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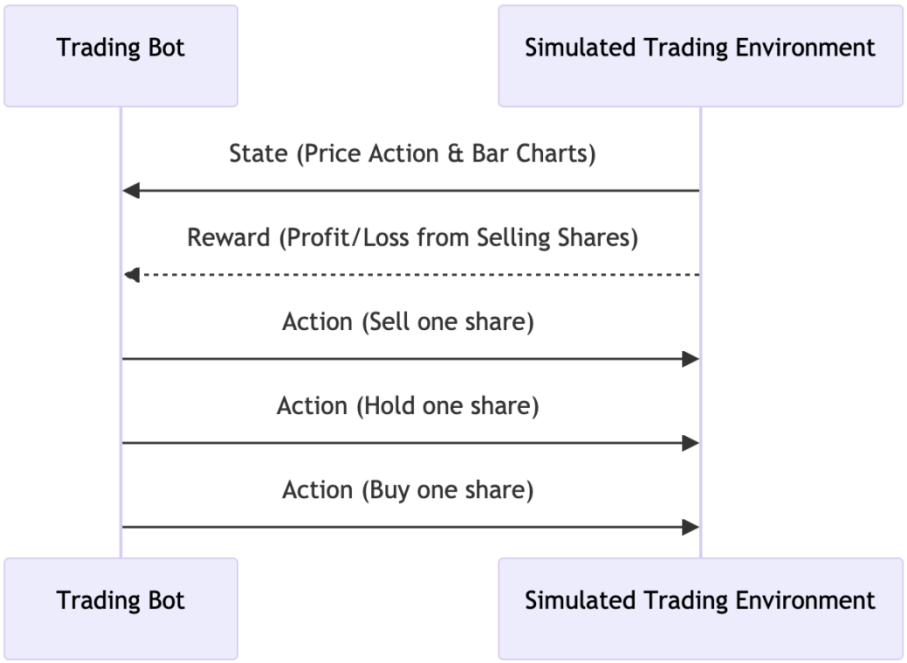
IS 160

Dr. Choi

Lab 10 RL Diagrams

Scenario	Stock Trading Bot
Agent	A Self Adjusting Trading bot that bases its decisions off of price action and bar charts
Action	Sell one share, Hold one share, Buy one share
Environment	A simulated stock market based off historical stock data in this case we will select QQQ a tech focused ETF
State	The state is represented by the current price of the share, the number of shares owned, and the cash on hand. State 1 (Price: $354, Shares 0, Cash $5000) Actions: {buy (0.6, -$354), hold (0.8, $0)} State 2 (Price: $353, Shares 1, Cash $4647) Actions: {buy (0.6, -$353), hold (0.7, $0), Sell (0.4, $353)} State 3 (Price: $352, Shares 2, Cash $4294) Actions: {buy (0.6, -$352), hold (0.7, $0), sell (0.4, $352)} State 4 (Price: $351, Shares 1, Cash $4646) Actions: {buy (0.6, -$351), hold (0.7, $0), sell (0.4, $351)} State 5 (Price: $350, Shares 2, Cash $4296) Actions: {buy (0.6, -$350), hold (0.7, $0), sell (0.4, $350)} State 6 (Price: $349, Shares 1, Cash $4647) Actions: {buy (0.6, -$349), hold (0.7, $0), sell (0.4, $349)}

	State 7 (Price: $348, Shares 2, Cash $4299) Actions: {buy (0.6, -$348), hold (0.7, $0), sell (0.4, $348)} State 8 (Price: $347, Shares 1, Cash $4648) Actions: {buy (0.6, -$347), hold (0.7, $0), sell (0.4, $347)} State 9 (Price: $346, Shares 2, Cash $4302) Actions: {buy (0.6, -$346), hold (0.7, $0), sell (0.4, $346)} State 10 (Price: $345, Shares 1, Cash $4648) Actions: {buy (0.6, -$345), hold (0.7, $0), sell (0.4, $345)}
Reward	The profit or loss made from selling shares

