

SAMPEX Spacecraft Modeling and Orbit Simulation

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- October 1997, NASA charged Bowie State University Satellite Operation Control Center (BSOCC) with control and maintenance of SAMPEX spacecraft.
- Jan 2004, BSOCC received WIRE missions.



BSOCC History

- SAMPEX

- launched on a Scout rocket on July 3, 1992
- Solar Anomalous and Magnetospheric Particle Explorer
- gathers scientific data in the fields of space plasma physics, solar physics and atmospheric physics
- detects solar energy particles, precipitating energetic electros, anomalous cosmic rays and galactic cosmic rays throughout a solar cycle

About the Spacecraft

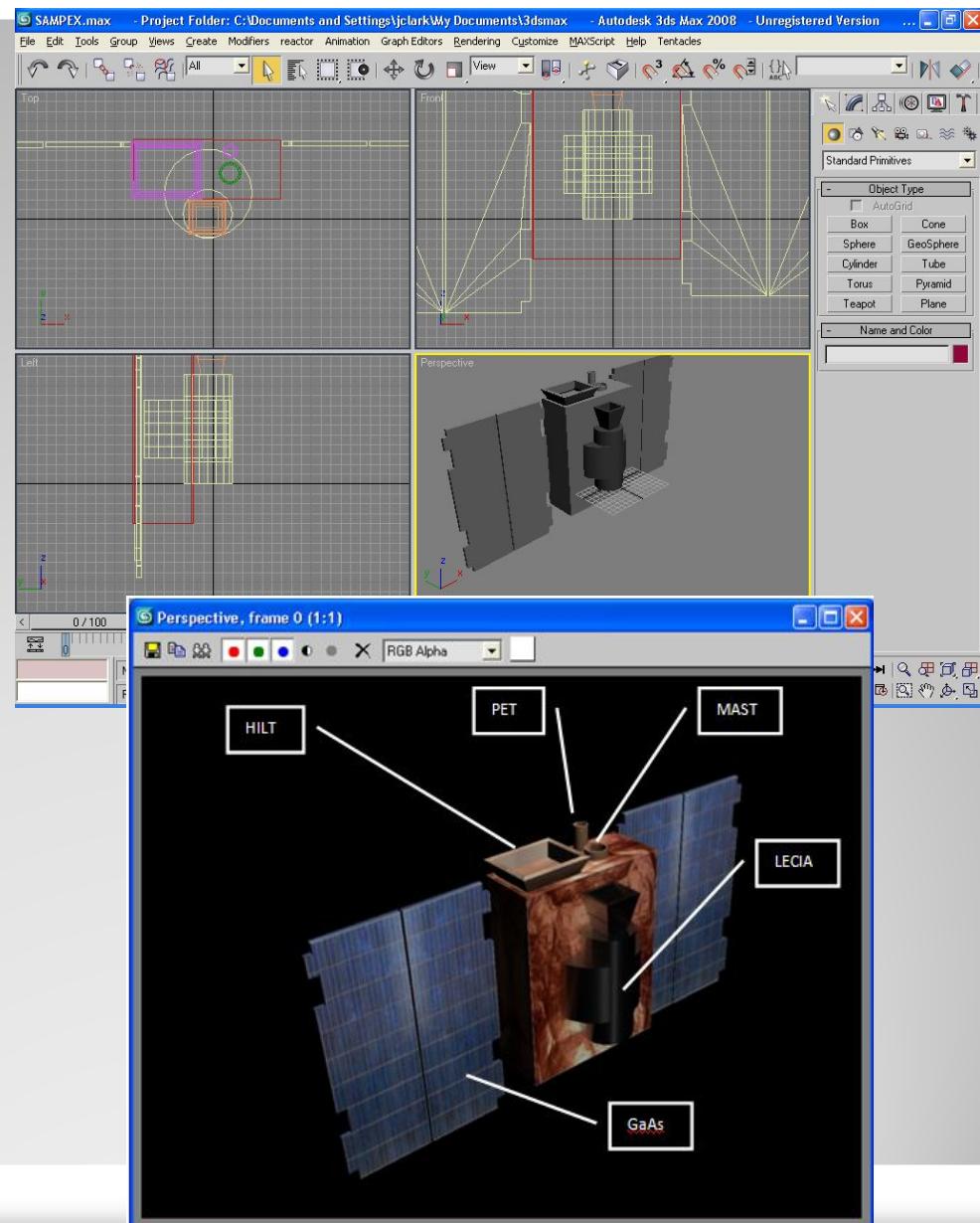
- 4 instruments & Solar Panels
 - MAST (Mass Spectrometer Telescope)
 - PET (Proton/Electron Telescope)
 - HILT (Heavy Ion Large Area Proportional Counter Telescope)
 - LECIA (Low Energy Ion Composition Analyzer)
 - and GaAs Solar Array panels.

