abstract

Space systems such as communication satellites, earth observation satellites and telescope require accurate pointing to observe fixed targets over prolonged time. These systems typically use reaction wheels to slew the spacecraft and gimballing systems containing motors to achieve precise pointing. Motor based actuators have limited life as they contain moving parts that require lubrication in space. Alternate methods have utilized piezoelectric actuators. This paper presents Shape memory alloys (SMA) actuators for control of a deployable antenna placed on a satellite. The SMAs are operated as a series of distributed linear actuators. These distributed linear actuators are not prone to single point failures and although each individual actuator is imprecise due to hysteresis and temperature variation, the system as a whole achieves reliable results. The SMAs can be programmed to perform a series of periodic motion and operate as a mechanical guidance system that is not prone to damage from radiation or space weather. Our efforts are focused on developing a system that can achieve 1 degree pointing accuracy at first, with an ultimate goal of achieving a few arc seconds accuracy. We have developed bench top models of the actuator system and are working towards testing the system under vacuum. A demonstration flight of the technology is planned aboard a CubeSat.