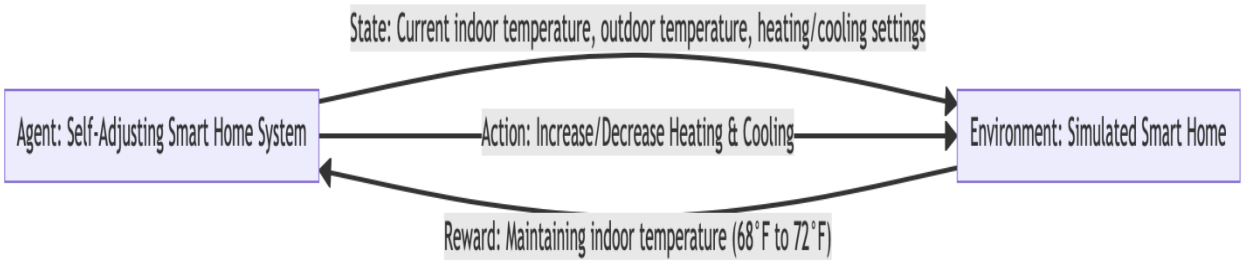


Stock Trading Bot Illustration

Scenario	Weather-Controlled Smart Home

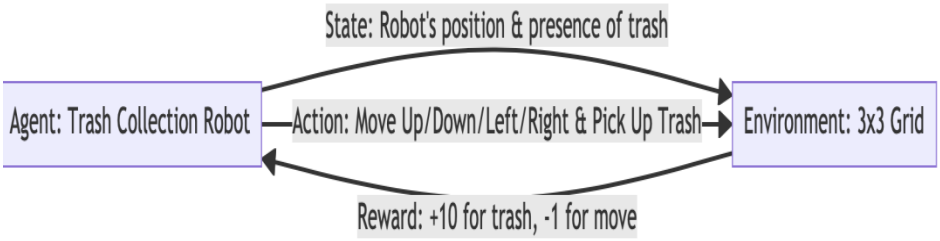
Agent:	A Self-Adjusting Smart Home System that bases its decisions on current weather data and forecasts to maintain a comfortable and energy-efficient indoor environment. Calculates how much each action will take
Action:	• Increase Heating • Decrease Heating • Increase Cooling • Decrease Cooling • Maintain Current Settings
Environment:	A simulated smart home environment where the weather conditions outside affect the temperature inside. The smart home system has access to current and forecasted weather data.
State:	The state is represented by the current indoor temperature, outdoor temperature, and the current settings of the heating/cooling system. • State 1 (Indoor Temp: 70°F, Outdoor Temp: 80°F, System Setting: Cooling Medium) • Actions: {Increase Cooling (0.8, -$5), Decrease Cooling (0.8, -$3), Maintain Current Settings (0.9, -$2)} • State 2 (Indoor Temp: 68°F, Outdoor Temp: 60°F, System Setting: Cooling Low) • Actions: {Increase Heating (0.8, -$4), Decrease Cooling (0.9, -$2), Maintain Current Settings (0.9, -$2)} • State 3 (Indoor Temp: 72°F, Outdoor Temp: 90°F, System Setting: Cooling High) • Actions: {Increase Cooling (0.7, -$6), Maintain Current Settings (0.9, -$3)} • State 4 (Indoor Temp: 65°F, Outdoor Temp: 30°F, System Setting: Heating High) • Actions: {Decrease Heating (0.8, -$3), Maintain Current Settings (0.9, -$5)}

	• State 5 (Indoor Temp: 74°F, Outdoor Temp: 95°F, System Setting: Cooling High) • Actions: {Increase Cooling (0.7, -$6), Maintain Current Settings (0.9, -$3)} • State 6 (Indoor Temp: 69°F, Outdoor Temp: 55°F, System Setting: Heating Low) • Actions: {Increase Heating (0.8, -$4), Decrease Heating (0.8, -$3), Maintain Current Settings (0.9, -$2)} • State 7 (Indoor Temp: 66°F, Outdoor Temp: 45°F, System Setting: Heating Medium) • Actions: {Increase Heating (0.8, -$4), Maintain Current Settings (0.9, -$3)} • State 8 (Indoor Temp: 75°F, Outdoor Temp: 100°F, System Setting: Cooling High) • Actions: {Increase Cooling (0.7, -$6), Maintain Current Settings (0.9, -$3)} • State 9 (Indoor Temp: 73°F, Outdoor Temp: 85°F, System Setting: Cooling Medium) • Actions: {Increase Cooling (0.8, -$5), Decrease Cooling (0.8, -$3), Maintain Current Settings (0.9, -$2)} • State 10 (Indoor Temp: 67°F, Outdoor Temp: 50°F, System Setting: Heating Low) • Actions: {Increase Heating (0.8, -$4), Decrease Heating (0.8, -$3), Maintain Current Settings (0.9, -$2)}
Reward:	• The reward is calculated based on maintaining an indoor temperature (e.g., 68°F to 72°F) while minimizing energy costs.



