as soon as possible, for Europe to remain an innovative and competitive manufacturing region.

Let's work together to keep Europe in the race. [Attend www.semi.org/BrusselsForum](http://www.semi.org/BrusselsForum)



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