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## OPTIMAL PATH PLANNING OF SPACECRAFT USING A DOUBLE DEEP NEURAL NETWORK

**Abstract**

This paper aimed to utilize a double deep neural network to achieve optimal path planning for a spacecraft during a landing mission on an asteroid. A minimum energy-consumption mission is evaluated in which a double DNN is utilized to predict the optimal path in case of any failures or unforeseen alterations. The paper uses a nested network comprising two DNNs and employs a polyhedral model, which is renowned as the most precise method for modelling the irregular shapes of asteroids. The first DNN is developed to handle the high computation load of the gravitational field of polyhedral models. The second DNN referred to as the main network, is utilized for path planning and incorporates data calculated by the internal network into lander dynamics equations. Moreover, this study indicates that the prediction errors of final locations are less than 1 kilometre, as the training errors of networks are deemed entirely satisfactory.