

# Topic 6: Finite State Machines

fast reactive  
decision making



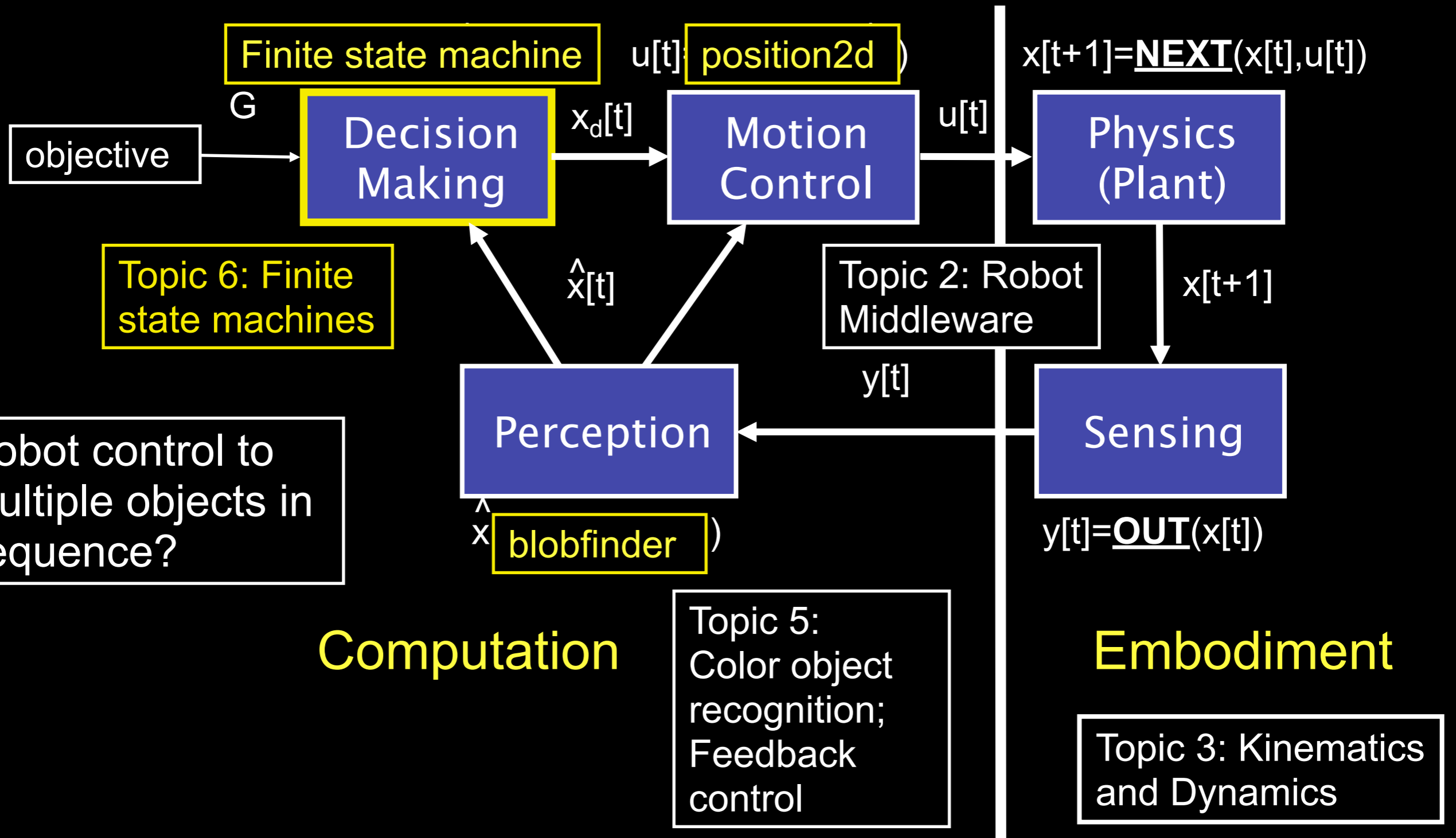
# got git?