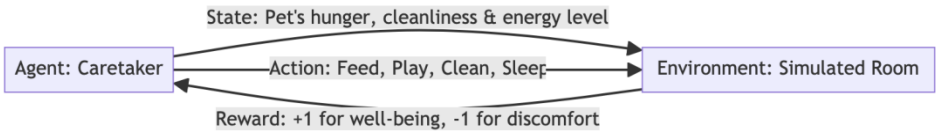
Scenario	Trash Collection Robot
Agent	A mobile robot tasked with collecting trash items scattered in a grid.
Action:	• Move Up • Move Down • Move Left • Move Right • Pick Up Trash
Environment	A 3x3 grid environment with some cells containing trash items.

State:	The state is represented by the robot's position within the grid and the presence of a trash item in that cell. • State 1 (Position: (1,1), Trash: Yes) • Actions: {Move Up (0.8), Move Right (0.8), Pick Up Trash (0.9)} • State 2 (Position: (1,2), Trash: No) • Actions: {Move Up (0.8), Move Right (0.8), Move Left (0.8)} • State 3 (Position: (1,3), Trash: Yes) • Actions: {Move Up (0.8), Move Left (0.8), Pick Up Trash (0.9)} • State 4 (Position: (2,1), Trash: No) • Actions: {Move Up (0.8), Move Down (0.8), Move Right (0.8)} • State 5 (Position: (2,2), Trash: Yes) • Actions: {Move Up (0.8), Move Down (0.8), Move Right (0.8), Move Left (0.8), Pick Up Trash (0.9)} • State 6 (Position: (2,3), Trash: No) • Actions: {Move Up (0.8), Move Down (0.8), Move Left (0.8)} • State 7 (Position: (3,1), Trash: Yes) • Actions: {Move Down (0.8), Move Right (0.8), Pick Up Trash (0.9)} • State 8 (Position: (3,2), Trash: No) • Actions: {Move Down (0.8), Move Right (0.8), Move Left (0.8)} • State 9 (Position: (3,3), Trash: Yes) • Actions: {Move Down (0.8), Move Left (0.8), Pick Up Trash (0.9)} • State 10 (Position: (2,1), Trash: No) (Revisited) • Actions: {Move Up (0.8), Move Down (0.8), Move Right (0.8)}
Reward:	• +10 for picking up trash items. • -1 for each move to encourage the robot to find the shortest path to collect all trash items.


State: Robot's position & presence of trash
Agent: Trash Collection Robot
Action: Move Up/Down/Left/Right & Pick Up Trash
Environment: 3x3 Grid
Reward: +10 for trash, -1 for move

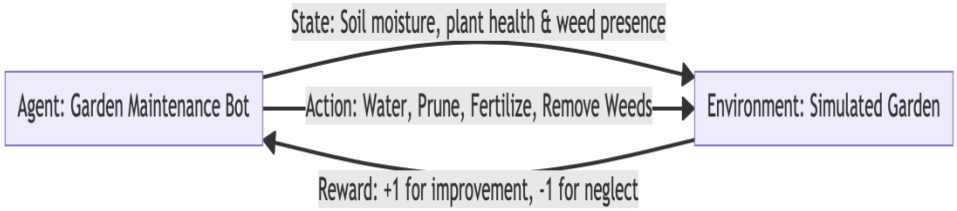
Scenario:	Virtual Pet Care
Agent:	A caretaker tasked with looking after a virtual pet.
Action:	• Feed Pet • Play with Pet • Clean Pet • Take Pet to Sleep
Environment:	A simulated small room where the pet lives.
State:	The state is represented by the pet's hunger level, cleanliness, and energy level. • State 1 (Hunger: High, Cleanliness: Low, Energy: High) • Actions: {Feed Pet (0.9), Clean Pet (0.8)} • State 2 (Hunger: Low, Cleanliness: Low, Energy: High) • Actions: {Play with Pet (0.9), Clean Pet (0.8)} • State 3 (Hunger: Low, Cleanliness: High, Energy: High) • Actions: {Play with Pet (0.9), Take Pet to Sleep (0.7)} • State 4 (Hunger: Low, Cleanliness: High, Energy: Low) • Actions: {Take Pet to Sleep (0.9)} • State 5 (Hunger: High, Cleanliness: High, Energy: Low) • Actions: {Feed Pet (0.9)} • State 6 (Hunger: High, Cleanliness: Low, Energy: Low) • Actions: {Feed Pet (0.9), Clean Pet (0.8)} • State 7 (Hunger: Low, Cleanliness: Low, Energy: Low) • Actions: {Clean Pet (0.8), Take Pet to Sleep (0.9)} • State 8 (Hunger: Low, Cleanliness: High, Energy: Medium) • Actions: {Play with Pet (0.9)} • State 9 (Hunger: Medium, Cleanliness: High, Energy: High)

	• Actions: {Feed Pet (0.9), Play with Pet (0.9)} • State 10 (Hunger: Medium, Cleanliness: Low, Energy: High) • Actions: {Feed Pet (0.9), Clean Pet (0.8)}
Reward:	• +1 for each action that improves the pet's overall well-being. • -1 for neglecting an action that leads to the pet's discomfort.



