Information Science & Technology Colloquium Series

2017 IS&T Colloquia Lecture Series
Goddard Showcase – Part One

Wednesday, September 13, 2017
Building 21 Room 183A – 11:00 AM
(Coffee and cookies starting at 10:30 AM)

Greg Shirah
Volumetric Visualization of 3D CO2

Abstract: The Scientific Visualization Studio (SVS) recently created several visualizations of time-varying three-dimensional global atmospheric carbon dioxide concentrations in the Earth's atmosphere. The visualizations were created in partnership with the Goddard Modeling and Assimilation Office (GMAO) using output from the Goddard Earth Observing System Model (GEOS), which includes assimilated Orbiting Carbon Observatory-2 (OCO-2) data. One of these visualizations won Science Magazine's "Data Stories" competition, and was included in the prestigious Electronic Theater at this year's ACM/SIGGRAPH conference. This talk will show these visualizations and briefly discuss how they were created.

Bio: Greg Shirah received a B. S. in computer science and mathematics from the University of Georgia and an M. S. in computer science from the George Washington University. Greg has worked at Goddard for over 30 year and has been creating scientific visualizations for over 20 of those years. He is currently the lead visualizer at NASA's Scientific Visualization Studio (SVS) where he designs and develops data-driven scientific visualizations for NASA public outreach.

IS&T Colloquium Committee Host: Keith Keller

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Information Science & Technology Colloquium Series

2017 IS&T Colloquia Lecture Series
Goddard Showcase – Part Two

Wednesday, September 13, 2017
Building 21 Room 183A – 11:15 AM
(Coffee and cookies starting at 10:30 AM)

Jacqueline Le Moigne
Autonomy for Intelligent and Collaborative Constellations

Abstract: Distributed Spacecraft Missions (DSMs) leverage multiple spacecraft to achieve one or more common goals. DSMs designed as distributed from inception can be broadly categorized as "Constellation", "Precision Formation Flying" and "Fractionated" systems. Previously, some DSM have been developed, either as several missions acquiring complementary data (e.g., EOS- Aqua and Terra, or the A-Train), sometimes described as virtual constellations, or as one mission designed as a DSM to respond to one specific scientific goal that cannot be achieved with only one spacecraft, e.g., MMS or GRACE. But none of these DSM missions have included true autonomy. In the early 2000's, the concept of Sensorwebs was developed in which space constellations added to aerial or ground sensors could acquire cooperative measurements; but it is only recently, with the convergence of such things as CubeSats/SmallSats development, component miniaturization, and the availability of diverse launch opportunities, that the notion of DSM has been revisited and new Science missions are now being developed taking full advantage of these concepts. When developing these missions, autonomy can be considered to enable "Intelligent and Collaborating Sensing" and to realize the full potential of a DSM. This talk will define what is exactly "intelligent and collaborative sensing", when it makes sense to include true autonomy in a mission, and which onboard technologies are necessary to enable autonomous DSM.

Bio: Jacqueline Le Moigne is the Assistant Chief for Technology in the Software Engineering Division at NASA Goddard, also working with the NASA Space Technology Mission Directorate (STMD) Space Technology Research Grants (STRG) program. From 2010 to 2016, she was involved in the development of the Space Technology Roadmap, Technology Area-11 (TA-11) "Modeling, Simulation, Information Technology and Processing". From 2009 to 2012, she was Goddard Center Associate for the Earth Science Technology Office (ESTO) Advanced Information Systems Technology (AIST) Program. Dr. Le Moigne has published over 130 journal, conference publications and book chapter articles, including more than 20 journal papers; she is the first author of an edited book on "Image Registration for Remote Sensing", published by Cambridge University Press in 2011. Her research interests include image registration and data fusion, especially utilizing wavelets, as well as high-performance and on-board processing; currently, she is the PI of several projects aimed at developing systems architectures and trade space analysis tools for Distributed Spacecraft Missions (DSM) and leads the Goddard DSM Initiative. She is a Goddard Senior Fellow and an IEEE Senior Member; she has been a Program Evaluator for the Accreditation Board in Engineering and Technology (ABET), and a NATO Science for Peace and Security Committee Panel Member. In 2012, she received the NASA Exceptional Service Medal and the Goddard Information Science and Technology Award.

