The objective of this paper is to develop a data-driven model of laser intensities and investigate its usage for Simultaneous Localization and Mapping (SLAM) in the field of robotics. In contrast to the standard usage of laser scanners in SLAM to generate geometric models of the environment, the research work on the applications of laser intensities is rather limited. Atypical lasers scanners measure the distance to an object as well as quantify the received optical power after reflection which is termed as intensity. The most interesting and relevant aspect of intensities in context of this paper is that they are dependent on an intrinsic surface property i.e. reflectivity as well as extrinsic parameters such as the distance to the surface and angle of incidence with respect to the surface normal. This paper focuses on modeling the influence of extrinsic parameters on intensities to acquire a pose-invariant measure of surface reflectivity. This measure is used in an extension of Hector SLAM in which a robot simultaneously acquires a geometric model augmented with surface reflectivity characteristics. An extensive experimental evaluation is carried out in an indoor environment to highlight...
the advantages and characteristics of the data-driven model and the proposed Hector SLAM extension.

Stichworte:
—SLAM, Mapping, Laser intensities, Surface reflectivity, Hector SLAM

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