Hindawi Publishing Corporation
Journal of Sensors
Volume 2016, Article ID 1751205, 2 pages
http://dx.doi.org/10.1155/2016/1751205

Editorial

Robotic Perception of the Sight and Touch to Interact with Environments

Pablo Gil,[1] Youcef Mezouar,[2] Markus Vincze,[3] and Juan A. Corrales[2]

[1]*Physics, Systems Engineering and Signal Theory Department, University of Alicante, 03690 San Vicente del Raspeig, Spain*
[2]*Université Blaise Pascal, SIGMA'Clermont, Institut Pascal, 63000 Clermont-Ferrand, France*
[3]*Automation and Control Institute, Technical University Vienna, 1040 Vienna, Austria*

Correspondence should be addressed to Pablo Gil; pablo.gil@ua.es

Received 14 November 2016; Accepted 15 November 2016

The presence of robotics and its application is becoming widespread. It is a reality that in the past few years robots have been revolutionizing the manufacturing and production as indicated by the International Federation of Robotics (IFR) in World Robotics Statistics. But also, robots are being successfully used in other fields, outside industry. Therefore, service robots are conquering various areas such as the domestic environment, transport, agriculture, security, education, medical and health care, and personal or professional assistance, among others. In these contexts, the sensing techniques are essential to enable robots to perform tasks autonomously. The sensorial perception from visual/tactile sensors is vital to develop autonomous robots with abilities for specific applications. On the one hand, visual sensors are widely used in mobile robots for mapping and exploration by land, sea, or air. But also, visual sensors are useful to recognize and locate objects in an environment. On the other hand, tactile sensors provide data for intelligent manipulation of located objects and to add semantic information such as hardness, flexibility, elasticity, roughness, or shape. Consequently, both sensors working together or separately allow researchers to implement new approaches, methods, and algorithms to achieve a robust sensing of dynamic and complex environments, improving the robot's abilities for specific applications in which there is interaction between a robot and its surrounding area.

This special issue consists of eight articles on various topics about robotics perception from six countries: China, Croatia, Germany, Korea, Mexico, and Spain. The aim of this special issue is an attempt to gather and cover recent advances in robotic perception. In particular, the editors wish to explore the challenges and solutions to improve robot perception in both indoor and outdoor environments.

The location and navigation problem has traditionally been addressed for land mobile robots in indoors and more recently for robots and autonomous vehicles in outdoors. In this line of work, the paper by J. Duque et al. presents a new indoor positioning system based on the combination of data obtained from a Wi-Fi signal and RGB-D images acquired from cameras based on Time of Flight technology to estimate people location in indoor environments. The proposed system is able to detect more than one person in the same room using a nonintrusive method and low cost and easy installation technology. Besides, the paper by L. Fernández et al. presents a comparison among five known image descriptors such as SURF with Harris corner detector, HOG, DFT, Fourier signature, and gist-Gabor descriptor. The authors assess these descriptors using spherical panorama images obtained from the services of Google Street View. The goal is to use the proposed descriptors to build outdoor visual maps from Google images which are applied to both autonomous navigation and localization processes of mobile robots. The descriptors goodness to achieve that goal is measured using the relationship between precision and recall for each descriptor as well as the computational cost.

Recently, the research which proposes solutions for navigation problems has been applied to other contexts, resulting in marine robots and underwater vehicles. In this field, F. Mandic et al. propose a method for navigation by tracking an underwater target with a robot marine named BUDDY

AUV which uses data fusion between USBL measurements and sonar images in real scenarios. The proposed algorithm obtains precise and reliable underwater object tracking at steady rate, even in cases when either sonar or USBL measurements are faulty or are not available. Moreover, the paper by R. Pérez-Alcocer et al. addresses the underwater navigation problem in poor visibility conditions. The underwater image tends to be blurred and/or colour depleted. The authors have developed a visual system based on $l\alpha\beta$ space colour for detection of artificial landmarks underwater in poor visibility conditions without requiring the adjustment of parameters when marine environmental conditions are changed. This visual system has been integrated in a navigation control system. Furthermore, in the same line as these aforementioned works, A. Maldonado-Ramírez and L. A. Torres-Méndez present a method of detection and tracking of visual targets which can be relevant for ocean bed exploration. Authors have demonstrated the method's effectiveness with experiments applied to explorations of natural underwater structures like coral reefs carried out by a marine robot guided by visual features but with no human intervention.

Service robots tend to be autonomous robots with intelligence to perform behaviours in the real world. Probabilistic methods and algorithms are a growing area in the field of robotics. Accordingly, probabilistic robotics is widely used to estimate the robot pose and location as well as planning and controlling their trajectory and movements. Probabilistic robotics uses statistics and mathematical tools of artificial intelligence such as Bayes/Kalman/Particle filters as well as other Markov and Monte Carlo techniques. In this way, the paper by C. Rink et al. is focused on Monte Carlo registration methods. They present techniques for object modelling and pose estimations for further manipulation by a robot. Authors show various experiments with depth images acquired from Time-of-Flight camera and laser striper in real-time.

J.-H. Kim et al. show a detection method based on visual feature selection for autonomous firefighting robot. In that work, authors use FLIR cameras to classify fire, smoke, and both thermal reflections in indoor fire environments where there is dense smoke with bad visibility. The cameras were mounted in SAFFiR robot to extract motion information and texture features. Additionally, a Bayesian classification is carried out to probabilistically identify multiple instances of each target in real-time.

Robotic applications as intelligent manipulation often require not only sense of sight but also sense of touch. In these cases, the robots mount grippers and hands at the effector which is equipped with a tactile sensing system. Design, performance, and fabrication of tactile systems are usually based on a conductive material and/or a circuit of networked resistive sensor arrays. The wire features and the connections among electronic components cause problems such as crosstalk. J. Wu and L. Wang's paper introduces the design of a new S-NSDE-EP circuit using two wires for every driving-electrode and every sampling-electrode to reduce the crosstalk caused by the connected cables in the 2D networked resistive sensor array.

Acknowledgments

We wish to give thanks to the reviewers for their help in selecting papers for this special issue. Also, we would like to acknowledge all members of Editorial Board of Journal of Sensor for approving the publication of this special issue. Finally, the authors are grateful for both the efforts in the preparation of the manuscripts and the choice of this journal's special issue to publish their scientific and technical contributions.

Pablo Gil
Youcef Mezouar
Markus Vincze
Juan A. Corrales