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Information Science & Technology
Colloquium Series

2017 IS&T Colloquia Lecture Series
Goddard Showcase – Part Three

Wednesday, September 13, 2017
Building 21 Room 183A – 11:30 AM
(Coffee and cookies starting at 10:30 AM)

Dan Mandl
Bitcoin, Blockchain, and Efficient Distributed Satellite Mission Management

Abstract: Bitcoin is a digital currency (also called crypto-currency) that is not backed by any country's central bank or government. Bitcoins can be traded for goods or services with vendors who accept Bitcoins as payment. Thus all transactions are conducted over a peer-to-peer network and an audit trail is maintained on a distributed block, "the blockchain" that is not centrally located but rather lives on each node in the peer-to-peer network. Encryption techniques are used to safeguard transactions. The key feature is the lowering of cost per transaction. Another innovation created by Ethereum, another crypto-currency, is the concept of the "smart contract" whereby transactions are automatically executed with conditions of execution stored in the blockchain. These same techniques can be used to increase the efficiency of how we manage our Distributed Satellite Missions (DSM) in the future, especially in light of the increasing complexity and the increasing amount of resources needed to support these missions. However, there are problems to overcome. Blockchains, as they are used in the various cyptocurrencies, such as Bitcoin, are slow and take up a lot of storage space. This is a problem for DSM whereby nodes such as cubesats have limited onboard computational resources and slow communication channels with possible large delays. This talk is an introduction to the key attractive features of blockchain technology for DSM, the problems it presents for use to support DSM, potential ways to fix the weaknesses and build this technology into a viable approach to lower our future operational costs for DSM.

Bio: Dan Mandl was the Earth Observing 1(EO-1) Mission Director until it was decommissioned recently. EO-1 was used for various technology experiments such as the onboard autonomy experiment, Autonomous Sciencecraft Experiment. He was the Principle Investigator on a few Earth Science Technology Office (ESTO) Advance Information System Technology awards which experimented with various SensorWeb experiments using EO-1, other satellites, Unmanned Aerial Systems and airplane based instruments. He was also the Ground Systems Manager and a ground systems engineer on more than ten other previous missions.

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Information Science & Technology Colloquium Series

2017 IS&T Colloquia Lecture Series
Goddard Showcase – Part Four

Wednesday, September 13, 2017
Building 21 Room 183A – 11:45 AM
(Coffee and cookies starting at 10:30 AM)

John "Hoot" Thompson
GSFC Private Cloud

Abstract: Information technology clouds have been and will continue to dominate the air space, and for good reason. With advancements in virtualization technologies and the inability of most applications to dominate physical resources, sharing resources makes logical sense. Clouds provide the opportunity to leverage centralized assets—processing and storage—as well as system administrators so that subject matter experts can focus on their core missions of science, engineering, finance, etc. Leveraging the experience of the NASA Center for Climate Simulation (NCCS) and knowledge gained building the Advanced Data Analytics Platform (ADAPT), a team at NASA Goddard Space Flight Center is building the Goddard Private Cloud (GPC). A GPC prototype is up and running in support of multiple early adopters from a variety of disciplines. The design features high-capacity storage and robust hypervisors all orchestrated by OpenStack cloud management technology. Plans are in place to take the capability into production with a true high-availability design spanning multiple buildings on the Goddard campus. This talk will provide an overview of the GPC and its capabilities.

Bio: Hoot Thompson, a University of Virginia graduate with nearly forty years of engineering experience, serves as CTO and lead systems architect for PTP, LLC, a Maryland based IT firm specializing in High Performance Computing applications. His focus over the past fifteen years has been storage and related technologies such as storage area networks (SAN) and shared file systems. As lead of the NCCS Advanced Technology group, Hoot works closely with candidate vendors assessing new hardware and software capabilities that have the potential to enhance the services delivered to the NASA science community. As an example, Hoot has spent significant time benchmarking cloud relevant technologies in particular virtualized Ethernet and InfiniBand interconnects. This work culminated with speaking engagements at the 2011 Intel Developers Forum and the 2013 Red Hat Summit as well as presentations at the annual supercomputing conference. His research was one of the catalysts that led to the development of the ADAPT virtualized environment, the data centric environment that's providing new levels of personalized capabilities to the NCCS user community.

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