National Aeronautics and
Space Administration

TECHNOLOGY SOLUTION

Robotics, Automation and Control

Algorithms for stabilizing intelligent networks

Biologically inspired algorithms for stabilizing intelligent, learning networks

Inspired by psychology, these algorithms could be developed and applied towards creating stable, predictable, and artificially intelligent networks. These algorithms collectively represent ways for intelligent systems to identify and correct unpredictable or unstable behaviors, creating stable emotional states that govern behaviors with given specific circumstances, and establishing an evolvable synthetic neural network that can eventually be scaled from low-level functions to higher level decision making processes. These algorithms could be key to research in autonomous spacecraft, nanorobotic swarms, and sensor networks.

BENEFITS

- Performs with stability and predictability
- Enables reliability in autonomous systems
- Enables highly parallel processes, such as robotic swarms or large sensor networks
- Self-stabilizes: identifies and regulates unusual responses to inputs
- Self-corrects: corrects for errors such as a network node sending unusual or erroneous data

THE TECHNOLOGY

Some of the current challenges faced by research in artificial intelligence and autonomous control systems include providing self control, resilience, adaptability, and stability for intelligent systems, especially over a long period of time, in changing environments. The Evolvable Neural Software System (ENSS), Formulation for Emotion Embedding in Logic Systems (FEELS), Stability Algorithm for Neural Entities (SANE), and the Logic Expansion for Autonomously Reconfigurable Neural Systems (LEARNS) are foundations for tackling some of these challenges, by providing the basic algorithms evolvable systems could use to manage its own behavior.

These algorithms would allow networks to self regulate, noticing unusual behavior and the circumstances that may have caused that behavior, and then correcting to behave more predictably when similar circumstances are encountered. The process is similar to how psychology in organisms evolved iteratively, eventually finding and keeping better responses to given stimuli.
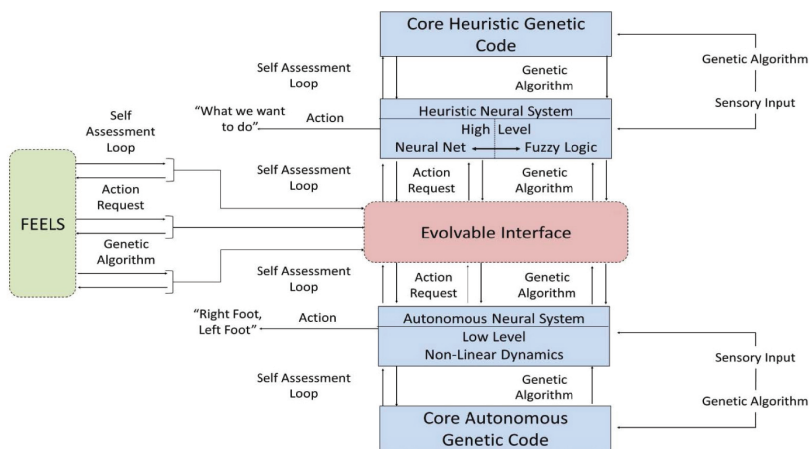
A detailed interface drawing of the Formulation for Emotion Embedding in Logic Systems (FEELS)

APPLICATIONS

The technology has several potential applications:

- Artificial intelligence research
- Sensor networks
- Autonomous spacecraft and robotics
- Autonomous network monitoring

PUBLICATIONS

Patent No: 8,095,485 ; 7,512,568; 8,041,661

Patent Pending

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