Introduction to Intelligent, Knowledge-Based, and Cognitive Systems

89-674

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Sunday 10-11, Building 202, Room 119
Tank Soar

- 14 X 14
- All sides bounded by rock
- Interior walls made by trees
- Each agent controls one tank
- Tank can:
  - take actions,
  - hold resources,
  - observe with sensors
- Takes up one block
- Various maps
Tank Soar Environment

• Open \SoarTutorial_9.4.0-Windows_64bit\TankSoar.bat

Create New Agent
Create an Eater

• Example: Agents\Eaters\Tutorial\move-to-food.Soar
• What happens?

[Diagram of Create Agent window with explanations]

Press this button to change the production rules that are loaded when an Eater is created.

This label shows which productions will be loaded when the Eater is created.

After productions are selected, the "Create Agent" button will be enabled.
Agent Resources

- Health – 0-1000 points. If missile hits tank while shields are down (-400). Increased when sits on a health charger (+150).
- Energy – 0-1000 points. Decreases when using radar, or shield (-20 per turn), or hit by missile when shields are up (-250). Increased when sits on energy charger (+250).

- When a tank dies, it is resurrected at a random open square with the initial values of all of its resources (health=1000, energy=1000, missiles=15)
Tank Primary Sensors

• Six sensors available to a tank on the input-link:
  
  • *Blocked sensor*: cells blocked or open (yes = blocked, no = open)
    
    • Attributes: ^backward, ^forward, ^left, ^right
  
  • *Incoming sensor*: detects an approaching missile (yes, no)
    
    • Attributes: ^backward, ^forward, ^left, ^right
  
  • *Radar sensor*: Needs to be turned on (allowing energy). Detects objects 3 squares in front of the tank (straight, left, right).
Tank Primary Sensors

• *Rwaves sensor* – if another tank is detecting the tank (yes,no)
  • Attributes : ^backward, ^forward, ^left, ^right

• *Smell sensor* : detects closest tank ( manhattan distance, color)
  • Smell penetrates obstacles so might not be closest achievable tank

• *Sound sensor* : detects closest moving tank (under 7 squares)
  • Returns direction to move on the shortest path toward the sensed tank
Tank Secondary Sensors

- Clock – glocal counter for all tanks
- Direction – the direction the tank is facing (north, south, east, west)
- Energy – current energy level
- EnergyRecharger – has value yes if tank is on an energy recharger
- Health – current health level
- Missiles – number of missiles the tank has
- My-color – the color of the tank
- Radar-distance – The distance the radar reached last time before blocked
- Radar-setting – The distance the radar has been set for radar-power command
- Radar-status – on/off
- Random – A random number 0.0-1.0 changes every cycle
- Resurrected – If tank died and resurrected has value yes
- Shield-status – on/off
- X / Y location on the map X 1(left)-14(right), Y 1(top) – 14(bottom)
Tank Actions

• Move
  • ^move.direction left/right/forward/backward/none ( indicates wait )
  • If tries to move by is blocked -100 health

• Rotate
  • ^rotate.direction left/right
  • All actions may be performed in parallel except move + rotate

• Fire

• Radar
  • ^radar.switch on/off
  • May fail if not enough energy -> ^radar-distance will by highest actually attainable level

• Radar range
  • ^radar-power.setting 1-14
  • The higher the level the more energy is used

• Shields
  • ^shields.switch on/off
  • Turning on costs 20 energy units. If not enough energy ^shield-status off
Tank Combat

- A tank destroys another tank by hitting it with missiles.
- A missile can damage any tank it hits (tank killed and recreated in the path of its own missile).
- Missiles fly at about 1.3 times as fast as tanks move.
- If a tank is hit when the shields are down (-400 health units).
- If a tank is hit when the shields are up (-250 energy units).
- If tank is hit on health charger or energy charger dies instantly.
- When a tank is killed it is resurrected randomly on an unoccupied square during next decision cycle.
Score

• A tank gets two points for each of its missiles that hits another tank while its shields are down.
• A tank gets three points for every tank it kills.
• A tank loses one point for each missile that hits it while its shields are down.
• A tank loses two points every time its killed.
• Tanks have an unlimited number of lives.
• The game ends when one of the tanks gets 50 points.
Tank Decision Cycle

• In Eaters, a new operator was selected on every decision
• Tanks perform extensive thinking
• TankSoar provides an alternative scheduler
• Every tank is run until it generates output commands
• 1-15 cycles
Human Approach: Mirror Neuron System [Rizzolatti]
Mirror Neuron System

- Imitation
- Intention Attribution
- Action Understanding
- Language Understanding

(Arbib, 2005; Rizzolatti, 1998; Buccino, 2004; Iacoboni, 2005; Carr, 2003)
Goal Mirroring
Efficient Online Goal Recognition for Continuous Environments

• Goal Recognition technique
• Inspired by hypothesized cognitive human recognition
• Utilizes a planner to generate plan hypotheses
• Efficient online recognition
• Tested in online, continuous env. using motion planners