- If not,
  - read git tutorial
    - <http://www-cs-students.stanford.edu/~blynn/gitmagic/>
  - read polm's quick start notes
    - <https://lists.cs.brown.edu/sympa/arc/cs148.2010-11.f/2010-09/msg00029.html>
  - come to TA hours for one-on-one git help
- If there is sufficient demand, TA could offer git help session

# robot control loop

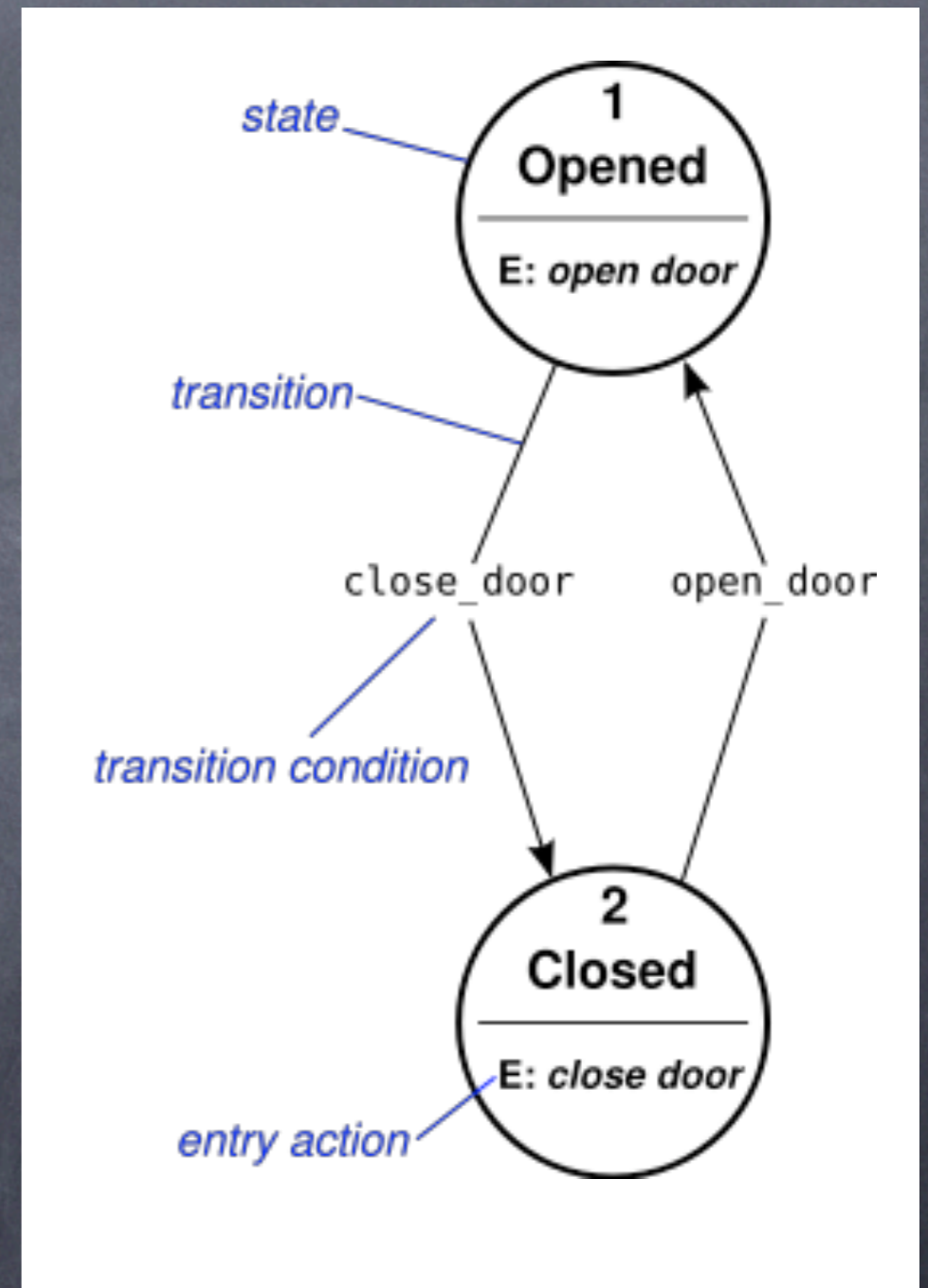
- someone please sketch on the board

# The Robot Control Loop



# Finite State Machines

- Components
  - alphabet (or inputs)
    - “observations” in robotics
  - states (some robot action)
  - transitions (between states)
  - stopping condition
- Commonly, implemented as switch-case or if-else within a while loop



[http://en.wikipedia.org/wiki/Switch\\_statement](http://en.wikipedia.org/wiki/Switch_statement)

