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# RUBIOS An Operating System for Exploring the Real Time Organization of Behavior

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We present our first steps towards the development of “RUBIOS” an Operating System designed as a tool to understand the computational problems faced by the brain when coordinating its network of sensors and actuators to produce adaptive behavior in real time. While traditional operating systems are designed to coordinate the behavior of deterministic components of a single computer (e.g., keyboard, monitor, hard-drive), RUBIOS is designed to coordinate the behavior of a network of stochastic modules, including sensors, actuators and information relays.

RUBIOS is organized around the idea of Intention Programming. Each node in a RUBIOS network is intentional, in the original cybernetics sense, i.e., it maps inputs and outputs in a manner that optimizes a utility function. In practice each node consists of: (1) a parameterized control law that maps observed states into actions, (2) a utility function that informs the node of its performance, and (3) a learning law that modifies the control law parameters based on the perceived utility.

One of our goals in this project is to better understand how to handle timing and uncertainty in a principled manner and how to use this knowledge to develop a new generation of robots capable of interacting in a socially intelligent manner with people in everyday life. To this end, we are trying to develop awareness of social moods and indicators and appropriate responses to them.

We will demonstrate RUBIOS at work on RUBI06, a humanoid robot being designed to interact with two-year-olds and teach them materials designated as appropriate for their age group by the California Department of Education.