Scenario:	Garden Maintenance
Agent:	A garden maintenance bot tasked with keeping a small garden healthy and well-kept.
Action:	• Water Plants • Prune Plants • Fertilize Soil • Remove Weeds
Environment:	A small, simulated garden with various plants, soil quality, and occasional weed growth.
State:	The state is represented by the soil moisture level, plant health, and weed presence. • State 1 (Soil Moisture: Low, Plant Health: Good, Weeds: Yes) • Actions: {Water Plants (0.9), Remove Weeds (0.8)} • State 2 (Soil Moisture: Good, Plant Health: Good, Weeds: No) • Actions: {Prune Plants (0.7)}

	• State 3 (Soil Moisture: Good, Plant Health: Excellent, Weeds: No) • Actions: {Fertilize Soil (0.6)} • State 4 (Soil Moisture: Excellent, Plant Health: Excellent, Weeds: Yes) • Actions: {Remove Weeds (0.8)} • State 5 (Soil Moisture: Low, Plant Health: Fair, Weeds: Yes) • Actions: {Water Plants (0.9), Fertilize Soil (0.6), Remove Weeds (0.8)} • State 6 (Soil Moisture: Good, Plant Health: Good, Weeds: Yes) • Actions: {Remove Weeds (0.8), Prune Plants (0.7)} • State 7 (Soil Moisture: Excellent, Plant Health: Fair, Weeds: No) • Actions: {Prune Plants (0.7), Fertilize Soil (0.6)} • State 8 (Soil Moisture: Low, Plant Health: Poor, Weeds: Yes) • Actions: {Water Plants (0.9), Fertilize Soil (0.6), Remove Weeds (0.8)} • State 9 (Soil Moisture: Good, Plant Health: Fair, Weeds: No) • Actions: {Prune Plants (0.7), Fertilize Soil (0.6)} • State 10 (Soil Moisture: Good, Plant Health: Good, Weeds: No) (Revisited) • Actions: {Prune Plants (0.7)}
Reward:	• +1 for each action that improves the garden's overall condition. • -1 for neglecting an action that leads to the garden's deterioration.



Scenario:	Library Management

Agent:	A virtual library assistant tasked with managing book loans, returns, and reservations.
Action:	• Loan Book • Return Book • Reserve Book • Check Availability
Environment:	A small, simulated library with a number of books and a community of borrowers.
State:	The state is represented by the number of books available, the number of books loaned out, and the number of reservations. • State 1 (Available Books: 50, Loaned Books: 10, Reservations: 5) • Actions: {Loan Book (0.9), Check Availability (0.8)} • State 2 (Available Books: 49, Loaned Books: 11, Reservations: 5) • Actions: {Return Book (0.9), Reserve Book (0.8)} • State 3 (Available Books: 50, Loaned Books: 10, Reservations: 6) • Actions: {Loan Book (0.9), Check Availability (0.8)} • State 4 (Available Books: 49, Loaned Books: 11, Reservations: 6) • Actions: {Return Book (0.9)} • State 5 (Available Books: 48, Loaned Books: 12, Reservations: 6) • Actions: {Loan Book (0.9), Reserve Book (0.8)} • State 6 (Available Books: 47, Loaned Books: 13, Reservations: 7) • Actions: {Return Book (0.9), Check Availability (0.8)} • State 7 (Available Books: 48, Loaned Books: 12, Reservations: 7) • Actions: {Loan Book (0.9)}

	• State 8 (Available Books: 47, Loaned Books: 13, Reservations: 8) • Actions: {Return Book (0.9), Reserve Book (0.8)} • State 9 (Available Books: 46, Loaned Books: 14, Reservations: 8) • Actions: {Loan Book (0.9), Check Availability (0.8)} • State 10 (Available Books: 45, Loaned Books: 15, Reservations: 9) • Actions: {Return Book (0.9)}
Reward:	• +1 for successfully loaning or returning a book. • +0.5 for successfully reserving a book or checking availability. • -1 for unsuccessful actions (e.g., attempting to loan a book that's not available).