Big Data Visualization for Planetary Science

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Takeaway

• Big data has many challenges
• Opportunity to leverage big data to improve user experiences and outcome
• Interactive Visualization and Analytics are critical
• Proven technologies and capabilities of those tools available today, yet data usability remains a challenge
• Path forward
  – Increase focus on data usability
  – Invest and research in these key areas
  – Work to improve and scale up data usability to meet increasing user expectations
  – Partner with industries
Outline

• Solar System Treks Project Overview
• What Big Data Challenges Treks face
• How Treks Address Big Data Challenges
• Treks Features
• Demo / Discussion
Solar System Treks Project Overview

- Sponsored by SMD and HEOMD, Mission (e.g., Cassini)
- Development and operations at JPL
- An element of NASA’s Solar System Exploration Research Virtual Institute (SSERVI)
- A family of web based interactive portals for mission planning, scientific research and public outreach
  - Visualization and Analysis tools
  - Data products from many past and current missions
- Data Access APIs
  - A variety of user interfaces (e.g., virtual reality goggles)
  - A variety of external platforms (e.g., Eyes on Solar System, planetariums)
Operational Treks

• Mars Trek
  https://marstrek.jpl.nasa.gov

• Moon Trek
  https://moontrek.jpl.nasa.gov

• Vesta Trek
  https://vestatrek.jpl.nasa.gov
Treks In Work

- Titan Trek
- Icy Moons Trek
- Phobos Trek
- Ceres Trek
- Comet CG Trek
What Big Data Challenges Treks face

- **Ever increasing (Velocity) Data Volume**
  - Over 3000 data products and > 8 TB data

- **Usability of large volume and Variety of data**
  - Discovery (browse, search)
  - Provenance, Quality (**Veracity**)
  - Download
  - Sharing, Collaboration
  - **Value** Transformation of Archive Data for Visualization and Analysis
How Treks Address Big Data Challenges

• Architecture (Data and System)
  – Scalability
  – Extensibility
  – Reusability
  – Standardization / Interoperability
  – FAIR (Findable, Accessible, Interoperable, Reusable)

• Approach
  – Common Service Oriented Infrastructure
  – Data Science framework (Visualization and Analysis)
  – Open Source Big Data Technologies (e.g., Cloud computing, Hadoop, No SQL, Deep Learning)

• Applicable to other domains
  – E.g., Earth Science (Hydrology: Water Trek)
Treks Features

• Data products browse, search & download
  Analysis tools
  • Lighting, Measurement, Profile, Sun angle, Slope,
    Rock/Crater Detection, Hazard, Surface Potential,
    Subset, Path
• Visualization
  • Overlay
  • 3D Flyover
  • Landing Site features
• Collaboration (sharing)
• 3D print
• Data
  • Past/current missions and various instruments
  • Various types of data products
• Users
  • Missions, Lunar scientists, Teachers/Students,
    General Public
Variety of User Experiences

- Virtual Reality Client
- Web
  - REST API
- HyperWall
- Touch Table

Serving data to Morrison and Hayden planetariums
Thank You!

Questions?
Lighting Analysis
Lighting Analysis
Lighting Analysis
Slope Tool

Bounding Box:
- Top: 42.6289
- Left: -11.5748
- Right: 10.9404
- Bottom: -43.3870

DEM: LRO LROC DEM, Tycho Crater

Email* Enter your email to get the result

Submit Cancel
Slope Tool
Crater Detection