Planetary Transfer Calculator

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The Planetary Transfer Calculator (PTC) is a tool to calculate and visualise transfers between planets, moons, and stars. The coding system uses a complex combination of mathematical algorithms to calculate optimised, real, and valid trajectories for planetary transfers. It displays the results of these transfers in full-scale simulations; demonstrating realistic applied mathematics so users can visually grasp the physics and mathematics behind the transfer. This is all achieved client-side in a webpage available on any computer or tablet. Space is becoming increasingly democratised - with private companies, universities, and schools getting involved. Tools are needed that give people without government resources access to the real numbers and calculations involved in interplanetary travel, while also providing a digestible grasp of the orbital mechanics. This is the first such tool within a web browser. The system uses Gauss's Solution to Lambert's Problem to evaluate individual ballistic transfer windows; and then uses techniques such as linear convergence, to determine p-values, and a coarse-grained then fine-grained search to improve calculation times by 98.5% from the unmodified original implementation. One of the challenges of putting the PTC on a website was achieving the algorithm optimisation required for the system to run at an usable speed. Iterative waves of improvement have reduced calculation times from minutes to seconds. The results are displayed in a detailed simulation of the Solar System or in a complete VR environment that truly gives an understanding of the scale of the Solar System and the complexity of the underlying applied mathematics.

Awards Won:

Fourth Award of $500

National Aeronautics and Space Administration: Honorable Mention