Neural Network Based Satellite Tracking For Deep Space Applications

Farid Amoozegar, Charles Ruggier

Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, California, 91109
Farid.Amoozegar@jpl.nasa.gov
(818) 354-7428

The number of simultaneous missions for deep space applications increases rapidly, and the frequency of operation also moves to higher ranges, such as Ka-band. At such frequencies, weather plays an important role in maximum data return from the spacecraft down to earth stations. While at lower frequencies, e.g., X-band, conventional Conscan, or Monopulse tracking are used without much complexity, however, tracking a deep space satellite for high percentage weather availability resembles tracking a maneuvering target with many other operational complexities imposed by weather scenarios. Modeling the statistical effect of weather and prediction of fade depth of the received signal is a challenging task, particularly with lack of sufficient long-term data for such applications. This is partly because the fading of signal due to weather, and the low transition density of the bit stream due to particular images transmitted from the spacecraft, and occasional maneuvers of the spacecraft are hard to separate, particularly if they occur in close proximity. The objective of this paper is to provide a survey of neural network trends as applied to tracking deep space satellites under various weather conditions, and the trade off between communication and tracking for deep space satellites at Ka-band frequencies.

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Brief Biography of the principal author: Farid Amoozegar received his Ph.D. degree in Electrical Engineering with minor in optics and applied math from University of Arizona, in 1994. He served as a lecturer at the University of Arizona for two years and joined Hughes Aircraft in 1996. He is with Jet Propulsion Laboratory since 10/02 in Communications System and Research section. His areas of interest are wireless communications, multi-target tracking, and free space laser communications. His current project is Optical Deep Space Network architecture study.