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LUNAR ZEBRO – AN AUTONOMOUS MOON ROVER

Abstract

Lunar 'Zes Benige Robot' or Lunar Zebro (LZ) is a miniaturized micro-rover platform, currently under development at the TU Delft along with various partners across the Netherlands. LZ is uniquely designed with inspiration from Boston Dynamics RHex and is a hexapod with C-shaped leg locomotion, which allows it to navigate with minimal obstruction on the lunar surface. Weighing a mere 3Kgs, and with dimensions of 280x260x80 mm, LZ is the lightest and smallest lunar rover built in Europe. The present Lunar Zebro model is designed to survive one lunar day (14 Earth Days) and will communicate directly with the Earth via the Dwingeloo, The Netherlands.

Furthermore, LZ is capable of scaling and adapting to various scientific payloads destined for the Lunar surface, and the interfaces within are customizable, and allows for the technical integration of the payload functions with the operations of the rover. Some of the key applications involved are- making images of the lunar surface in the optical spectrum, measuring cosmic radiation to better plan future lunar missions, Moon-based radio astronomy for ultra-long wavelengths, and potential human assisted exploration of the Moon environment.

LZ is an autonomous rover, which is capable of positioning, navigating, and sensing in the less understood Lunar terrain, particularly in the absence of human-based infrastructure. This autonomous capability would enable LZ to execute semi-autonomous tasks during its limited mission lifetime. In the upcoming decade, LZ is envisioned to be part of a swarm to significantly improve the spatio-temporal performance of the applications.

In this paper we highlight the key developments, features and innovations of LZ and its various subsystems over the past years. We present the status of development, the initial results from various subsystem tests, including the analogue missions. Furthermore, we look ahead and present feasible mission plans for LZ, and the discuss the benefits of autonomy and swarming, for various applications on the Moon.