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RoB-ArtS: Robotic Behavioral-Arts System

A Platform for Creative Exploration of Agent Behavior

A new form of illiteracy is emerging, which concerns the relationship between the individual and technology. Even though familiarity with new devices is continuously increasing, the majority of those that are not intimidated by technology are nevertheless passive users. It is critical in our age to strive towards a community of active and constructive users.

The discriminating factor is the ability to program a device: here, literacy is the writing of one's intentions in a form executable by a machine. The primary goal of project RoB-ArtS (Robotic Behavioral-Arts System) is bringing to the general public a gaming platform through which to develop programming literacy. In this respect, RoB-ArtS rightfully classifies as edutainment. Inherent in the process of learning the spirit of programming is a great deal of potential for raw creativity to be expressed. Live-coding is a way to bring programming to the speed at which natural thought processes occur – in real time. It is important to bypass tedious mechanical steps such as compiling the source code and repeatedly running the executable files, so as to leave proper room for intuition, skill and creative instinct.

Live-coding is technically a very challenging choice; in addition, players must be given sufficient expressivity to vehicle their creativity and not so much as to impair system functionality. Careful design of the set of available programming constructs is key. One way to answer this design challenge is accept a rather constrained initial expressivity and place the emphasis on

the interaction of threads, rather than on single programs. In this respect, our platform markedly differs from programming games that have already been developed.

Focusing on interaction of programmable agents opens the way to explore emergence of complex behaviors from elementary units. The player faces a world of rich patterns, unpredictable stimuli and sometimes beautifully effective constructions from modest building blocks. These features have been extensively studied in fields that originate from (or are related to) AI – such as complexity science, small-population social dynamics, game theory and cellular automata. Our platform can also be viewed as an agile and flexible tool for research in such fields.

RoB-ArtS brings into focus the notion of agent behavior. Players program virtual robots immersed in a vivid environment to accomplish specific missions. The problems are inherently open-ended, given what the player has available and the characteristics of the environment. A simple solution that works most of the time is preferable to very complex solutions that are conceptually more accurate. A key part of the game is the exploration of collaborative behavior – so that effective problem-solving can be perceived as emerging form interaction of partial solutions.

Instead of guiding the player through progressively longer and more sophisticated programs, our focus is on writing simple and short scripts on the fly. We believe that programming skill, depth and agility can be trained equally as effectively in a responsive and fast-changing environment. Reactivity in the world also encourages reactivity in the player, in the form of on-the-fly scripting. We hope in this way to discourage programming practices that take away from raw creativity and encourage, instead, sticking to simple ideas, tuned to match intervening circumstances. A skilled programmer can easily devise a script to encode complex behavior, but it is not common practice to try realizing goals through interaction of simple autonomous units.

Single-player mode emphasizes adaptability and interaction of simple autonomous units; the player is guided towards the notion of distributed computation and of swarm intelligence. In multi-player mode, players measure themselves against virtual agents whose behavior is a priori unknown, learn which attitudes towards other agents are more likely to be successful and explore relating to agents that are perceived as outside the boundaries of the self.

A parallel theme explored in RoB-ArtS is the interplay between consciousness and its embodiment. The game storyline is centered around an intelligence awakening within a robot – the only embodiment suitable to support it after a global catastrophe has left the world in lifeless ruins. As the game progresses, this intelligence is able to expand into further hardware – and thus doing it remembers itself, apparently evolving into something larger but in actuality simply reclaiming room for self-expression. This process is accompanied by new perspectives available to the player (first- and third-person view, split screens, inner/outer view) and by a larger set of noun/verbs to program with.

RoB-ArtS is an ongoing independent project. In addition to gaming, the platform comprises a set of interfaces meant to build on the feel for emerging behavior developed in the game; behavioral intuition can be turned into an opportunity for critical thinking on social interactions in the human community. Players can view themselves as embodied behaviors and draw inspiration from the strategies that have proven successful in the game. Reprogramming an under-performing robot is quite natural in the game; it can map into a positive stimulus to believe that personal change is possible.