# "nice" recognizer

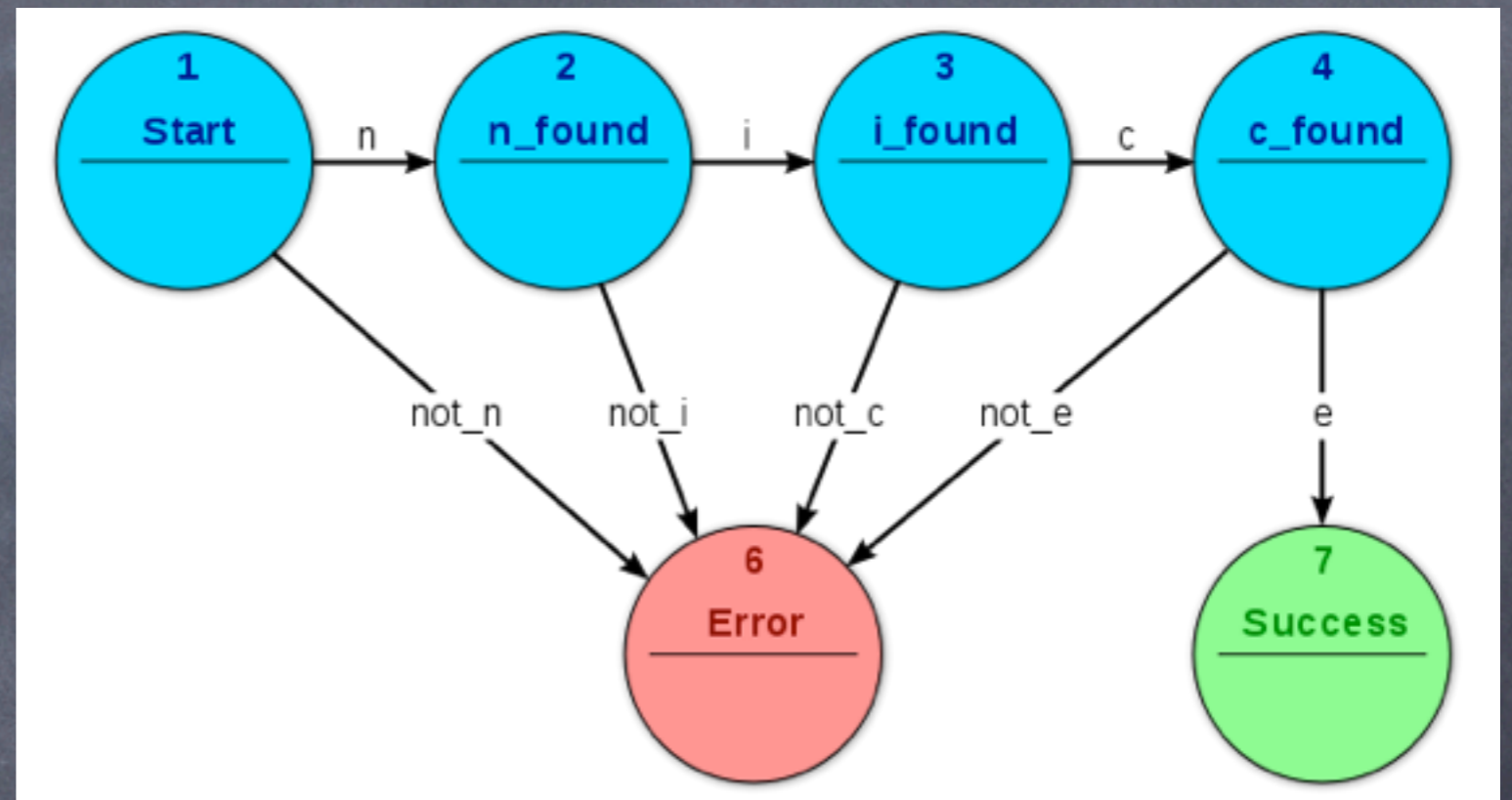
- recognize the string "nice" from input

- if input is "nice"

- output success

- if input not "nice"

- output error



- robotics uses

- preconditions (enter state)

- postconditions (exit state)

state  $\leftarrow$  start

while state  $\neq$  success and state  $\neq$  error

token  $\leftarrow$  next string character

switch (state)

