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PROJECTE DE DOCTORAT INDUSTRIAL EXPEDIENT 2014 DI 081

DADES DE L'EMPRESA I DE L'ENTORN ACADÈMIC

Títol del projecte

Unified long-term 3D simultaneous localization and mapping for service robots

Empresa

PAL ROBOTICS SL

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BREU DESCRIPCIÓ DEL PROJECTE DE RECERCA

Unified 3D long-term 3D simultaneous localization and mapping for service robots.

Mobile robot navigation is considered a solved problem for indoor settings. An example of this are some of the new ubiquitous vacuum cleaners, several examples of museum tour guides, or the service robots made by the hosting company PAL Robotics. In outdoor environments, robust localization is possible in open roads and streets, as demonstrated by numerous autonomous driving initiatives conducted initially by Google, and lately by most car manufacturers. This is possible thanks to advanced sensor systems onboard vehicles (laser, differential GPS), and because navigation is constrained to the finely a priori mapped paths indicated by roads. The whole area in between these two applications remains elusive however for penetration into the market. The creation of robust, reliable, and safe mapping, localization and navigation of mobile robots in outdoor settings, especially in urban pedestrian areas still poses a tremendous challenge.

In this thesis, the student will develop at PAL Robotics, and in collaboration with the advisor herein indicated, very robust, reliable, and safe methods for mobile robot localization, mapping and navigation. The developed system should allow navigation in outdoor urban sidewalks for sustained periods of time avoiding injury to other pedestrians. The work to be developed will have as a starting point PoseSLAM, a library at the host institution for robot mapping and localization, and will be enhanced with robust odometric priors computed from IMU sensing and vision.



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State of the art computer vision and range sensing algorithms will be developed to guarantee robustness to the localization and navigation modules, to deal with large levels of occlusion, illumination variation, time of day and weather change. Pedestrian safety will always be a major concern. To avoid localization drift after sustained periods of time, the student will not only use proprioceptive robot sensors (lasers, cameras, odometry), but might also exploit available exteroceptive sensing capabilities when available (GPS, wifi or 3G signals, etc).