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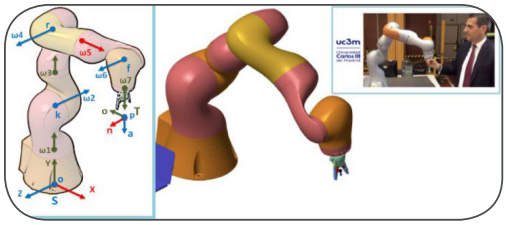
Jose M Pardos Gotor

UC3M, Spain

Screw theory for robotics - A modern mechatronics mathematical foundation

The importance of screw theory in robotics is recognized, but in practice, not many teach it to engineering students. Only few postgraduates know how to exploit it. However, in a variety of areas of robotics, the methods and formalisms based on the geometry and algebra of the screws have proven to be superior to other techniques and have led to significant advances recognized by robot researchers. Many say that kinematics for robots of many degrees of freedom (DOF) can only be addressed in a practical way with numeric algorithms. However, this approach is not very suitable for real time applications. Screw theory paves the way for solving kinematics with very compelling computational geometric algorithms truly effective and efficient, even for mechanisms and robots with many DOF. Using the product of exponentials, it is possible to develop geometric algorithms to solve the inverse kinematics problem. This method was originally presented by Paden and built on the unpublished work of Kahan. It is possible to develop additional problems to solve the inverse kinematics of different robots. For instance, the author presents some Pardos-Gotor (PG) canonical subproblems useful for solving prismatic joints. Several examples with applications to real industrial robots will be presented with MATLAB-Simulink-Simscape simulations and videos.



Recent Publications

1. J M Pardos Gotor (2018) Screw theory for robotics – an illustrated handbook. Amazon Fulfillment, ISBN: 31214278R00123.

Biography

Jose M Pardos Gotor has an extensive international career in the energy industry. He works for the Spanish utility ENDESA and has developed projects in Europe and Latin America in the fields of: Change Management, Sustainability, Electric Vehicles, Business Model Generation, Innovation, R&D, Commodity Markets & Trading, Energy Management and Power Generation. He is an Associate Professor in the Department of Systems Engineering & Automation at the UC3M (Universidad Carlos III de Madrid). His teaching and research areas are focused on production systems, industrial automation and robotics.

jpardos@ing.uc3m.es

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