

CSCI 136: Fundamentals of Computer Science II

Artificial Intelligence 2

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Outline

- ▶ Case Based Reasoning Algorithm
- ▶ Fuzzy Parts of the Algorithm
 - Measuring Similarity
 - Deciding Next Action
 - Recording Results of an Action
- ▶ What Goes into the Case Base
- ▶ How to Generate a Case Base

Case Based Reasoning / Learning (CBR)

- ▶ Similar to how physicians and attorneys work
 - Look for similarities between the current situation and past cases
 - Find the N most similar past cases (N could be 1)
 - For each case,
 - Look at what action was taken
 - Look at whether that action was successful or not
 - If successful, take that action in the current case
 - If not... perhaps a random action
 - Record the current situation and action taken
 - When results of the current action are known, record that also (success or failure)

Measuring Similarity

- ▶ boolean: matches or it doesn't
- ▶ numeric: perhaps the (absolute value of the) difference
- ▶ position (point): Euclidean distance
- ▶ String: perhaps equals, perhaps contains

- ▶ Caveat: You may want to normalize all measures so they lie between 0 and 1.
 - If you don't, the numeric difference between say 100,000 ns. and 100,100 ns. is 100, and the distance between point 1,1 and 2,2 is $\sqrt{2}$, and it will seem like the case doesn't match because 100 is such a "large" number.
- ▶ Ultimately, you need to decide which features are important to measure similarity with (or not)

Deciding Next Action

- ▶ Could use:
 - Random choice
 - Based on a fallback strategy
 - Search through more cases
 - Have cases “vote”, choose the majority action
- ▶ But, you need to choose something, or your creature will time out after $\frac{1}{2}$ second and turn into an apple

Recording the Results of an Action

- ▶ Global Result:
 - Did my side win or lose?
- ▶ Local Result:
 - Did I spawn a minion?
 - Am I still alive?
- ▶ May need to wait a turn or two to record success or failure
- ▶ Again, you need to decide what the value of each result is

What's in the Case Base?

- ▶ Current Situation:
 - Things your creature can sense about the situation (see the javadoc API)
 - Things you can calculate from sensed information
- ▶ Action Taken:
 - Straightforward – there are only 8
- ▶ Result of Action:
 - Success or not – you will have to decide on levels of success or failure, and how far ahead in time you look.

How to Generate a Case Base

- ▶ Play against pre-defined creatures and save results
 - Flytrap, