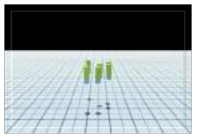
SELF-ASSEMBLING MORPHOLOGIES

GENERALIZATION VIA MODULARITY

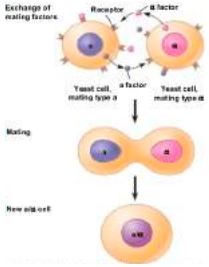


Deepak Pathak*, Chris Lu*, Trevor Darrell, Philipp Isola, Alexei A. Efros

UC Berkeley

* equal contribution

Unicellular to Multicellular Evolution



Investigate "Modularity"

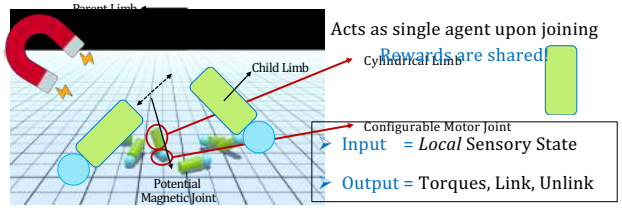
Reusability
+
Compositionality

Modular Co-evolution of Control and Morphology

a collection of primitive agents learns to self-assemble to jointly solve control tasks.

Pathak*, Lu*, Darrell, Isola, Efros. NeurIPS 2019 (Spotlight).

Modular Co-evolution of Control and Morphology



Acts as single agent upon joining

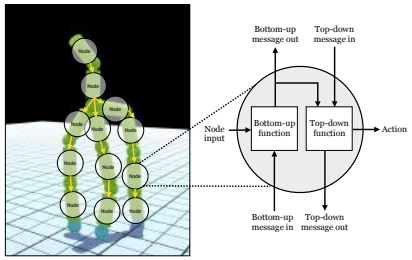
Rewards are shared

Input = *Local* Sensory State

Output = Torques, Link, Unlink

Pathak*, Lu*, Darrell, Isola, Efros. NeurIPS 2019 (Spotlight).

"Modular" Self-assembling Morphologies



$$\max_{\theta} \sum_{i=\{1,2,\ldots,n\}} \mathbb{E}_{\tau_\theta^i}[\Sigma_t r_t^i]$$

Dynamic Graph Networks

Pathak*, Lu*, Darrell, Isola, Efros. NeurIPS 2019 (Spotlight).

Environments