Henry KING (University of Maryland, ZDA)

Semiconfiguration spaces of linkages, or how to design a device which will draw a picture or sign your name

Abstract. A linkage in $\mathbf{R}^n$ is an (ideal) device made of rods, some of which are attached to each other by freely rotating joints, and some of which may have fixed ends. Linkages have been studied for a long time, for example by James Watt (18th century), Chebyshev (19th century), and Thurston (20th century). A semiconfiguration space of a linkage is the space of all possible positions of k given points on such a device. This is a semialgebraic subset of $\mathbf{R}^{nk}$, i.e., a subset defined by polynomial equalities and inequalities. I will describe the possible semiconfiguration spaces of linkages. In particular any compact semialgebraic subset of $\mathbf{R}^{nk}$ is the semiconfiguration space of some linkage. Since any compact subset of $\mathbf{R}^{nk}$ can be arbitrarily closely approximated by a semialgebraic subset, it is possible (though not practical) to design a planar linkage which will, for example, draw Picasso's Don Quixote or sign your name.