Abstract

Technological advances in conjunction with changing societal attitudes suggests that autonomous vehicles are poised to soon enter mainstream applications in business, the government, and the private realm. Steering a vehicle autonomously while avoiding obstacles is critical for achieving this goal. In this context, a case study is presented of a collision avoidance system that directly integrates the kinematics of a bi-steerable car with a suitable path planning algorithm. The first step is to identify a path using the method of rapidly exploring random trees, and then a spline approximation is computed. The second step is to solve the output tracking problem by explicitly computing the left inverse of the kinematics of the system to render the Taylor series of the desired input for each polynomial section of the spline approximation. The method is demonstrated by numerical simulation.

Bio

Luis A. Duffaut Espinosa received the B.S. degree in physics from the Universidad Nacional de Ingeniería in Perú in 2003, the M.S. degree in mathematics from Pontificia Universidad Católica del Perú in 2007, and the Ph.D. degree in electrical and computer engineering from Old Dominion University in 2009. He then held postdoctoral positions at Old Dominion University and Johns Hopkins University, as well as a research associate position at the University of New South Wales in Canberra, Australia. He is also a consultant for several international organizations in the Consortium of International Agricultural Research Centers (CGIAR). He is currently an adjunct professor in the ECE Department of George Mason University. He has more than fifty publications including journal papers, conference papers and book chapters in journals such as SICON, Automatica, System & Control letters and Journal of Algebra. Among his research interests are systems, control and robotics of nonlinear systems, algebraic combinatorics, quantum control and complex systems.