Maverick Hedge Funder, Jeffrey Epstein, Funds the First Humanoids in Berlin

There is a virtual new world in Berlin that is one step closer to replicating the human mind. Thanks to funding from a maverick New York science investor called Jeffrey Epstein, virtual and robotic models of the human brain are moving away from traditional algorithms with deterministic pathways, towards a realm of emotional, less predictable androids.

The engineer behind these new replicas is called Joscha Bach, a young cognitive scientist, specializing in artificial intelligence. For the last few years, Bach has been a professor, cognitive researcher and software entrepreneur at Humboldt University in Berlin. He is also the author of *Principles of Synthetic Intelligence* (Oxford University Press). Bach's newest humanoid venture, called MicroPsi Project 2, is not to duplicate the human mind, as it is to see what artificial intelligence can reveal about human cognition.

The exploration of the mind has been a longstanding focus of Jeffrey Epstein, a private hedge funder in New York with an extensive resume in science philanthropy. In addition to founding the Program for Evolutionary Dynamics with a $35 million gift to Harvard University, which studies the mathematical evolution of micro-systems and diseases, Epstein's foundation, The Jeffrey Epstein VI Foundation, has become one of the largest funders of independent scientists around the world. According to *New York Magazine*, Epstein has donated up to $200 million a year to prominent scientists. His roster of luminaries includes Stephen Hawking, Marvin Minsky, Martin Nowak and Nobel laureate physicists Gerard 't Hooft, David Gross, and Frank Wilczek. Epstein also regularly finances cutting edge research in neuroscience. A former board member of Rockefeller University and the Mind, Brain and Behavior Committee at Harvard University, Epstein plays an active role in brain institutes around the world.

Joscha Bach's MicroPsi 2 Project is a software program that creates goal and sensory driven agents in a virtual computer platform: specifically three characters that roam around a tropical island. The program is transferable to actual robots but for now, Bach prefers the flexibility and conceptual focus of a virtual platform.

To create his agents, MicroPsi has a series of 'node nets' built into each one, where conceptual, associative and sensory information is received and processed. As each character wanders through its landscape, information is sent to its node nets, which in turn influence the character's choices.

The structure of the node processing system is algorithmic but uniquely embodies preferred or weighted pathway choices, based on physiological needs, sociological needs, associative memory encapsulation and many other features. For example, three types of drives are written into each character's nodes: physiological (i.e., hunger), social (i.e., affiliation needs), and cognitive (i.e., reduction of uncertainty and expression of competency). As these drives or 'reserve tanks' get depleted or filled based on time and an agent's interactions, they influence the agent's pathway choice. So a character that is low on water for example, will prioritize a pathway to a water element in its environment. To support all of this, the environment is rich with hundreds of fundamental elements written into it, such as temperature, food and water.

Associative memory is another critical factor that drives these characters. As sequential pathways are experienced, the sequence, and no longer just a single element, becomes a part of that character's sense, which in turn influences pathway choice. So if a character encounters element A and then B, and if B represents pain, that character will prioritize another pathway upon encountering A. Repeated sequences also increase the associative memory and decay if pathways are not routinely connected, which is true for human neural connections as well.

The first MicroPsi Project built roughly between 2003 and 2009, has more than 60,000 lines of Java code with a set of plugins for Eclipse IDE. MicroPsi 2 is written in Python; and unlike standard code (domain specific language with a set of rules and representational items), Python uses graphical and spatial definitions for its characters. The graphical paradigm better highlights weighted associations, allows the programmer to visualize conceptual hierarchies, pathway activation spreading, perceptual schemata and parallelism.

"The use of a virtual platform to explore the workings of the human brain provides optimal flexibility," Jeffrey Epstein remarked, who also supports MicroPsi's AI collaborators in Hong Kong, an open source AI foundation called OpenCog. "Scientists need to focus on the concepts and not get bogged down with the mechanics of a robot."

Bach does not see his new MicroPsi Project as anywhere close to being a valid cognitive model but rather as an evolving effort to provide a unified theory of cognition. And as more variables are built into these agents, MicroPsi will undoubtedly shed new light into the expansiveness or even limitless nature of the human brain. It might even surpass it into something else: a realm of unknown intelligence (UI).