

SmartCodingTech

Smart coding technology for advanced communications in space and ground segments. We offer optimal and innovative solutions for faster data transmission and efficient storage. Our technology enables higher transmission rates while downloading satellite data to the ground and to increase the amount of transmitted data. One of our proposals is included in an upcoming CCSDS standard.

Need

1. Overcome the limited capacity of satellites' downlink channels.
2. Maximize the storage efficiency of on-board mass memories.

Today, on-board captured data can neither be fully stored nor completely transmitted and is partially discarded. As an example, the IASI sensor on-board the MetOp B satellite captures data at 45 Mbits/s, having only 1.5 Mbits/s allocated in the downlink channel.

Solution

Data compression technology is an efficient answer to solve these two problems, as it reduces the size of the captured data.

1. Our proposals exploit the mutual information among bands through different spectral transforms.
2. The transforms are computationally undemanding.
3. Compression ratio for lossless coding improves the ubiquitous 2:1.
4. Compression ratio for lossy coding may reach 100:1.
5. Our proposals are amenable to radiation-hardened hardware.

INNOVATIVE AND DIFFERENTIATING FEATURES

Designing and implementing advanced data compression techniques aiming at higher transmission rates and improved storage requirements has become essential for remote sensing data sharing. Most deployed Earth Observation missions include a data coding process.

Our added value consists of:

- Active involvement with the Working Group on Multi and Hyperspectral Data Compression (MHDC) from CCSDS.
- Collaboration with international research groups and space agencies (ESA, NASA, CNES, DLR, ...).
- Expertise in current coding standards: JPEG, JPEG-LS, JPEG2000, H.264, HEVC, among others.

Our differentiating features rely on:

- Currently developing the upcoming standard for data sharing CCSDS 122.1 together with CNES (French Space Agency).
- Providing on-ground tools to work directly on the compressed data, thus delivering a complete product for efficient and secure space downlink systems.
- Published open source code for CCSDS Recommendations 121.0, 122.0 and 123.0. Only two open source implementations available worldwide for 122.0 and 123.0.
- Published open source code for ISO standard JPEG2000 Part 1 and Part 9.

Europe is investing on Critical Space Technologies for European Strategic Non-Dependence: "N42- New data compression systems for space instrumentation". It is the right time and place for our technology.

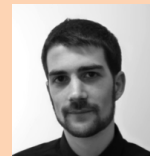


Team



Joan Serra-Sagristà

Associate Professor at UAB. Head of GICI group. 20+ years experience on data compression. 1.5+ M€ in public & private funding. 100+ publications.



Ian Blanes

Postdoc at CNES. Assistant Professor at UAB. 5 years working in the newest standard CCSDS-122.1. Several publications in high impact journals.



Sara Álvarez-Cortés

BS.c & MS.c in Telecommunication Engineering. MS.c in Computer Vision. Ph.D. student on remote sensing data compression.



Stefan Pahon:

Last year LL.B & BBA student. Specialized in finances and fundraising. President AIESEC Local Cmte. AIESEC Campus Rec. Mgr. in Belgium & Luxembourg.

Development status

- Coding techniques for on-board operation are well established and consolidated, however current technology achieves a limited compression ratio.
- A software implementation of our proposal for CCSDS-122.1 recommendation for progressive lossy-to-lossless multicomponent data compression that boosts the coding performance is fully implemented and tested.
- Cross-validation against a NASA implementation has been successfully carried out.
- The multi-platform software runs in real-time.
- A radiation-hardened hardware implementation has been investigated and found achievable.
- The software builds upon our previous open source implementation for CCSDS-122.0.

Future steps

1. Q2 2016: CCSDS standard submitted for Final Agency Review. CCSDS Management Council approval expected by Q4 2016.
2. Q4 2016: Promote the need for a ESA IP-CORE. Form consortium to build IP-CORE.
3. Q4 2016: Work further on the radiation-hardened hardware implementation.
4. Q1 2017: Submit proposal to H2020 Space Program on topic COMPET-3-2017 High speed data chain - On-board compression.

Intellectual and industrial property

Our group has published open and free software for data compression. Such software is suitable for dual-licensing agreements. Examples:

- A JPEG2000 JPIP implementation, 3.000+ source code requests.
- A CCSDS IDC implementation, 1.600+ source code requests.

Wide know-how of coding techniques and its implementation. Worldwide scope.

TARGET MARKET AND COMPETITION

MARKET: Public Organizations, Space Agencies and Companies.

- European Commission: Horizon 2020
- Public and Government agencies: ESA, EUMETSAT, CNES, ...
- Private Companies: Digital Globe, ...

The Tauri Group reports 2014 revenue of over 323B\$ for the Global Space sector and 3% expected growth during 2015. From these revenues, 123B\$ refer to Satellite Services (Telecommunications -101B\$- and Earth Observation -1.6B\$- mainly). We foresee a market share for products employing our technology accounting to about 0.1% of these amounts, i.e., about 103M\$.

COMPETENCE: European research groups with strong background in image coding & standards:

- IST Lisboa, QMUL London. MPEG Std.
- VUB Brussel. JPEG2000 Std.
- EPFL Lausanne. JPEG-XR Std.
- Uni Stuttgart. JPEG-XT Std
- PT Torino. CCSDS 123.0 Std.

Our technology, crafted for space communications, can be readily adapted to the ground segment.

FINANCIAL NEEDS

As UAB employees, we tally our salaries as initial investment (85.000€/year), including manpower and material resources. CNES provided funding over 45.000€/year for on-going CCSDS-122.1 standard development.

Financial needs concern hiring a project manager to help us contact interested companies, identify suitable Calls and prepare competitive proposals. Estimated cost: 50.000€ for first two years

FINANCIAL PROJECTIONS

| | 2016 | 2017 | 2018 | 2019 |
|----------|---------|---------|---------|----------|
| Incomes | 45.000€ | 85.000€ | 95.000€ | 110.000€ |
| Expenses | 45.000€ | 75.000€ | 85.000€ | 100.000€ |

*Note that the incomes and expenses correspond to our technology development funding, not to the revenues it might produce.

PARTNERSHIPS

The natural partners for this project are companies with proven capabilities to develop space-qualified hardware and software of our compression technology.

Meetings have been held with Sener to consider joint participation in ESA compression technology calls and in a H2020 research and innovation action.

Contacts have also been held with the engineering consultancies GTD and Noveltis to pursue future partnerships in ESA ITT and ITI calls.

A contract was awarded to EADS-Astrium by CNES to investigate the suitability of a hardware implementation of our proposal for CCSDS-122.1 recommendation.

University of Las Palmas also researched on an FPGA implementation of our proposal.