

Symbiotic Multi-Agent Construction (SMAC) 6.0

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Objectives

Physical:

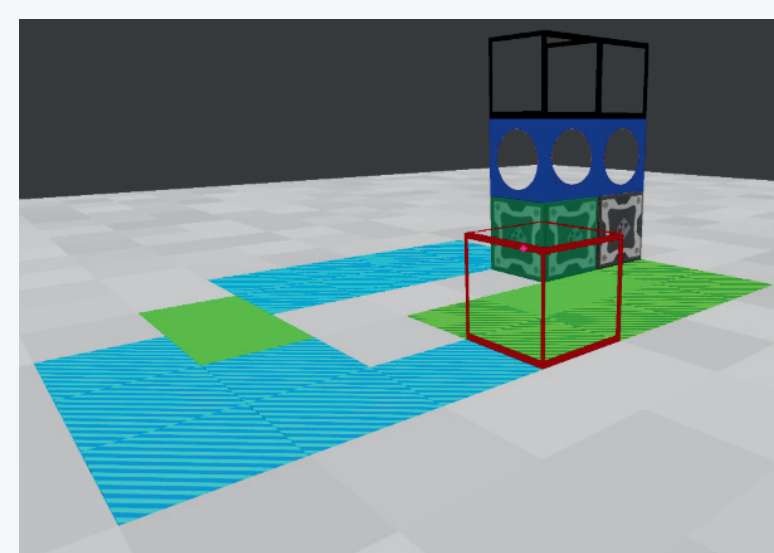
- Implement two untethered manipulators
- Complete build goal without inchworm collisions
- Verify block locations through communication with adjacent blocks

Simulation:

- Implement two-builder construction using stigmergy (inchworm builders store information in smart blocks who instruct further actions)

