Fully Autonomous Reproduction Robotic System

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Abstract

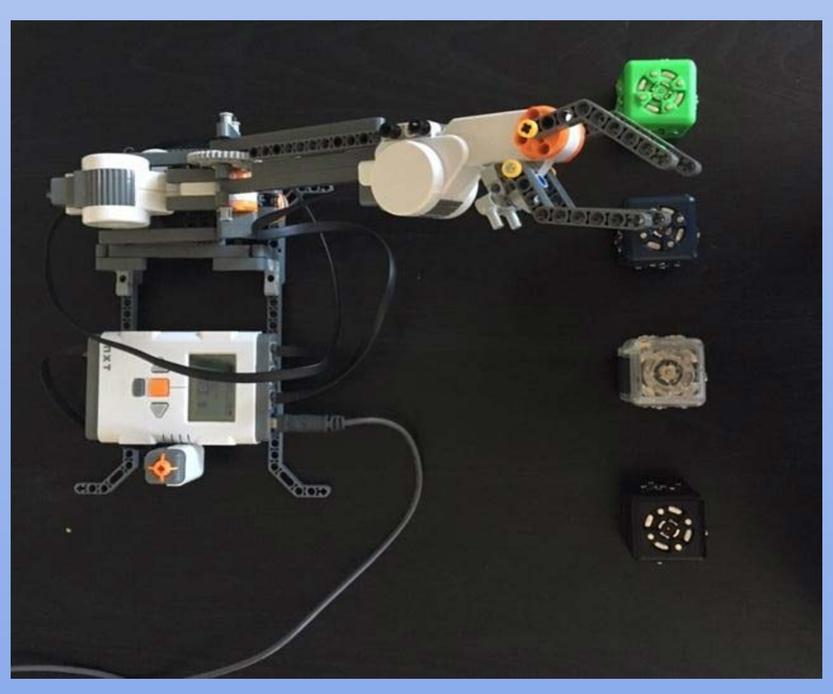
Self-reproduction robotics systems are capable of producing other robotic systems; such that the resulting systems are fully functional and autonomous. In this poster, a novel method for producing modular robotic systems is presented, where the resulting robots consist of Cubelets – modular robots kit – and the producing robot is built using Lego Mindstorms EV3.

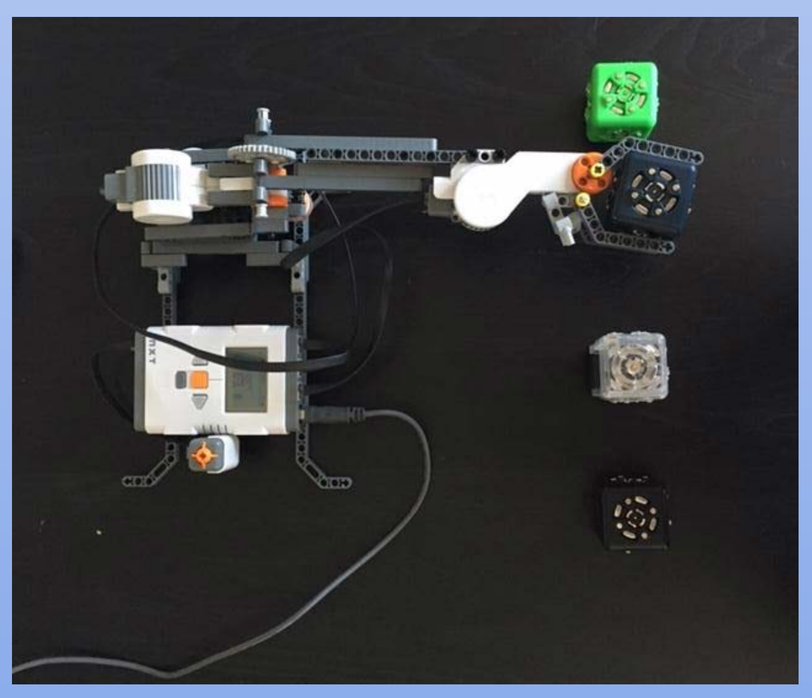
Objective

The objective of the proposed system is to produce multiple robots that can accomplish a specific task, which results in an exponential growth in the number of robots to perform that job, and drastically shortening the original time needed to accomplish that task, which allows planetary exploration and rescue missions in hazardous environments.

Methodology

The design of the resulting robot is accomplished using an evolutionary computational algorithm, specifically Genetic Algorithm (GA). The main robot is constructed and operates using the Lego Mindstorm EV3 kit. It is programmed to autonomously assemble robots consisting of Cubelets modular robotics kit. We opted for using a robotic arm manipulator for ease of moving and putting together the Cubelets modules.





Conclusion

In this poster, we presented a robot that can produce other robots and assemble the resulting robotic modules autonomously. This process takes the morphological structure as input and then picks the right modules from a dispenser and assembles them according to the input structure. This method allows more efficient task performance in less time.

References

[1] R. Alattas,“Hybrid Evolutionary Framework for Designing and Implementing Autonomous Modular Robotics,” ASEE NE Section Conference 2016, Kingston, RI, April 28-30, 2016.
[2] R. Alattas, “Hybrid Evolutionary Designer of Modular Robots,” IEEE Connecticut Conference on Industrial Electronics, Technology & Automation (CT-IETA 2016), Bridgeport, CT, October 14 - 15, 2016.
[3] C. Chen, C. Dietrich, & C. Miller, “Cubelet Detection and Localization by Template Matching.”