SAMPEX

- To create a realistic model of this spacecraft and its orbit for use by the BSOCC team during informational sessions with visitors in order to give an idea of what the satellite does during its space flight.
- The environment includes outer space, satellite, earth and moon.
- Later a solar system model was added to the project

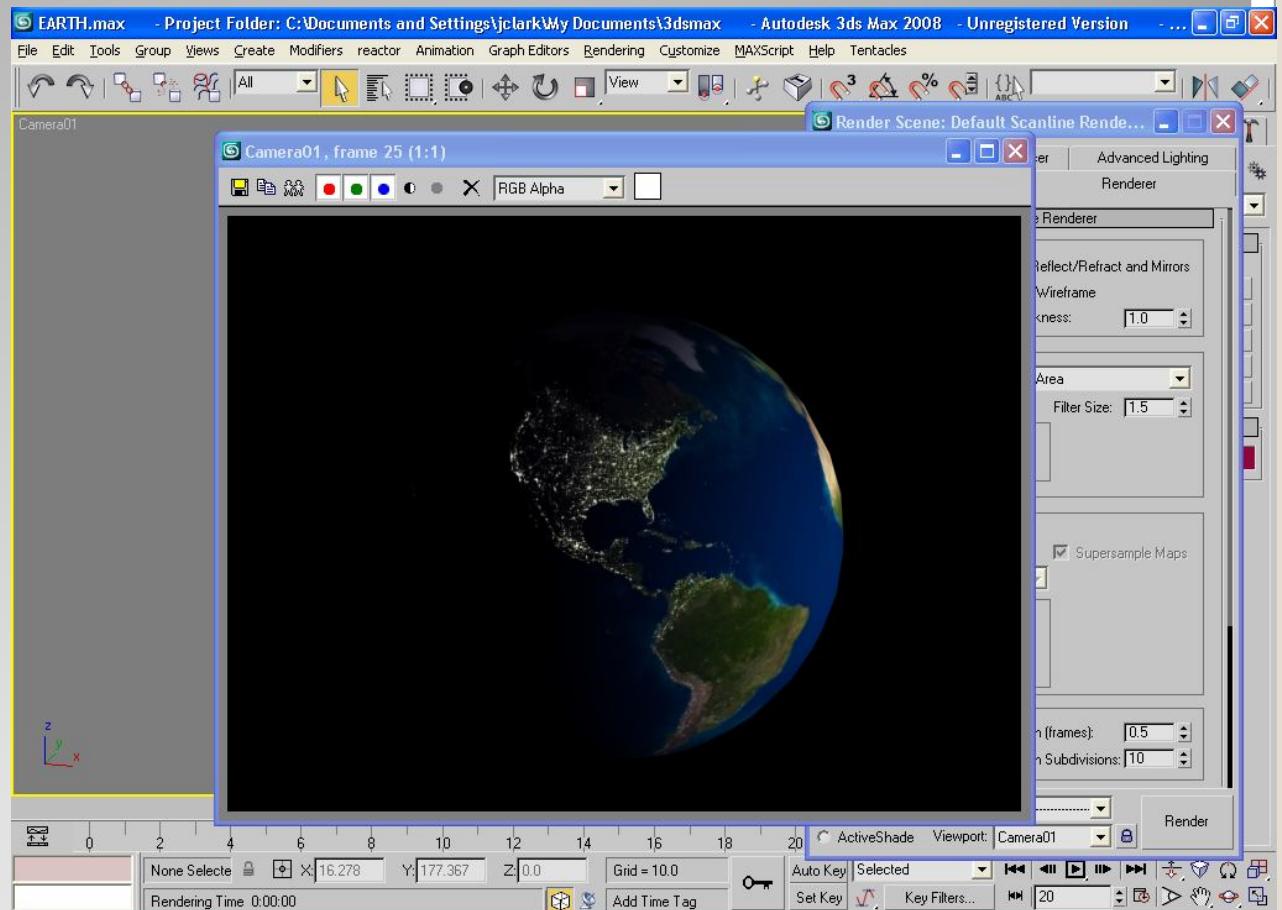
Goals & Objectives

- 3DS Max



Modeling

• 3DS Max



EARTH

• VRML

earth.wrl - VrmlPad

File Edit View Debug Tools Help

Scene Tree

- Background
- PointLight Omni01
- Group ButtonGroup
- NavigationInfo
- Transform Sphere01
- OrientationInterpolator OI
- TimeSensor TIME
- TimeSensor TIME3
- Transform SAMPEX
- Script SCRIPT2
- OrientationInterpolator OI2
- NavigationInfo
- TimeSensor TIME2
- Transform SPHERE
- Script SCRIPT
- Viewpoint
- Viewpoint
- Viewpoint
- Viewpoint

File Edit View Favorites Tools Help

H:\Jaye Clark\VR Project\earth.wrl - Windows Internet Explorer

File Ed View Favorites Tools Help

Star H:\Jaye Clark\VR Project... Bowie's Satellite Operations ... chrome sheet - Google Imag...

earth.wrl / solar.WRL / earth.wrl / SAMPEX.WRL

```
}
-----SAMPEX Orbit-----
DEF SCRIPT2 Script {
  eventIn SFFloat set_fraction
  eventOut SFVec3f translation_changed
  field SFVec3f translation 0 0 0

  url "vrmlscript";
  function set_fraction(time){
    t = time * 2 * Math.PI; // time is the time fraction from the time sensor
                           // here it is converted to radians
                           // ranges from 0 to 2Pi.
    translation.x = 2000 * Math.sin(t);
    translation.y = 2000 * Math.cos(t);
    translation_changed = translation;
  }
}

ROUTE TIME3.fraction_changed TO SCRIPT2.set_fraction
ROUTE SCRIPT2.translation_changed TO SAMPEX.set_translation

-----SAMPEX rotation-----

DEF OI2 OrientationInterpolator {
  key [0., 25 .5, 75, 1.0]
  keyValue [
    0 0 1 0.00, 0 0 1 1.57
    0 0 1 3.14, 0 0 1 4.71
    0 0 1 0.00
  ]
}

# DEF TIME5 TimeSensor {
#   loop TRUE
#   cycleInterval 5
# }

ROUTE TIME3.fraction_changed TO OI2.set_fraction
ROUTE OI2.value_changed TO SAMPEX.set_rotation
# moon orbit
NavigationInfo { headlight FALSE }
DEF TIME2 TimeSensor {
  loop TRUE
  cycleInterval 40
}
```

