Mapping Planetary Terrains

College of Science Middle School 2024 Summer Teacher Workshop

1. Nature of the need
    a. The concept of remote sensing in this context
    b. What are the primary goals for mapping heretofore unknown terrains?
    c. In what possible applications could these techniques be useful?

2. Our lesson approach
    a. Create a scenario and need to know
    b. Student created planetary surface
    c. Student teams
    d. Assigned roles and responsibilities

3. Essential apparatus
    a. The Vernier GDX wireless motion detector
    b. Meter stick and distance gauge
    c. Vernier Graphical Analysis

4. Setting up
    a. Scaling the area
    b. Creating features
    c. Buffer margins
    d. Floor material
    e. Meter stick, sensor, string and weight

5. Operational techniques – How do we do it?
    a. Control variables – optimizing the outcome - accuracy of the map
        i. Distance above floor
        ii. Tick rate
        iii. Speed across terrain
        iv. Width of the path/overlap
        v. Angle of view for the GDX MD (15 degrees)
        vi. Feature dimensions

Operational techniques and data collection (continued)

b. Techniques
    i. Steady speed
    ii. Maintain constant distance
    iii. Tape ticks at the margins
    iv. Managing the unexpected
    v. Team focus

6. Let's look at some data
    a. Export CSV from Graphical Analysis
    b. Open in Excel
    c. Delete speed and acceleration columns
    d. Create "subtracted" columns
    e. Create surface plot (distance vs time)
    f. Interpreting height and time
    g. Artifacts and anomalies

7. Classroom in action
    a. Colombia photos and video, Excel data and images
    b. Single set-up versus individual teams
    c. Competitive strategies
    d. Time allotment

8. Physics and Astronomy Outreach
    a. Saturday Morning Astrophysics at Purdue (SMAP)
    https://bit.ly/SMAPPurdue
    b. Teachers for SMAP (lessons and resources)
    https://bit.ly/SMAPTeachers
    c. SMAP YouTube
    https://bit.ly/SMAPYouTubeHome
    d. Physics Inside Out (Summer grade 7/8 student workshop)
    https://bit.ly/PhysicsInsideOut