Universal Timekeeping in Space: Moving Beyond Earth as the Reference

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ABSTRACT

Establishing a timekeeping solution for the Moon marks a pivotal moment for humanity. In general, timekeeping across space presents unique challenges, as current theories focus on Earth-based observers rather than accommodating multiple observers spread across space and time. Due to spacetime effects, time dilations complicate clock synchronization for distant observers. The White House's goal for time on the Moon, stated in April of 2024, is to ensure traceability, accuracy, resilience, and scalability for space-timekeeping. Current proposals for Moon time fall short, relying on an unscalable geo-centric approach aimed at accommodating relativity and achieving real-time synchronization using a grid of clocks synchronized to a single point on Earth. Vartis Space offers a simplified solution with only two clocks, one on Earth and the other on the Moon. This is made possible by revolutionizing the tools for modeling space and time. The approach combined an in-depth study of ancient timekeeping systems with modern advancements in the theory of relationalism as well as established principles in set theory, computer theory, dimensional analytics, and signal processing. These emerging tools pave the way to achieve current goals for Coordinated Lunar Time (LTC) and introduces the first step towards a universal calendar system that begins by linking Earth s Coordinated Universal Time (UTC) with LTC. The tools are also proposed to incrementally achieve similar results across wider spans of space, enabling precise synchronization processes for independent multi-celestial clocks throughout the galaxy.