Finding Voice in the Vacuum:

Technology Design Principles for the Extreme, Complex Environments of Space

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The Context

Today, national space agencies and private space companies anticipate a near future of space exploration, asteroid mining, and human settlement in cislunar space and on other celestial bodies. In contrast to past eras of space activity, this future will be steered substantially by the prerogatives of private space companies, in addition to those of national governments and their space agencies.

The Questions

What might life be like for human beings living and working in an environment in which the essentials of life will be produced through capital-intensive, algorithmically- and robotically-mediated industrial processes undertaken by private actors? What prospects are there for democratic self-government under such conditions? And how might those prospects be enhanced through the design legal and economic management systems?

The Challenges

The space environment is lethal, vast, and abundant with materials that can be processed as inputs to survival, transportation, and economic activity—but only with specialized technologies. Sound will be heard via microphones and speakers (and will thus be subject to always-on recording); air pressure and content will be monitored and adjusted by artificially intelligent agents (which will monitor and steer human activity, attention, and emotional states); radiation will be managed by routines, structures, and garments that will insulate humans from their external environments—by controlling their movements.

When the foregoing environmental features are combined with mediating technologies designed to maximize private profits, authoritarian social relations would appear to be the likeliest arrangement. It is difficult for a free society of equals to take root in a context in which surveillance is total, government does not need to consider the preferences of non-shareholders, and, due to the hostility of the space environment, noncompliance with authorities is lethal.

Original Research in Design, Law, and Economics

How might we imagine alternative patterns of social relations while acknowledging the biophysical realities of space environments and the types of the technologies necessary for human life within them? This paper frames the structural features that will shape future space societies and economies, and uses the social technology of law and the methods of design to explore possibilities for democratic intervention. By unbundling the ownership and management features of property rights, we can begin to imagine alternative management architectures that support relational equality among spacefaring humans.

Related Fields

Space law; system design; space system engineering; political philosophy; common-pool resource management