

The Erfoud dataset: a comprehensive multi-camera and Lidar data collection for planetary exploration

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Extended Abstract

The availability of large amount of representative data is key for the development of perception processes. In this paper, we will present a dataset acquired on mars-analogue terrains during the 2018 Morocco campaign carried out in the context of the InFuse project [1], along with experiments held by the Facilitators project [2], both part of the European space robotics SRC.

The dataset has been gathered with the two mobile robots Mana and Minnie (Fig. 1), Mana being equipped with a panoramic Velodyne HDL64 Lidar, and Minnie with three stereoscopic benches (one mounted on a orientable turret on top of a mast, two large field of view benches looking forward and backward), and a panoramic Velodyne HDL32 Lidar. Both robots are endowed with wheel odometry, a high-end FoG gyro, a low cost IMU, and a cm accuracy RTK GPS for pose ground truth.



Fig 1: the robots Minnie and Mana

Three sites with different geological features have been selected, on which aerial images have been collected by a SenseFly UAV and port-processed to produce a

4.5cm resolution digital elevation map (along with the associated orthoimage, Fig. 2). On each site, a series of trajectories have been recorded, from a few hundreds of meters up to km long, along which data have been gathered at speeds ranging from 0.2 to 0.5 m/s, at different times of the day. Some trajectories have been executed forward and backward, and some involve both robots following simultaneously the same route. All in all, the dataset comprises nearly 1 million of geo-referenced stereoscopic image pairs and half a million Lidar scans, collected along 20 km.

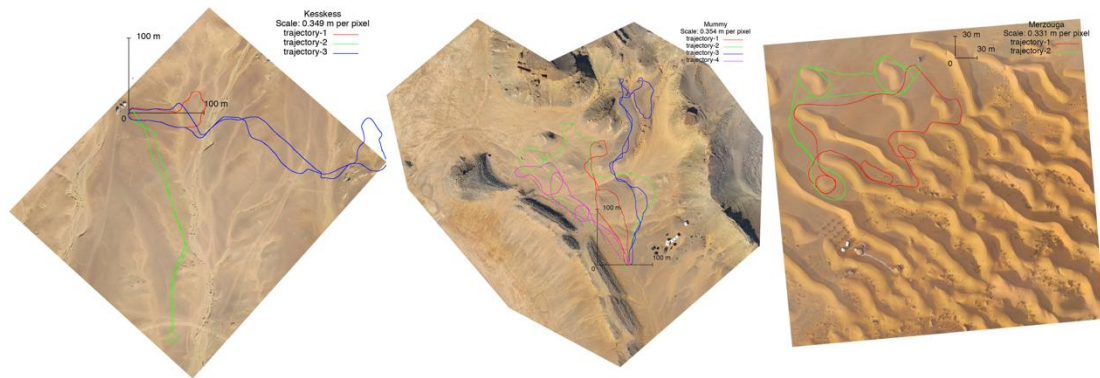


Fig. 2: Orthoimages of the three different sites on which data has been collected. The trajectories along which data has been collected by the robots are shown.

The dataset can be used to test, evaluate and validate classic perception processes involved in planetary exploration by robots (stereovision, visual-odometry, visual SLAM, terrain modeling), but also a series of processes that can hardly be run on similar datasets available so far, *e.g.* vision/Lidar fusion, Lidar SLAM, multi-robot SLAM, and absolute localization with respect to orbital data.

At the time of publication (if granted), the dataset and associated documentation will be made available, via a classic interface that allows to download data associated to a given sensor and a given trajectory, but also via an innovative SIG-oriented interface that allows to browse and download parts of the data in an intuitive and efficient way, according to requests such as “select and download *all* the data that correspond a designated area”.

References

- [1] Shashank Govindaraj, Jérémie Gancet, Mark Post, Raúl Dominguez, Fabrice Souvannavong, et al.. “InFuse: A Comprehensive Framework for Data Fusion in Space Robotics”. 14th Symposium on Advanced Space Technologies in Robotics and Automation, Jun 2017, Leiden, Netherlands, 2017
- [2] Facilitators H2020 project webpage: <https://www.h2020-facilitators.eu/>