The Global Optimization Approach to Robot's Workspace Determination

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The workspace is the set of points the end effector or the tool can reach. The topic has been investigated thoroughly for decades, and an interested reader should be referred to [1], where its authors suggest the following classification of the workspace assessment techniques: geometrical, algebraic, and discretization. The majority of these techniques are intended to be used only for robots within the class they were developed for. For instance, the geometric techniques are quite efficient, though they can be applied to relatively simple robots. The techniques that based on discretization can be applied to a wider class of parallel robots, though they time consuming and are intended to be used in cases when the forward or the inverse kinematic problems have a simple solution.

In this work, we present a general approach suitable for any robot whose workspace can be defined as a system of inequalities. This approach is based on the non-uniform covering technique [2] that we use to solve a system of non-linear inequalities. We illustrate the efficiency of the proposed approach using a real-life example of a planar parallel robot [3].

References

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