case start

if token = "n" then state  $\leftarrow$  n\_found

else state  $\leftarrow$  error

case n\_found

if token = "i" then state  $\leftarrow$  i\_found

else state  $\leftarrow$  error

case i\_found

if token = "c" then state  $\leftarrow$  c\_found

else state  $\leftarrow$  error

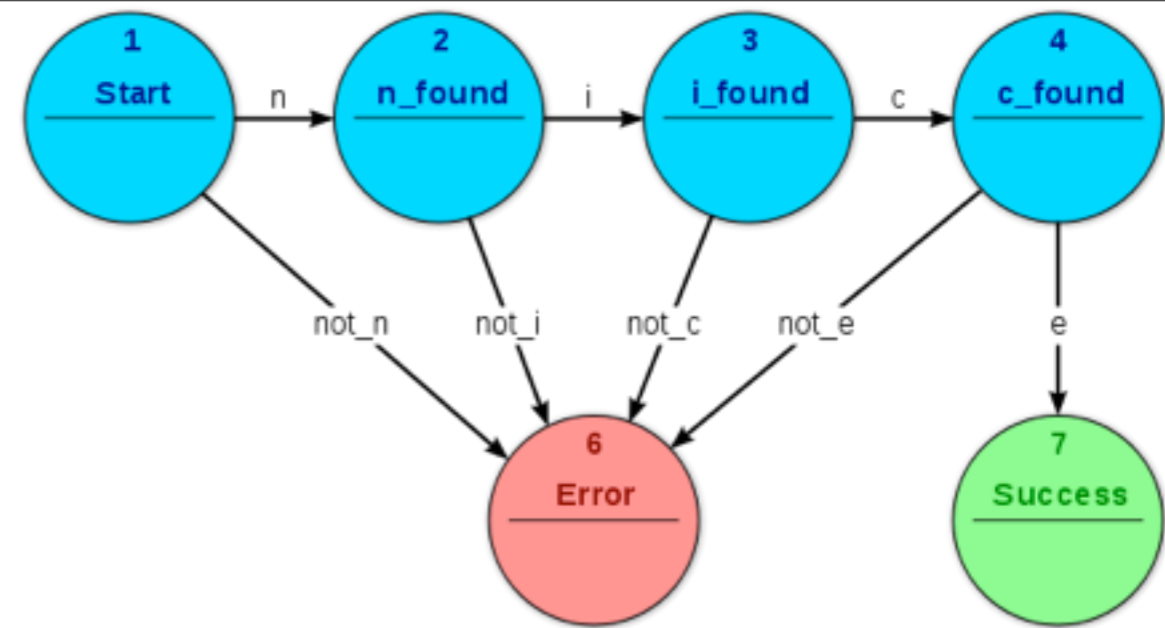