Ready

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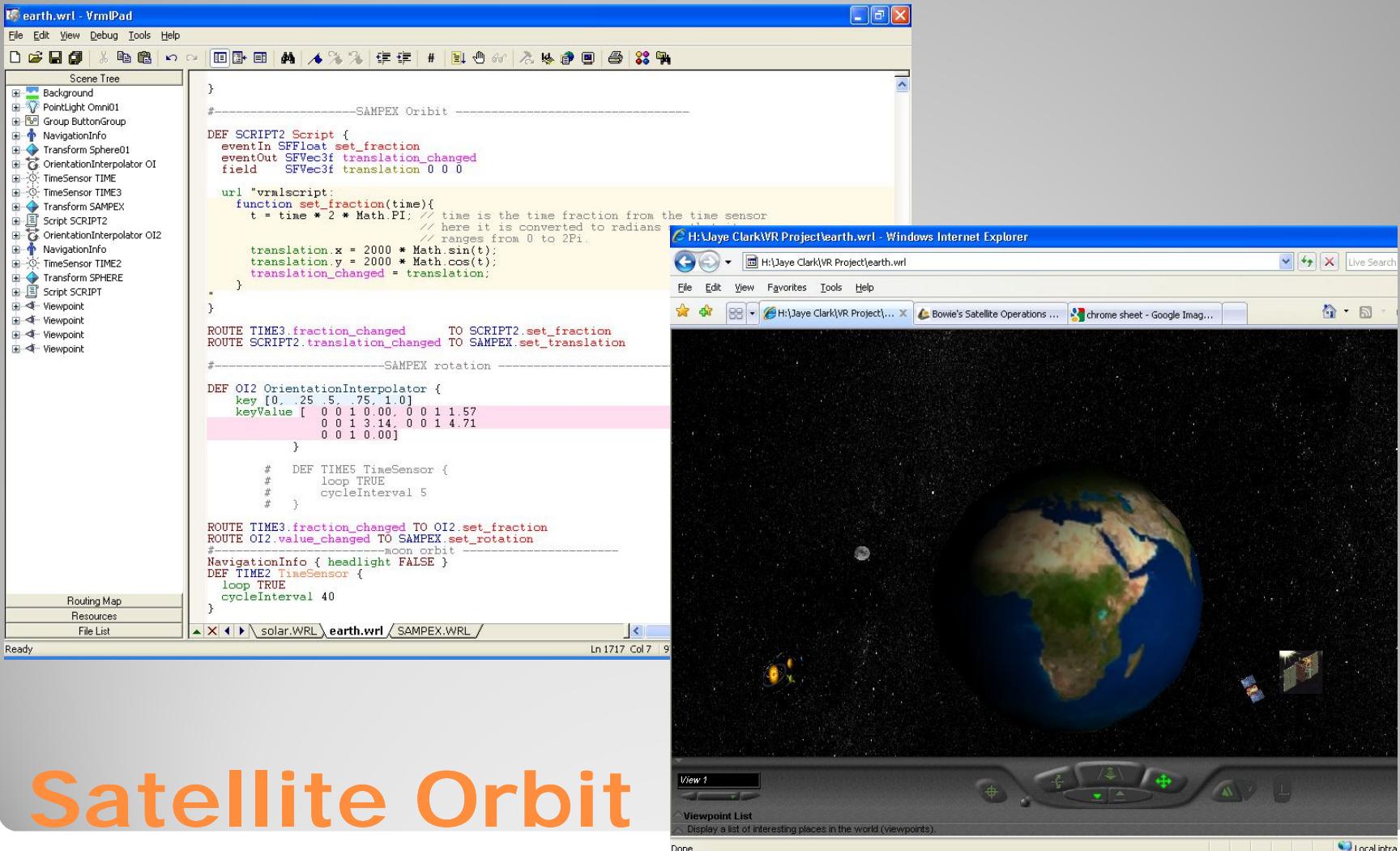
View 1

Viewpoint List

Display a list of interesting places in the world (viewpoints).