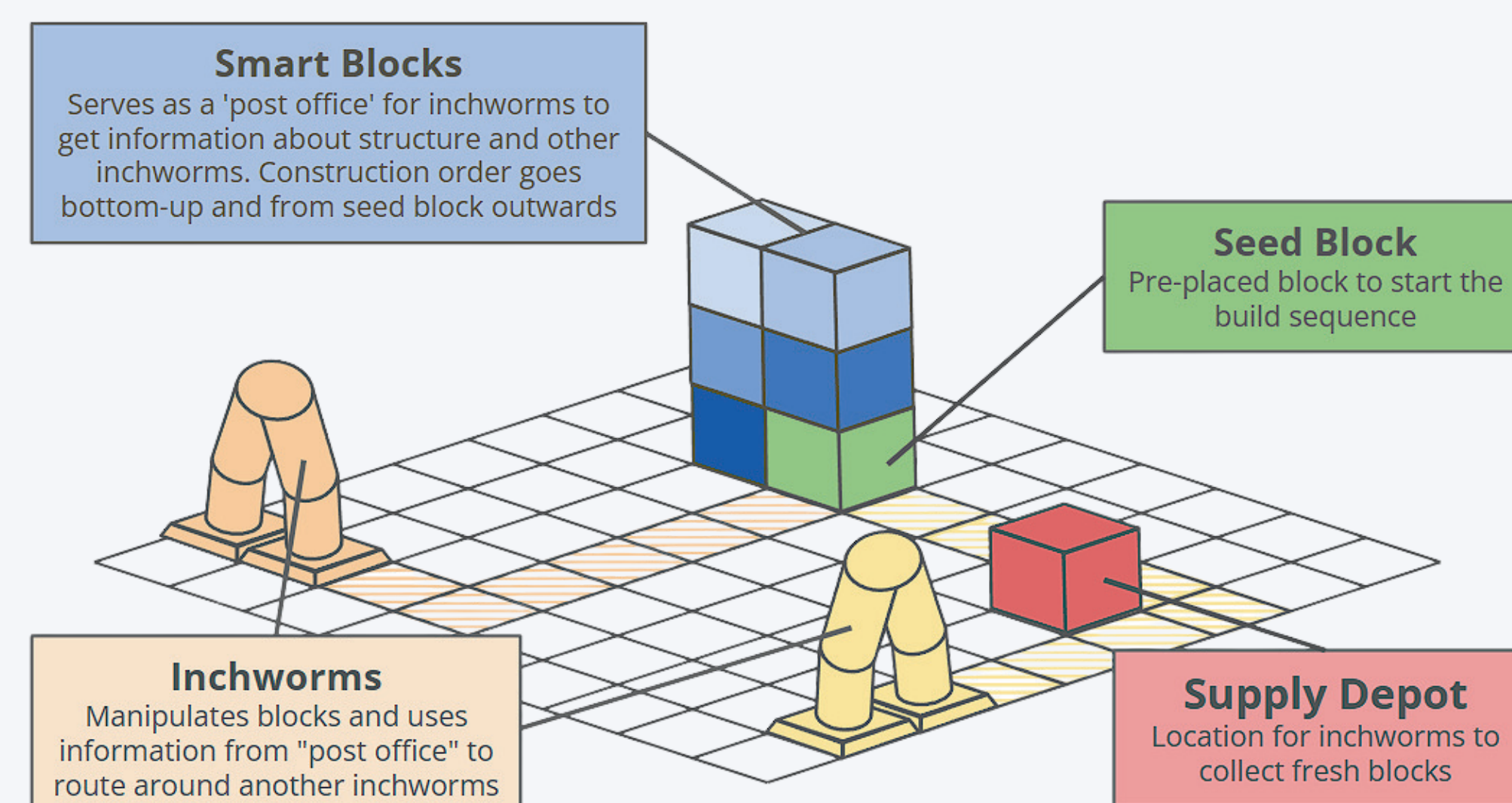


Build Goal

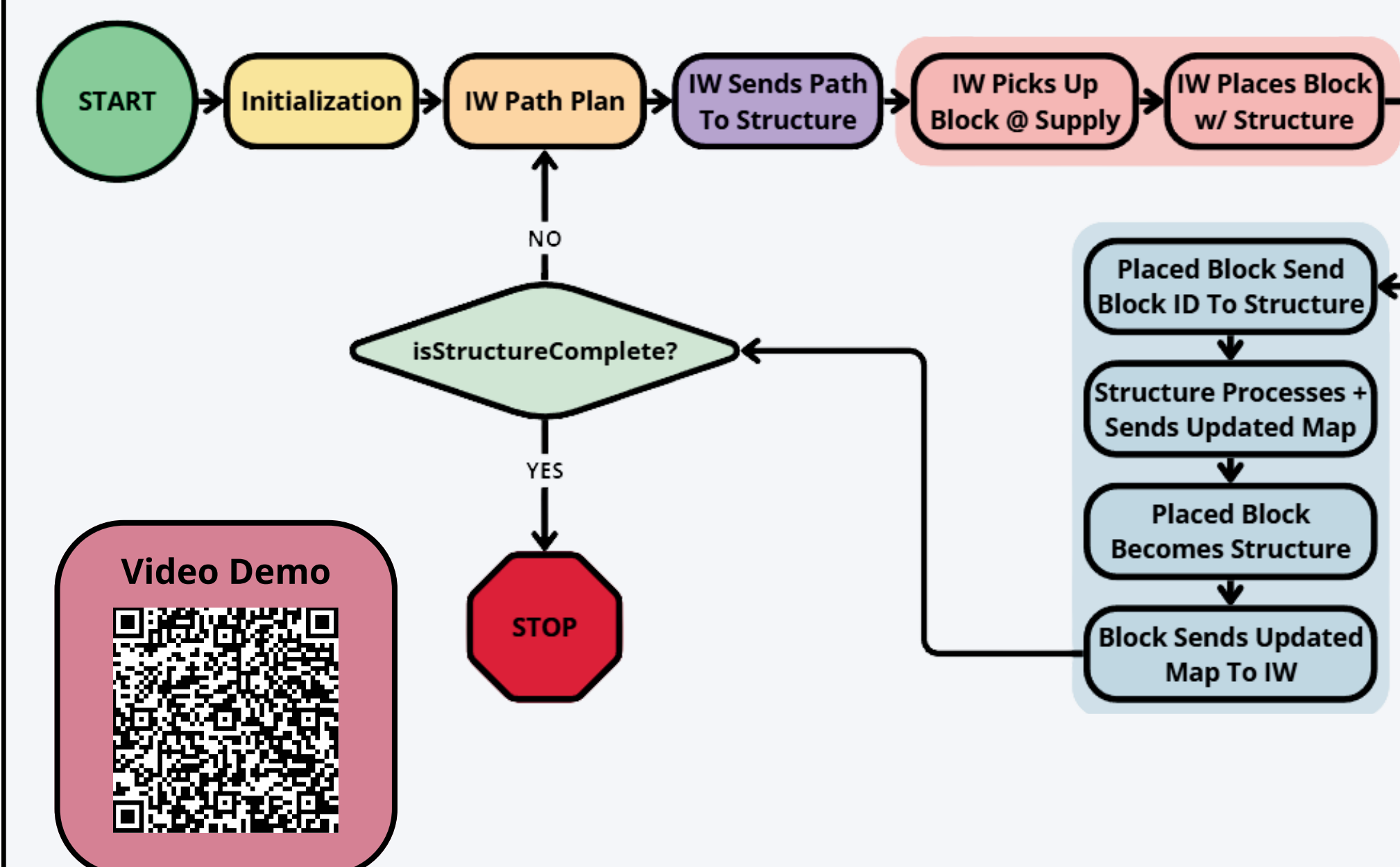


Abstract & System Overview

Multi-robot construction systems allow for autonomous construction in dangerous environments. SMAC proposes a collaborative, decentralized system of inchworm robots and discrete smart blocks to coordinate construction.