case c\_found

if token = "e" then state  $\leftarrow$  state

else state  $\leftarrow$  error

end while loop

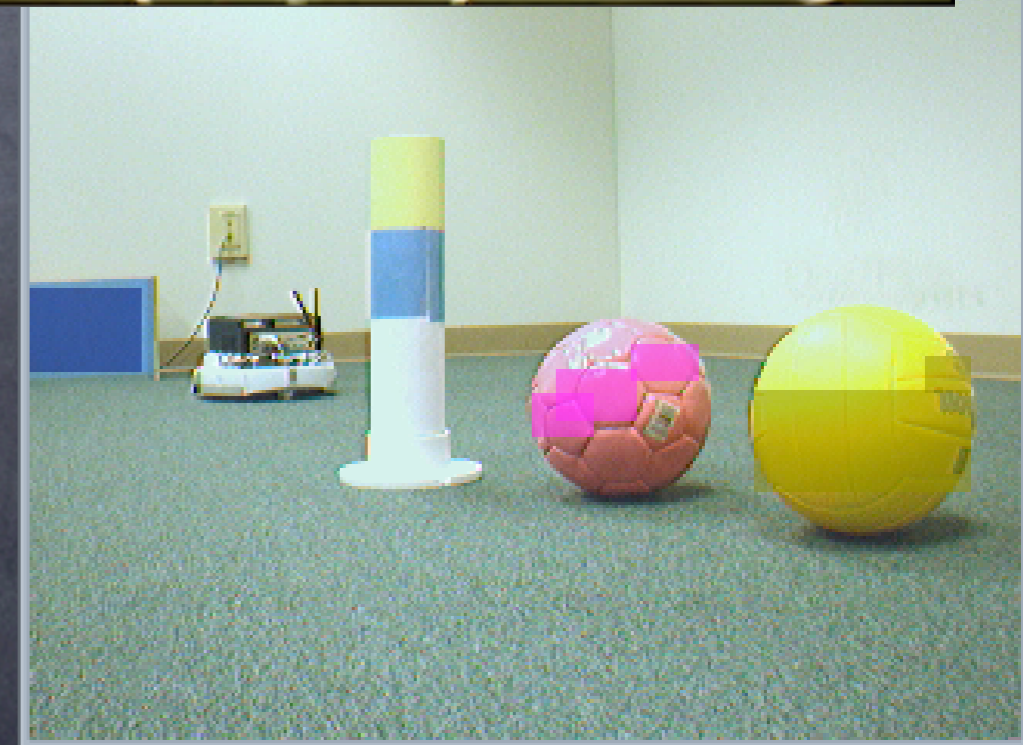
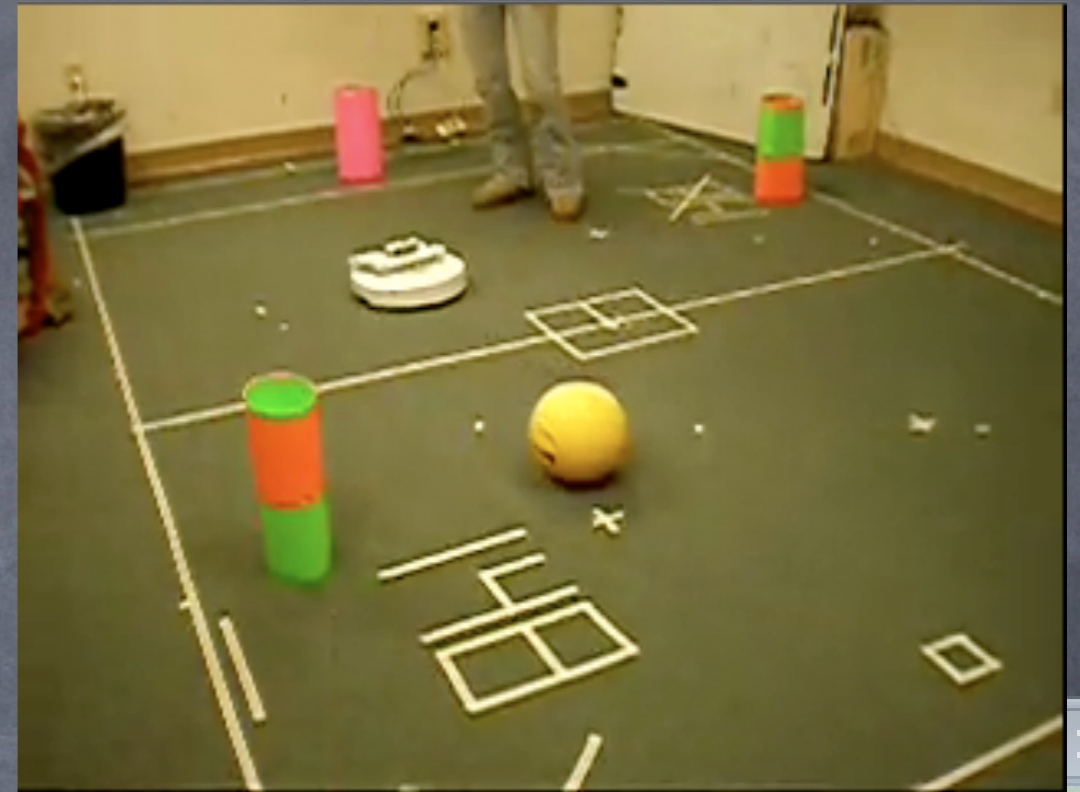
output  $\leftarrow$  state

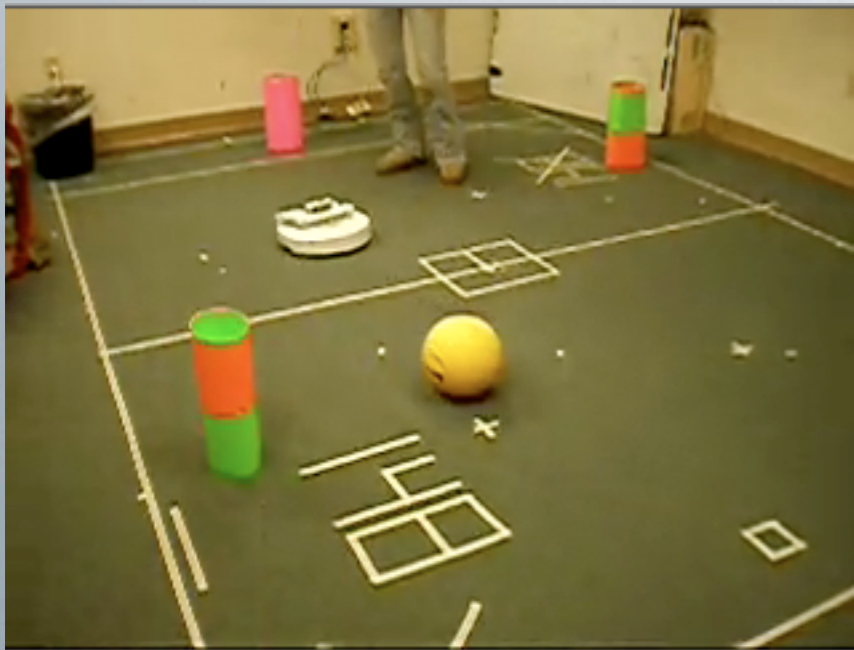


Can we relate this string recognizer to object seeking?

