

The Purposeful Placement of Singularities

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Abstract: Kinematic singularities in robots are generally problematic. There are two main types of singularities. For the first type, a robot loses its ability to exert forces in a certain direction. For the second type, a robot loses its ability to move in a certain direction. Therefore it is best that singularities be avoided. This presentation takes a backward approach. Singularities are embraced, and we explore what extra functionalities might be obtained by purposefully designing singularities into the configuration space. This act of design is nonelementary. We take a computational approach, one based in root-finding. The root-finding problems posed can be huge. Therefore, we have pushed the bounds in coming up with more capable root finding algorithms. Results are packaged into visualizations suitable for design space exploration.