Development of a general purpose tour-guide robot able to learn routes from people and to adapt and move in unstructured and crowded environments

Título Development of a general purpose tour-guide robot able to learn routes from people and to adapt and move in unstructured and crowded environments

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Abstract This doctoral thesis is part of the research projects: "intelligent and distributed control scenario for the fast and easy deployment of robots in diverse environments" (Ministry of Science and Innovation, TIN2009-07737), and â€œservice robots that learn from you and like youâ€ (Ministry of economy and competitiveness, TIN2012-32262). The main goal of the proposed thesis is to build a general-purpose guide robot which is able to learn routes from people and repeat them at any moment even in crowed and unstructured environments. To achieve this objective, it will be necessary to use and develop computer vision and artificial intelligence algorithms. The presence of robots in different events is increasing (museums, workshops, conferences ...). However, the tasks performed by the robots in these events are often limited to a set of pre-designed movements in clearly defined conditions. It would be desirable that robots could act as guides in an event without human supervision, and without the previous intervention of experts in robotics. For this reason in this thesis we want to develop a prototype of a general purpose tour-guide robot that is able to learn routes from any person and by a demonstration process, with the purpose that afterwards the robot will be able to retrieve these routes and reproduce them autonomously. It is important to remark that the research work that is necessary to carry out to achieve this general tour-guide robot involves solving many state-of-the-art challenges which go beyond the resolution of a particular task: first of all we want the robot being able to learn routes by a demonstration process, therefore the robot should be able to identify and track the person that teaches the routes, avoiding confusing this person with the rest of the people present in the same place. This will require advanced processing of visual information with dynamic selection of the most discriminative features of the person who is showcasing the route. On the other hand, in order to repeat the route, the robot will need to know its position in the environment and record all the necessary information during the demonstration process. Another aspect that we will have to address during this thesis is the visual recognition of commands that allow the human-robot interaction. This recognition will allow the human operator to stop along the route, indicate points of interest, and order the robot to record information that will be later reproduced along with the route. Finally, the robot should be able to repeat these routes at any time, taking into account that the environment may have changed, there might be positions along the robot that are not feasible any more, unstructured environments, etc. Therefore the algorithms developed within this thesis should be characterized by their robustness and real-time adaptability to the environment in which the robot operates. Like people, the robot should learn from its own experiences to adapt its future behaviour, this is the reason why as part of this theses we will also try to explore the use of algorithms that allow fast and continuous robot learning during its movement in the environment. We plan to validate our system in the DOMUS museum located in the city of A Coruña, and in demonstration processes in which many people can take part. The resolution of the challenges set out in this thesis represent a step forward towards the achievement of personal service robots able to get along with people and perform tasks that directly influence on their living.

LIGAZÓNS

Teseo

DESCARGAS

Referencia BibTex

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PROGRAMAS CIENTÍFICOS

Robots persoais