Fountains of Paradise

Mobile Earth Base Design for the Space Elevator

Robotic Architectural Environments: Winter 2009

Department of Architecture
California State Polytechnic University
Units: 3.0: Lecture / Location: MWF 2-6pm, IDC
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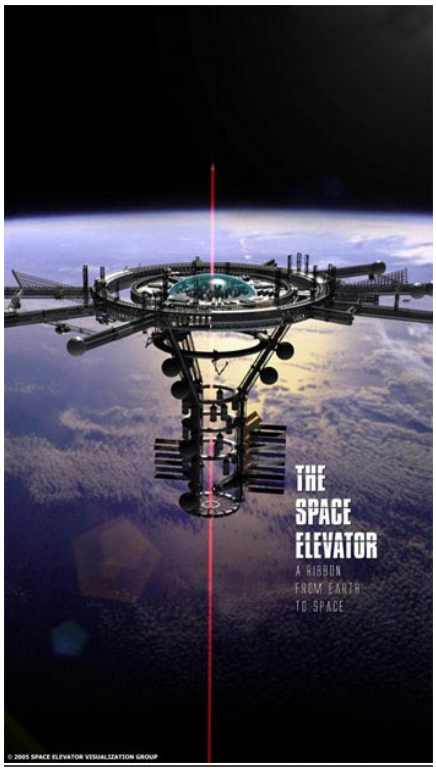
http://www.robotecture.com/spaceelevatorbase



Artist Pat Rawling's concept of a space elevator viewed from the geostationary transfer station looking down along the length of the elevator toward Earth based on work from the Institute for Scientific Research and NASA

COURSE OUTLINE

The focus of this design studio is to allow architecture students to make contributions to the conceptual design for an Earth base of the Space Elevator. A space elevator is essentially a long cable extending from our planet's surface into space with its center of mass at geostationary Earth orbit (GEO), 35,786 km in altitude. Electromagnetic vehicles traveling along the cable could serve as a mass transportation system for moving people, payloads, and power between Earth and space.

The Space Elevator is a very real proposal which has already seen quite a bit of development from an engineering standpoint in terms of the cable design and propulsion requirements. The project has however seen little development from an architectural standpoint in terms how to build the base for the elevator, how to design it and where to set up the operation. The designs in this studio will primarily focus on a base tower approximately 50 m tall with the cable(s) tethered to the top. The tower will also be supported by numerous support structures including research labs, housing, infrastructural and tourist facilities. The base will be a mobile seagoing anchor station would incidentally act as a deep-water seaport. The mobility of such a base will have the advantage of being able to maneuver to avoid high winds, storms, and space debris.

An equatorial location is ideal for a tower of such enormous height because the area is practically devoid of hurricanes and tornadoes and most importantly, because it aligns properly with geostationary orbits. To keep the outer end of the cable structure from tumbling to Earth, it would be attached to a large counterbalance mass beyond geostationary orbit. Each design will propose and develop a counterweight strategy.

On an architectural level, designs will explore and demonstrate efficient planning issues that include the development of transportation, utility and facility infrastructures to support space construction and industrial development from Earth out to geostationary orbit (GEO). The high cost of constructing a space elevator can only be justified by high usage, by passengers and payload, tourists and space dwellers. Students will work in teams of two to produce complete building designs including the detailed development and construction concept for the base. Students will develop scaled prototypes of the system that can successfully demonstrate the robotic aspects of the project that will be integrated into the designs to optimize the performative aspects of the designs in terms of energy, mobility and robustness. Physical models will demonstrate actual robotics, structure and materials.

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