# Move to objects in sequence?

- How can our robot move to a given sequence of objects?
  - yellow ball
  - green/orange landmark
  - pink landmark
  - orange/green landmark



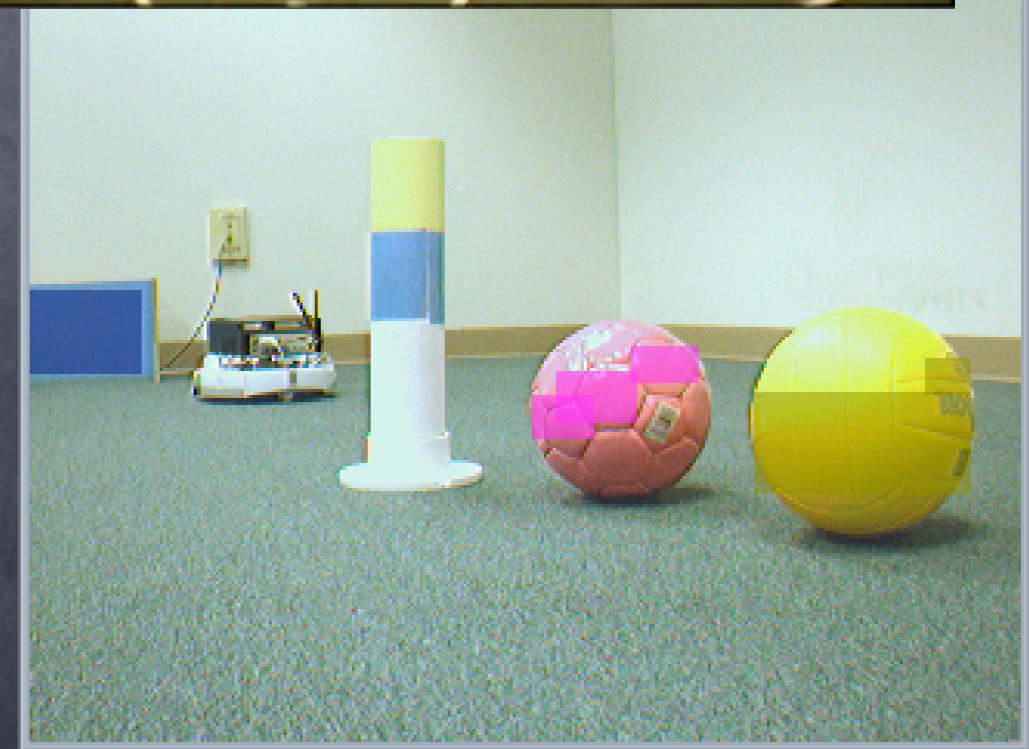
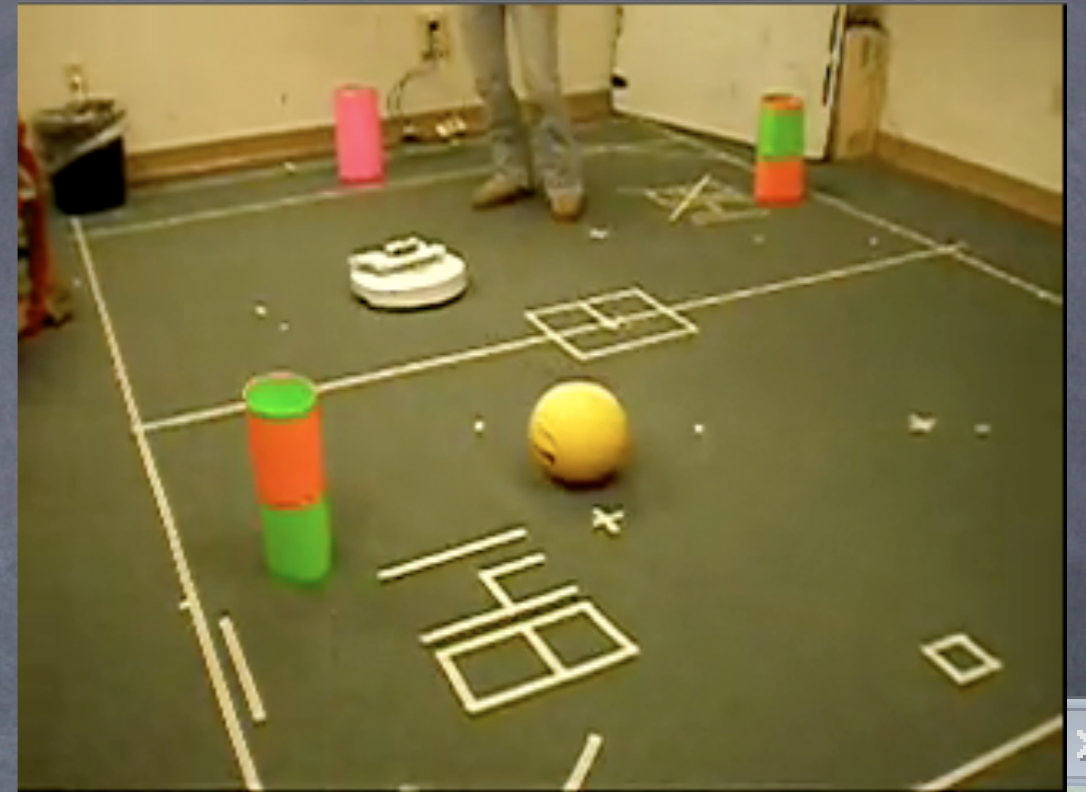


