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Strategies for Rapid Implementation of Interstellar Missions: Precursors and Beyond (4)

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THE EXOPLANETS AS TARGETS FOR FUTURE INTERSTELLAR MISSIONS

Abstract

The discovery of exoplanets has made interstellar space mission much more interesting than they were in the past. However, there are doubts that such missions will ever become feasible and, in case they will be, it is impossible to forecast a timeframe for them. Often the difficulties linked with interstellar missions are considered as related with the energy required for reaching the target star system within a reasonable timeframe. While this may well be a showstopper, it is not the only problem to be solved to make them possible. Two other issues are those linked with the probe's autonomy and the telecommunications required to transmit large quantities of information at those distances. Missions to the exoplanets may be subdivided in the following categories:

- 1) robotic missions to the destination system, including flybys;
- 2) robotic missions including landing on an exoplanet;
- 3) robotic sample return missions;
- 4) human missions.

Missions of type 1 are problematic for propulsion, while autonomy and telecommunication problems are more or less manageable with predictable technologies. Missions of type 2 are more demanding for what propulsion is concerned, but above all require a much larger artificial intelligence and will generate large amounts of data, whose transmission to Earth may become a problem. Missions of type 3 are at least twice as demanding than those of type 2 for propulsion, and are much more demanding from the viewpoint of autonomy. They may be simpler from the viewpoint of communications. Finally, missions of type 4 are often regarded as belonging to the science fiction domain more than to that of feasible realities. However, they might be the only possibility if the progress in the field of robotics and artificial intelligence will fall short from making it possible to proceed with robotic missions. We can assess that, short of unpredictable technological breakthroughs, missions to the exoplanets are still far away in the future and educated guesses can set them centuries away from now. What can be done is to identify critical technologies and assess a roadmap to increase their technological readiness. This effort is really worthwhile, since aiming at a very difficult task like interstellar missions, will yield a positive fallout on space exploration in general.