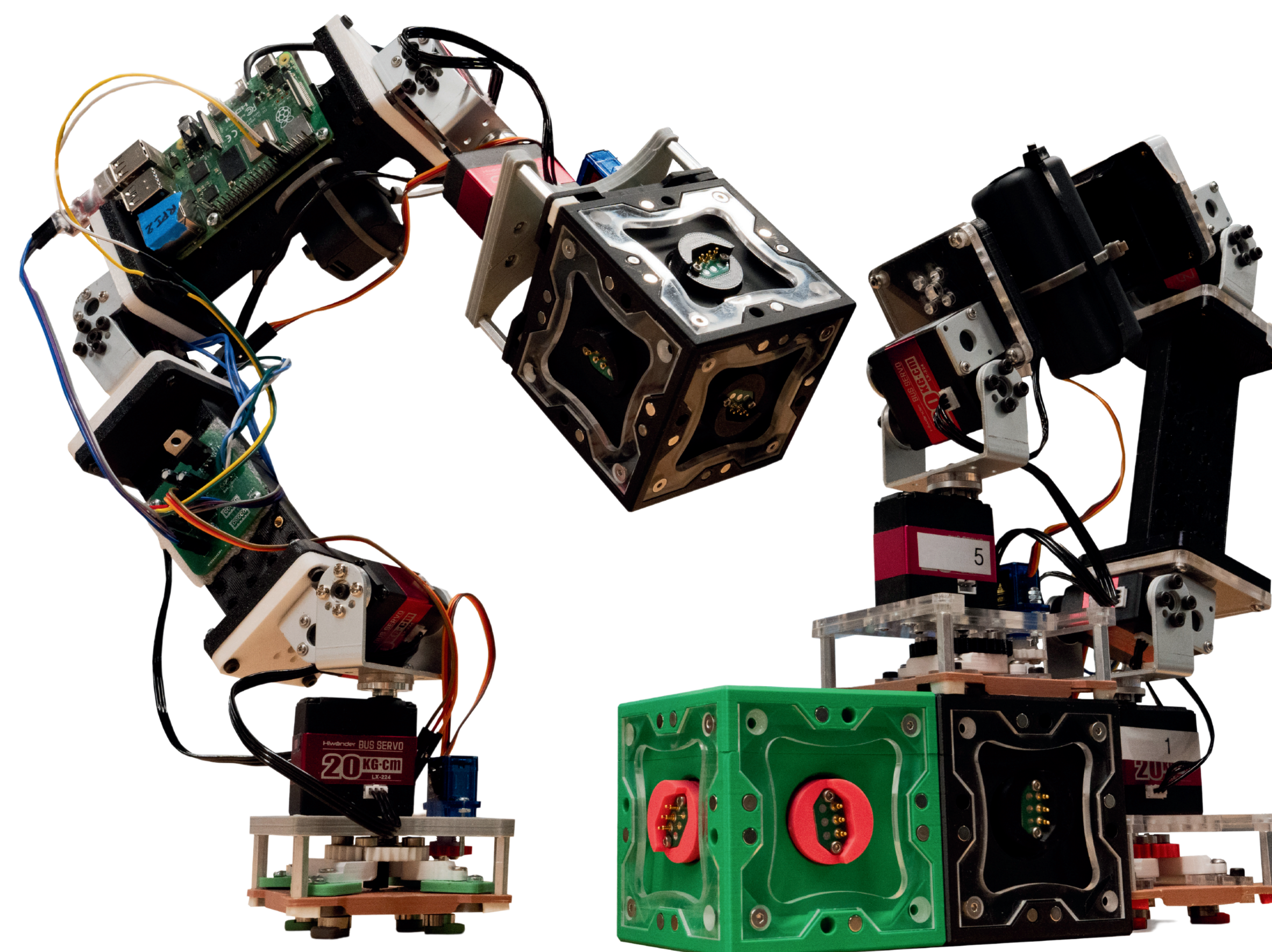
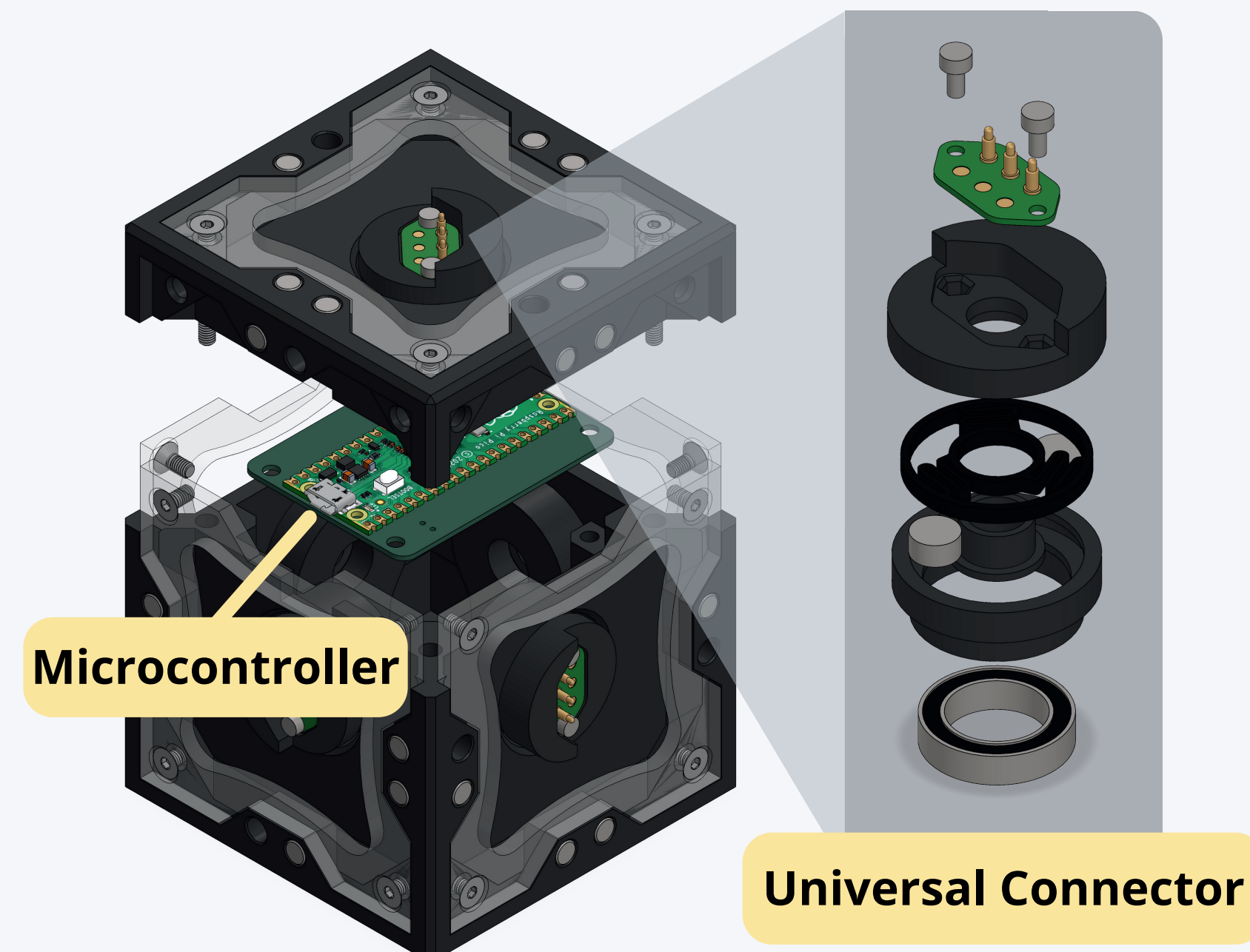