# OBJECT SEEKING

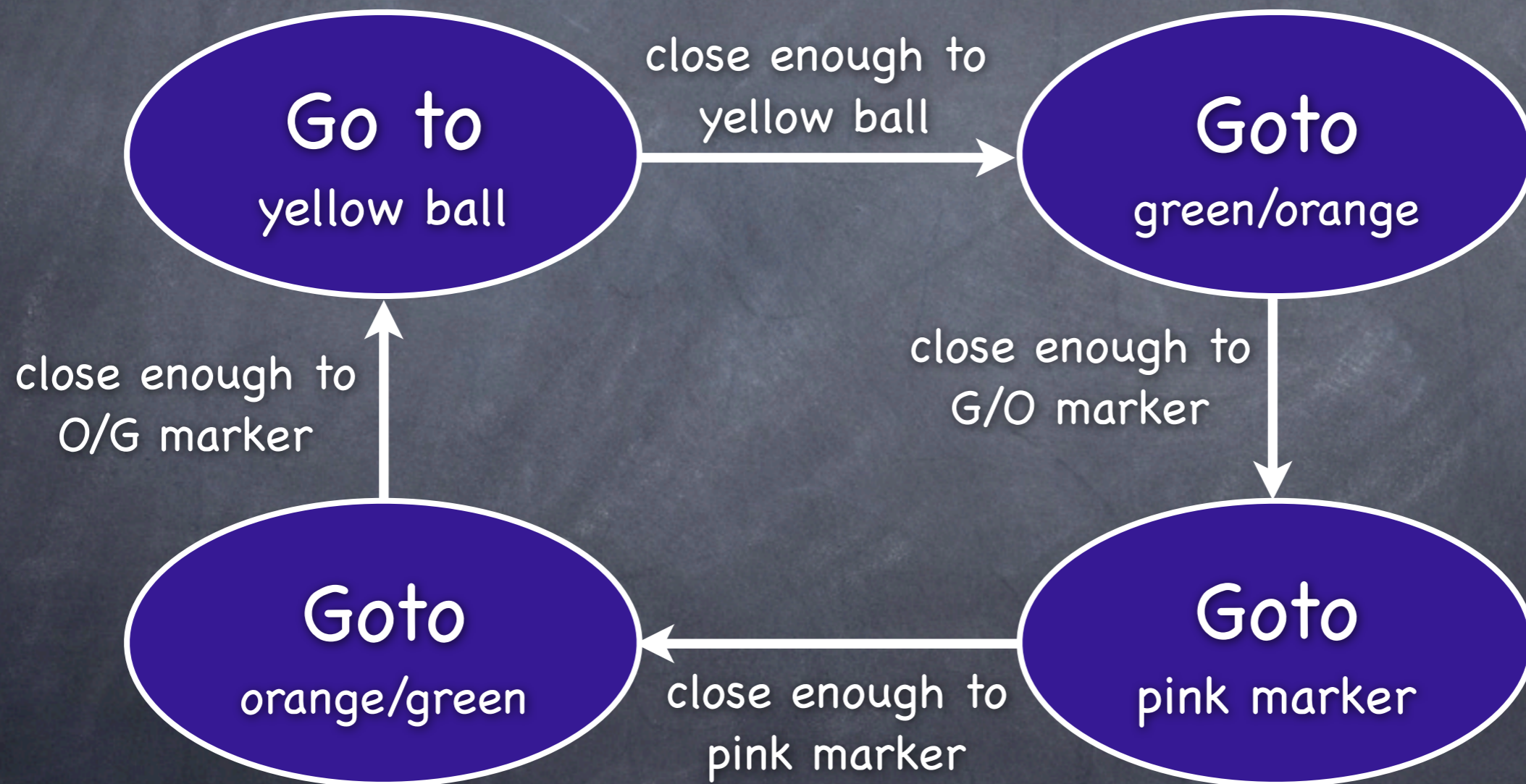
<http://www.youtube.com/watch?v=-hOA0jMUggg>

# Move to objects in sequence?

- What are the states?
  - What are the transitions?
  - Preconditions for states?
  - Postconditions for states?
- 
- Can someone sketch on board?



