Pumagrass
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Title: What is the Configuration Space of a
Cockroach?

Abstract

A configuration space of a system is a manifold, each of whose points
corresponds bijectively to a possible position of all of the parts of this system.
For instance, a switch can be in just one of two states, so its configuration
space is made of two points. Meanwhile, a circular crank has a configuration
space that can be represented by S^1. Now let's imagine a simple mechanism,
made of legs, joints, and anchors. Legs connect joints and anchors and they
have a fixed length. Anchors stay in a fixed position, while joints can move
freely (as far as is permitted by the legs). These simple pieces allow us to make
interesting mechanisms and ask about their configuration spaces. If a 6-legged
cockroach consists of a body (a joint) joined to 6 feet (anchors) by legs with a
knee (two legs with a joint), what is the manifold of its configuration space?
What if the cockroach has n legs? All this and more can be answered!