CLIFFORD ALGEBRAS AND ITS APPLICATIONS TO NAVIGATION AND CONTROL

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The aim of this talk is to highlight the utility of Clifford algebras in solving various robotics problems, focusing on their application in the development of navigation algorithms for autonomous vehicles and coordinated control of robot formations.

In the first part of the presentation, the relationship between Clifford algebras and key mathematical concepts such as quaternions, dual quaternions, and displacements will be explored. Through concrete examples, it will be demonstrated how these algebras allow symbolic manipulations of these mathematical objects and how their application can contribute to problem-solving in robotics control.

A fundamental element that will be addressed is how this mathematical formalism facilitates coherent and unified manipulation of common geometric objects, such as linear spaces, spheres, and displacements, within a single framework. This coherence is essential for improving the understanding and control of mobile robots, as well as for achieving effective coordination in robot formations.

Additionally, the talk will present concrete examples of applications in mobile robotics currently being developed in our group, illustrating practically how Clifford algebras are becoming an essential tool in the evolution of modern robotics.