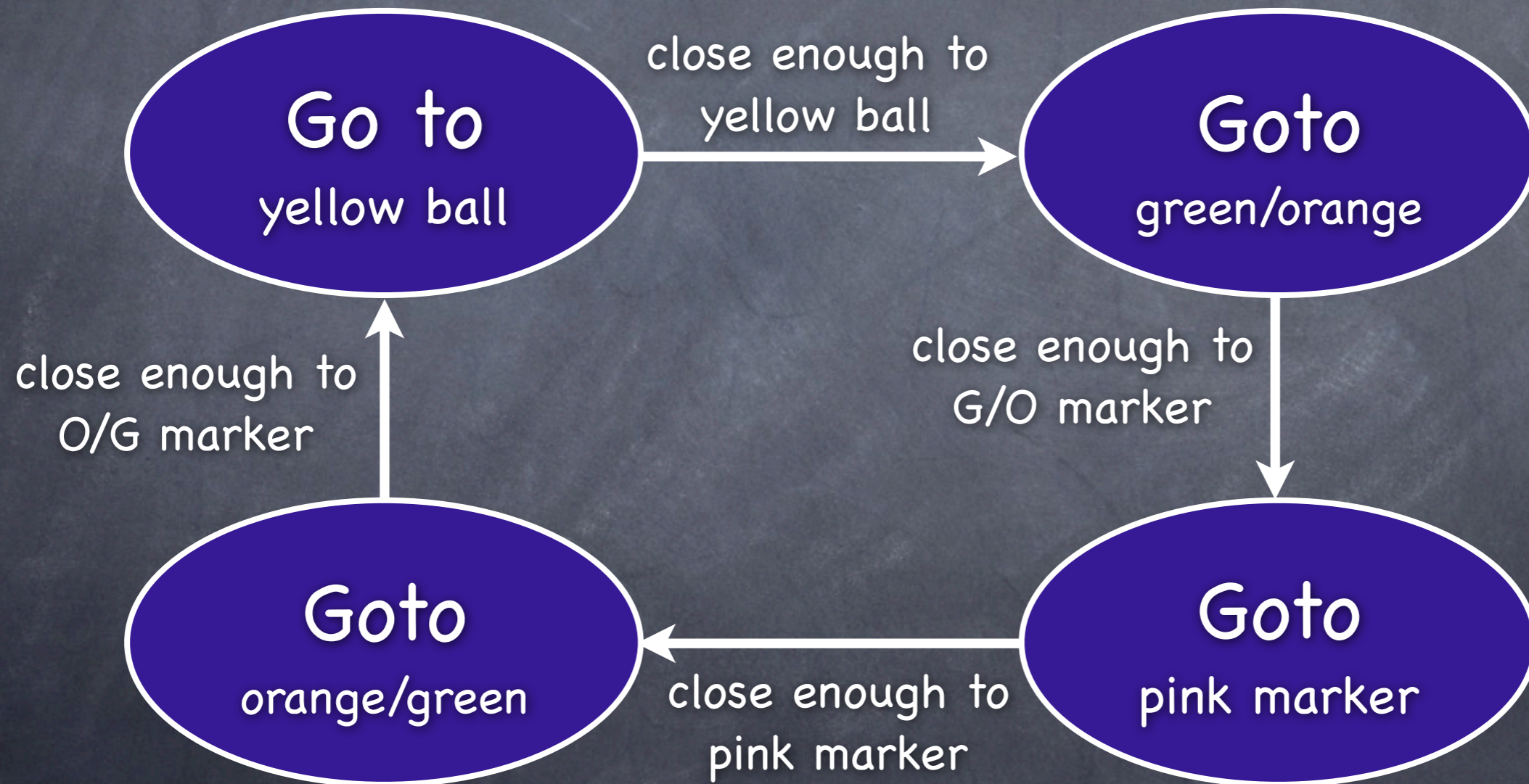
# Object seeking FSM



# Object seeking FSM

How to implement state?

How to detect "close enough"?



# FSMs for Other Tasks

- Robot foraging?
- Robot tennis/pong?
- Pushing a ball into a goal?
- Vacuuming a room
- Driving a car?

