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

Author: Prof. Giancarlo Genta  
Politecnico di Torino, Italy

INTERSTELLAR EXPLORATION: FROM SCIENCE FICTION TO ACTUAL TECHNOLOGY

**Abstract**

The exploration of the solar system has already started: robotic probes reached all the planets and many minor bodies, and the plans to land humans on Mars are being developed. The technology for even the most advanced missions in the solar system doesn't need advances in basic science. Traveling through the solar system can be described through what is called 'hard science fiction,' i.e. science fiction strictly based on scientific knowledge. Interstellar exploration is completely different. Robotic flyby missions to the nearest stars using nanoprobes can be performed using technologies based on known science, while anything beyond this requires advances which we don't know how to implement, but even we are not sure whether they are possible at all. Here the point is not only the technological aspects but even the scientific bases on which the relevant technologies may rest. The missions requiring less scientific-technological advances, are slow missions, like space arks (generation ships) or missions based on hibernation with travel times up to hundred years. To implement both, the uncertainties are more related to the advances in space medicine and biology than in propulsion and physics. The fastest travels allowed by the current interpretations of the relativity theory are relativistic missions in which the time contraction at speeds closing the speed of light is exploited to decrease the travel time for the astronauts, although the travel time seen by those who remain on Earth is close, in years, to the distance travelled expressed in light years. However, the energy required for this type of travel is large and grows drastically with the increase of time contraction. FTL travel, which seems to be possible following some interpretations of relativity involving either wormholes or warp drive, requires substantial advances in fundamental physics. A symptom of this is that the novels dealing with interstellar travels belong more to the space opera than to the hard science fiction subgenres, not following strictly scientific credibility. No novels of this kind explain in some detail how the relevant machinery works, and even less scientifically realistic are the movies and TV series of this kind. Moreover, to achieve a travel time allowing to reach distant star systems in reasonable times using warp drives, the authors of Star Trek had to resort to the Warp Factor which is essentially an exponential scale. This makes the requirements for FTL travel even more difficult to achieve.