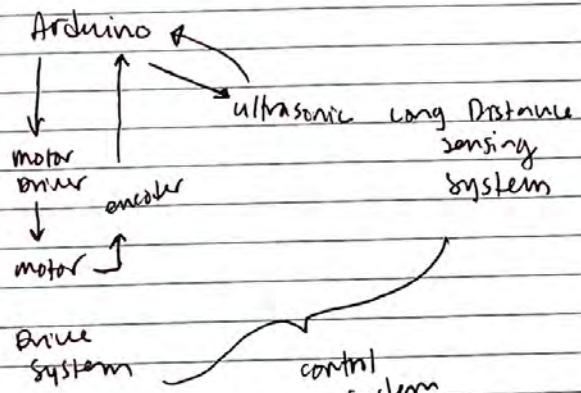
COGS 300 — Emergence 02 — Oct 23/25

what is a "system"?
In physics, a set of interacting objects.
In computing, a set of interacting modules.

robot:



Last time we talked about automata

system
agent ⟷ environment

Langton's Ant

part of the same cognitive system

any "decision" is emergent (highway = decision)

but conway's game of life is a little less clear... what is agent + what is environment?

In GOL, the only "agentic" part seems to be an individual tile. Yet, with absolutely <u>no</u> control bottom-up, emergent effects appear. The agent emerges from the cellular interaction.

~~[illegible]~~
~~conways editor~~ ↳ wire example
~~smoothlife~~ "purpose" driven.
but system doesn't "know" that.

Extensions to Game of Life.

↳ CA rule editor → lenia
→ conways editor → activity
↳ discover how to massively overpopulate.
→ discover how to kill off non-trivially (slowly)

zoom in / out → can't we make this continuous?

Two types of continuity / discretization.

spatial □ ↔ ☐

value 0 → 1 → 10

Primordia space +/−

↳ explore until boundries emerge.

Boundary layers allow for a true differentiation between environment and agent

↳ smooth life.

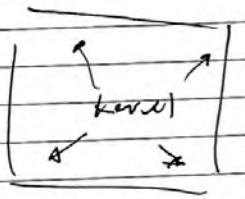
remember, nothing here is "goal directed" or "moves" or anything like that...
yet what do we see?

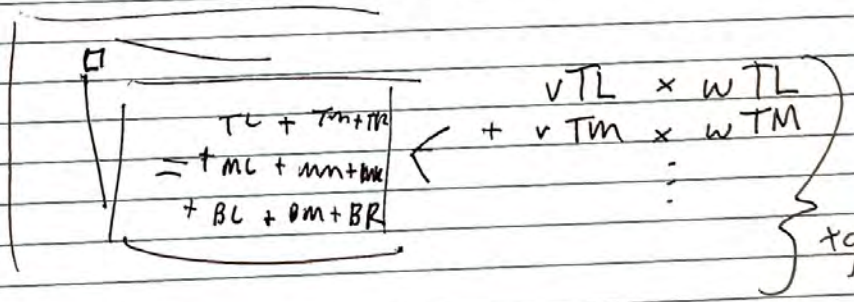
↳ Lenia.

→ start/stop once.

→ preset

→ random ↗ S/S





Extensions to GOL:

→ grid (med cells)
→ substrate
→ rule set

no agent intention.

Do these simulate life?
↳ if so, what level?
→ if not, why not?

Are these alive?

↓

life def.

next time: swarms.

COGS 300 **Emergence 02** oct 28/25

Warm-up: Draw non-rectangular "grids" e.g.

triangle

octogon (+ diamond)

diamond

others?

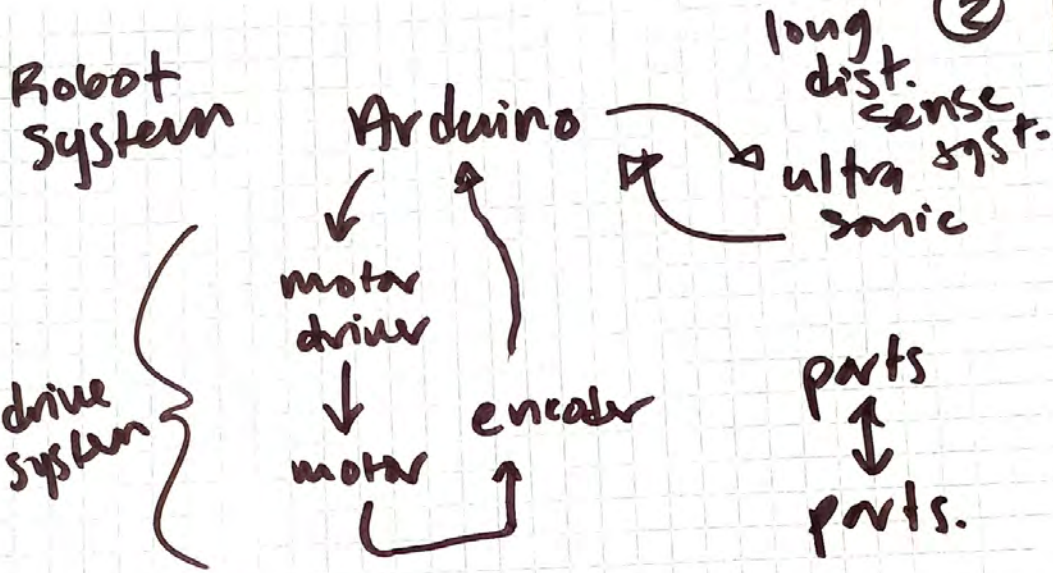
What is a "system"?

parts ⟷ parts

↑

interaction

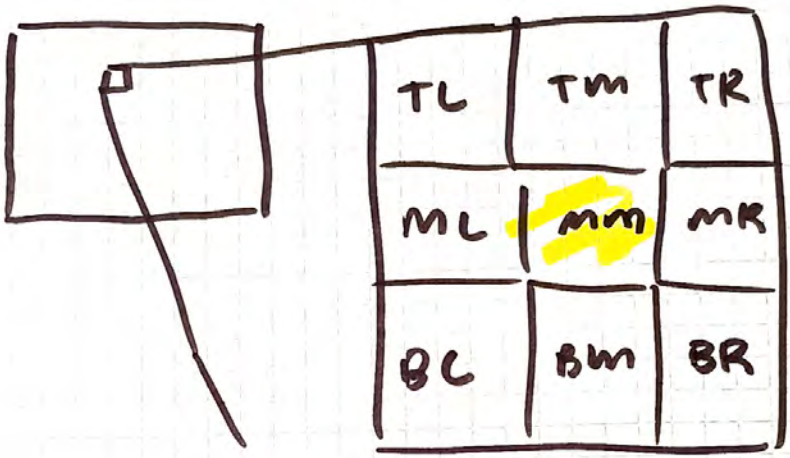
editorial



conway's game of life

challenges systems view (modular)

decision + detection



$$mm = w_{TL} \times V_{TL} + w_{TM} \times V_{TM} + \dots + w_{BR} \times V_{BR}$$

Kernel → (9)

→ Are these alive?

↓ yes
define

↓ no
find the boundary that makes it alive

(4)

Extension to GoL

Brainstorm

↳ grid
→ substrate
→ dimensionality
→ rule sets

Cellular

Simulation
show emergent effects