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Scared computers? Bio-inspiration as a source of computational progress



Those responsible for many of our reactions and interactions with the world are the set of different chemical neurotransmitters in our brains. What would happen if the artificial machines also had this characteristic? In this study, the combination of only 3 neurotransmitters has been used to provide artificial machines with basic emotions.

When you decide to do something that frightens you but it makes you happy, when you react furiously to an attack, or when a person makes you feel special you are actually experiencing in your brain the combination of various neurotransmitters. Thanks to this chemical soup, our minds label the world and make us react in one direction or another, that is, make us be like we are and make us feel the same world in various ways. If humans are biological machines that process the information neurochemically, ¿could we make artificial machines to imitate this characteristic?

Following this idea, researchers from the Kazan Federal University (Alexey Leukhin, Max Talanov, Fail Gafarov) and the UAB (Jordi Vallverdú), belonging to the areas of Engineering, Computation and Cognitive Sciences, have been working together for years designing bio-inspired computational architectures. In this article they have employed a simple model called the "Lövheim Cube" that uses the combination of 3 neurotransmitters (dopamine, serotonin and noradrenaline) to generate a diverse set of basic emotions depending on how they combine these three neurotransmitters, and they have implemented it using the NEST 2.12 simulation

software to carry out various tasks (utilization and distribution of computational resources, memory distribution, or memory and storage, among others).

The result of our experiments shows that dopamine and norepinephrine increase the amount of resources needed to calculate a psychoemotional status while serotonin reduces them. Hence, we have demonstrated that Artificial Intelligence or Robotic systems could use bio-inspired mechanisms when it comes to efficiently managing their own resources. In other words, we would equip them with mechanisms really related to the ability to have emotions, which, after all, are the evolutionary result of living systems strategies. The future of emotional machines is already in our hands and, perhaps soon, in their own ones.

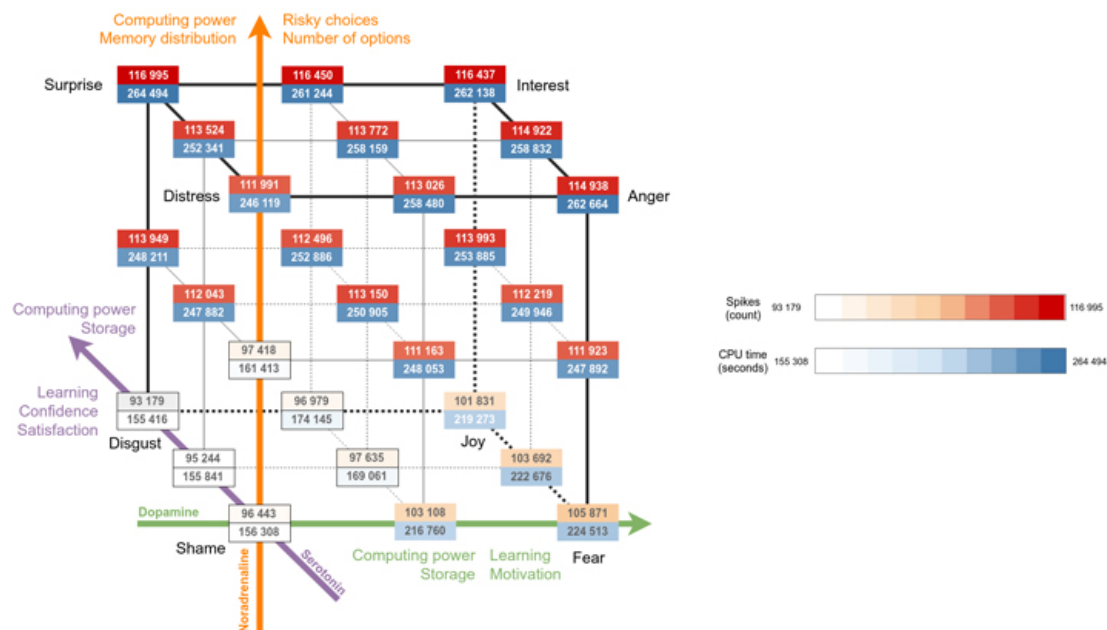


Figure 1. Lövheim Cube.

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