MULTI-AGENT MANIPULATOR CONTROL AND MOVING OBSTACLE AVOIDANCE

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Abstract A novel approach to planar serial manipulator motion and reactive moving obstacle avoidance, based on a multi-agent architecture, is presented. A conceptual model of the manipulator is considered, that mimics the motion of a chain of potentially expandable rods, interconnected at their endpoints using pins. Rods and pins are represented by respective software agents. A one-way "Master – Slave" relationship is suggested, with the event of an autonomous motion of an agent propagating to its two neighboring ones in the manipulator chain and progressively further on towards the two endpoints of the chain. A constraint preservation mechanism enforces the respecting of the pin angle and rod length bounds at each propagation step. Thus, the whole chain behaves as if a moving part of the chain is pushing or pulling the two subparts of the chain it connects. To cater for fixed base manipulators, and support replanning in case some slave part of the chain can't adapt to its master's motion cause its trapped in some obstacles or malfunctioning, the notion of a "Master – Vetoable slave" relationship is introduced, where a slave part can object (veto) to the motion of its master part.

Keywords: Redundant manipulators, Reactive motion, Moving obstacle avoidance, Rope-like motion, Multi-agent systems, Event propagation, Constraint satisfaction, Master - Vetoable slave relationship, Push-Pull-Rotate behavior