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ETERNAL MEMORY: LONG-DURATION STORAGE CONCEPTS FOR SPACE

Abstract

This paper explores the rationales for an eternal memory concept for space. The paper also develops three eternal memory concepts for space. Eternal memory is information encoded in some medium and capable of surviving in storage for a very long time. Historical development drivers for data storage are storage density and processing speed, while longevity of data has been limited to decades. Recent advances in storage technologies, such as optical storage and DNA storage, allow data storage for timescales of millions to billions of years. Eternal memory concepts for space are of interest to initiatives such as Lunar Mission One, the Long Now Foundation and the Human Document Project. The recent technological advances and the focused initiative of these projects produces a gap for the development of eternal memory concepts for space. This paper uses product development methodology to develop three eternal memory concepts for space. The study first identifies potential stakeholders, such as Lunar Mission One, the Long Now Foundation and the Human Document Project, and categorizes stakeholders by motivation. Stakeholder needs are interpreted from statements of motivation. Stakeholders want an eternal memory concept to encourage global public engagement, to move humanity toward becoming a dual-planet species, to embrace and constrain the information age, and to allow storage of information for a very long time. These needs are arranged hierarchically for each stakeholder and the most prevalent needs are selected. Metrics are then assigned to each need. A suggested storage technology and storage location are recommended for each case study. Each storage concept attempts to add value to stakeholders, addressing financial, scientific, technological, and sociocultural needs.