System's Order of Operations



Smart Blocks

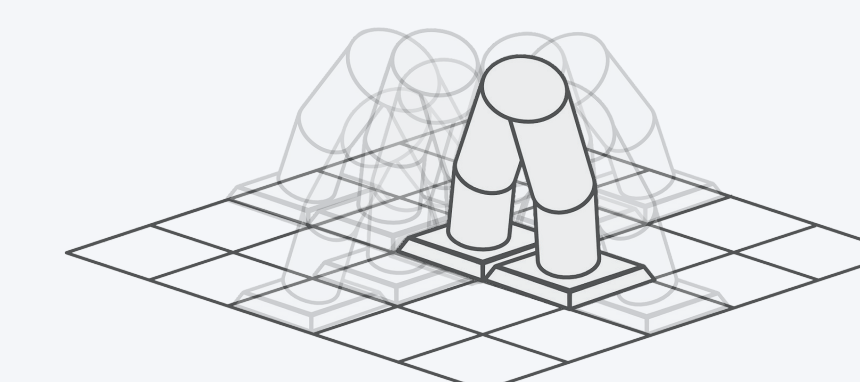
Blocks with a microcontroller and 6 ports connect to other agents and store information about the current progress of build. Each block is independent from one another but work together as one structure by continuously updating one another with new information.



Inchworms

Two 5-DOF construction robots pick & place smart blocks and work together to build a structure in tandem (using stigmergy). They are embedded with algorithms to be independent and capable of decision making based on the current structure status.

Universal Connector



Dynamic trajectory planning and inchworm movesets to automate and modularize different combinations of instructions.

