



UNIVERSITY OF TRENTO - Italy
Department of Industrial Engineering

Optimal Path Synthesis for Differential-Drive Robots with limited Field of View

Andrea Cristofaro
University of Camerino, Italy

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Department of Industrial Engineering
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Abstract

Consider a robot with unicycle kinematics equipped with a limited Field-Of-View (FOV) camera, which must keep a given feature in sight. The goal is characterizing the family of optimal paths between two assigned robot poses. Previous works on this subject have provided a complete synthesis of shortest paths for the case in which the FOV is limited in the left and right image plane directions (H-FOV). Toward the final target of obtaining the optimal paths synthesis for a realistic image plane modeled as a rectangle, the complementary case in which only upper and lower image plane direction are limited (V-FOV) is investigated. In particular, two different cost functions are considered corresponding to seeking for shortest and time-optimal paths, respectively. A finite alphabet of extremal arcs is obtained and, for the case of minimum length, it is shown that the optimal path might not exist, i.e. the infimum of the cost function might be not achieved. As a conclusion to the presentation, an overview of the complete HV-FOV synthesis problem is provided.

Biography

Dr. Andrea Cristofaro has received the M.Sc. in Mathematics from University of Rome La Sapienza (Italy) in 2005 and the PhD in Information Science and Complex Systems from University of Camerino (Italy) in 2010. Between 2010 and 2015 he has been first a post-doctoral fellow with eMotion research team, INRIA Rhone-Alpes, Grenoble (France) and then a Marie-Curie post-doctoral fellow with the Department of Engineering Cybernetics, Norwegian University of Science, Trondheim (Norway). From August 2015 to February 2016 he has been Adjunct Associate Professor with the same Department. Since March 2016 he is Assistant Professor in System and Control Theory at the Department of Mathematics, University of Camerino. His research interests include: constrained and robust control, optimal control, estimation, control allocation, autonomous vehicles, control of partial differential equations. Dr. Cristofaro is author of several scientific papers, and he is in the Editorial Board of IET Journal of Engineering and of International Journal of Control, Automation and Systems.