The Use of GNSS in DubaiSat Programme

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• EIAST Overview
• DubaiSat Programme
• Challenges and Future Projects
• UAE activities in the ICG
• Dubai Government Initiative established in 2006.

• With a vision to be a world class leading organisation in advanced science and technology.

• A mission to boost prosperity and enhance sustainable development by fostering technological advancement and inspiring scientific innovation.
Space Programme

• DubaiSat Programme
  — DubaiSat-1:
    • Technology Transfer Program Satrec Initiative of South Korea.
    • Launched on 29th July 2009.
  — DubaiSat-2:
    • Joint Development with Satrec Initiative of South Korea
    • To be Launched End of 2012.

• Ground Segment
  — Satellite Command & Control.
  — Image Processing and Product Generation.
## DubaiSat Programme

<table>
<thead>
<tr>
<th>Item</th>
<th>DubaiSat-2</th>
<th>DubaiSat-1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Shape</strong></td>
<td><img src="image1.png" alt="DubaiSat-2 Shape" /></td>
<td><img src="image2.png" alt="DubaiSat-1 Shape" /></td>
</tr>
<tr>
<td>GSD</td>
<td>1 m Pan and 4 m MS</td>
<td>2.5 m Pan and 5.0 m MS</td>
</tr>
<tr>
<td>Swath Width</td>
<td>12.2 Km</td>
<td>20 Km</td>
</tr>
<tr>
<td>Image Storage</td>
<td>256 Gbit SSR</td>
<td>64 Gbit</td>
</tr>
<tr>
<td>Image Transmission</td>
<td>160 Mbps</td>
<td>30 Mbps</td>
</tr>
<tr>
<td>Weight &amp; Dimensions</td>
<td>Hexagonal shape, &lt; 300 Kg mass 2 m height, 1.5 (3.3) m diameter</td>
<td>Hexagonal shape, &lt; 200 Kg mass 1.4 m height, 1.2 (3) m diameter</td>
</tr>
<tr>
<td>Orbit</td>
<td>600 ~ 700 Km Sun Synchronous Orbit</td>
<td>682 Km Sun Synchronous Orbit</td>
</tr>
</tbody>
</table>
DubaiSat-1 GPS Receiver

• Function:
  – Technology Demonstrator.
  – Provide Pulse Per Second (PPS) signal to Modules.
  – Ephemeris Data for Images.

• Technologies Used:
  – Based on ARM60 RISC microprocessor.
  – GP2021 Correlator: Receives up to 12 channels of L1 C/A code.
  – GP2015 RF Front-End Chip : Frequency down conversion and outputs GPS signal (C/A code) as a 2-bit digital data.
DubaiSat-2 GPS Receiver

- **Function:**
  - Provides coordinates for satellite Attitude and Orbit Determination and Control (ADC).
  - Provide Pulse Per Second (PPS) signal to modules.
  - Ephemeris data for images.

- **Technologies Used:**
  - Based on an SMJ320C6701 Digital Signal Processor.
  - GP2021 Correlator: Receives up to 12 channels of L1 C/A code.
  - GP2015 RF Front-End Chip: Frequency down conversion and outputs GPS signal (C/A code) as a 2-bit digital data.
## Comparison Table

<table>
<thead>
<tr>
<th></th>
<th>DubaiSat-1 GPS Receiver</th>
<th>DubaiSat-2 GPS Receiver</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Receivers</strong></td>
<td>1 Receiver</td>
<td>2 Receivers</td>
</tr>
<tr>
<td><strong>Processor</strong></td>
<td>ARM60</td>
<td>DSP SMC320C6701</td>
</tr>
</tbody>
</table>
| **Task Architecture**   | 0.1sec - Acquisition of Observation Data  
                          1.0sec – Assignment of channel  
                          1.0sec – Decoding Navigation Message  
                          1.0sec – Calculation of Navigation Solution | 0.1sec – Acquisition of Observation Data  
                                                                                          1.0sec – From Assignment to Calculation of Navigation Solution |
| **Communication I/F**   | RS422                   | CAN bus                 |
| **EMIF(External Memory Interface)** | N/A                    | DSP EMIF(External Memory Interface) - (SRAM/EEPROM/Correlator) |
| **Signal Tracking**     | 10 GPS satellites (signal C/A, L1) | 12 GPS satellites (signal C/A, L1) |
| **Orbital Navigator**   | N/A                     | Includes the orbital navigator which performs the propagation of the orbit and the update of the orbit with GPS navigation solution. |
| **Precision of Navigation Outputs(PVT)** | 1Hz                     | 1Hz                     |
| **Navigation Solution** | Position: 10 m          | Position: 3 m           |
Challenges and Future Projects

• Challenges:
  – Technologies becoming obsolete.
  – Higher accuracy.
  – Develop the right skills to continue technology development.

• Future Projects:
  – Develop GPS/GLONAS/GALILEO Receiver
  – Develop FPGA based correlators.
UAE activities in the ICG

• The UAE hosted a regional GNSS workshop entitled United Nations/United Arab Emirates/United States of America Workshop on the Applications of Global Navigation Satellite Systems from the 16\textsuperscript{th} - 20\textsuperscript{th} of January 2011 in the city of Dubai.

• Some of the highlights of the workshop:
  – Over 100 attendees from 30 countries.
  – Concentration on regional activities.
  – Raising the profile of GNSS applications in the region.
  – After successful implementation, future plans for bigger events.
UAE activities in the ICG
Thank You