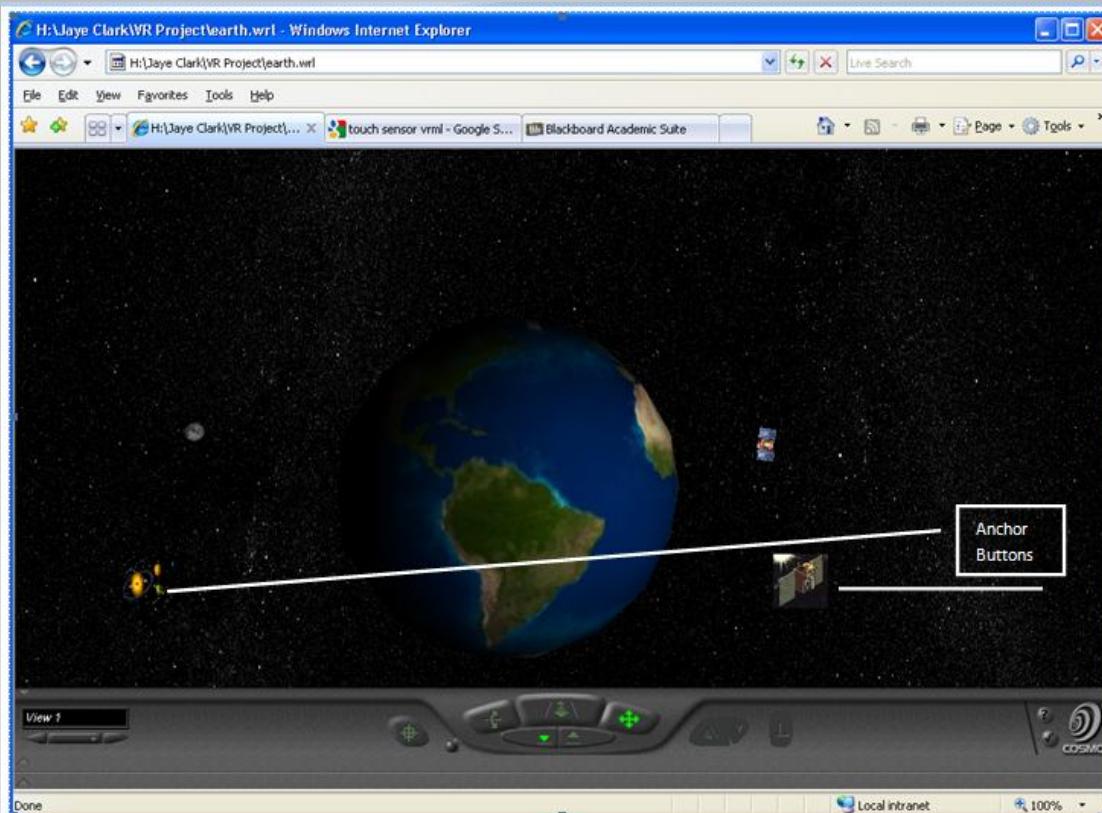
Done

Local intr



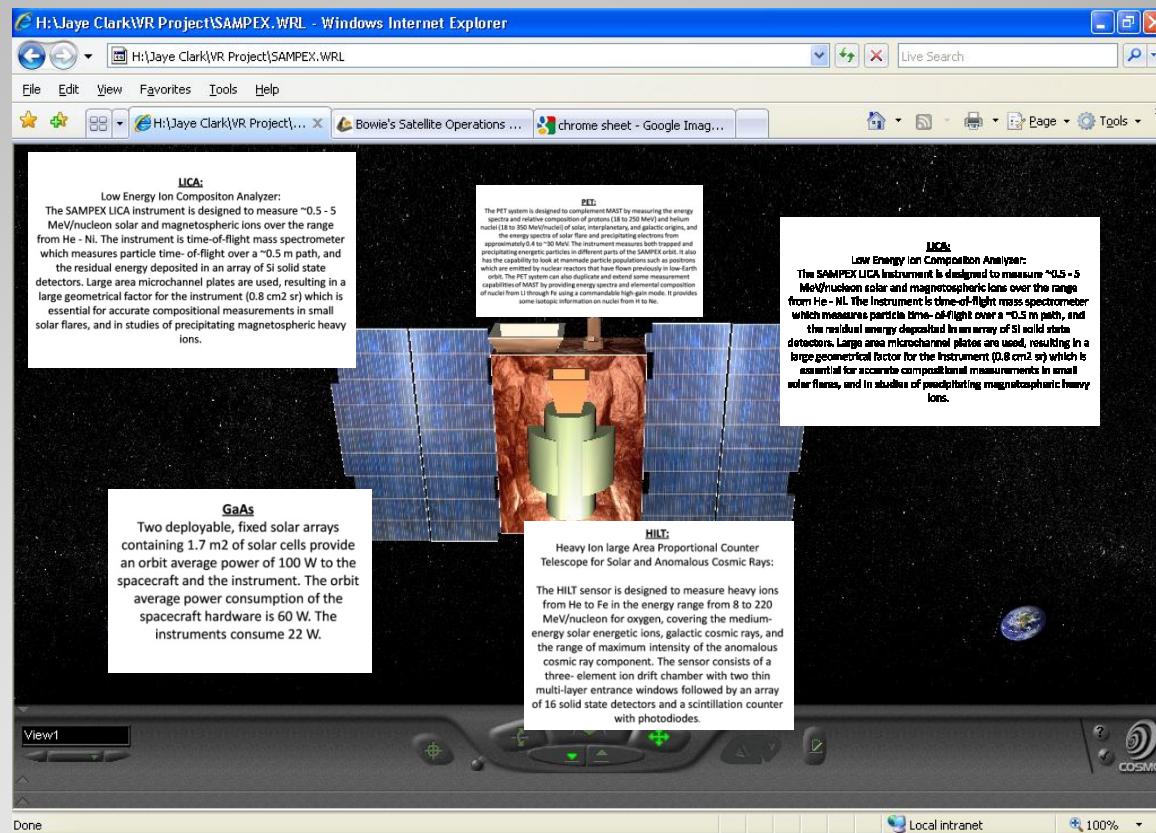
Satellite Orbit

- Link the full world file to the Satellite file and the solar orbit simulation



Anchor Nodes

• Touch Sensors



SAMPEX

- Problems included
 - Loss of data and features in transitioning from 3DS Max to VRML
 - Time consumption for modeling satellite and coding environment in VRML
 - Learning to create elements on the fly
- Recommendations
 - Completing animations for ground station transfers

Problems & Recommendation

- Special thanks...
 - Harish Vadali
 - Patrick Asata
 - Oluseye Fadiran
 - Todd Watson & BSOCC
 - Dr. Sharad Sharma

Any Questions?