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MACHINE LEARNING MODEL FOR DETECTING THE SHADOWED AREAS ON THE MOON

Abstract

In light of the validated existence of water on the lunar surface and the discerned significance of the Lunar South Pole as the principal focus for potential water reservoirs, the imperative for exploration of the shadow areas has been notably heightened within academic research circles. However, these areas are considered some of the most challenging for humanity to explore. The shadowed regions on the moon may pose a danger to unmanned lunar vehicles, as entering them may cause a lack of energy, especially if the vehicle is powered by solar energy. This may lead to the failure of the intended mission. Additionally, it is essential to recognize that in these shadow areas, temperatures plummet significantly, potentially jeopardizing spacecraft survivability. Thus, in the event of losing contact with the vehicle, it is crucial to ensure that the control and navigation software prevents the vehicle from inadvertently entering these dark shadowed areas, mitigating the risk of lowering the power and temperature of Lunar exploration spacecrafts. Therefore, ensuring the safety and robustness of both the vehicle and the lunar mission demands meticulous consideration. This study proposes a Machine Learning (ML) model to distinguish between dark-shadowed regions and bright areas. The functional testing of the ML model was carried out using a prototype utilizing a Raspberry Pi board and a commercial camera deployed in a dark environment. The ML model was trained using the raw images that captured the dark shadowed areas. The images were then processed, and the model was trained. This system has been tested to prove its effectiveness. The system proved to be highly effective, achieving an impressive accuracy rate of more than 87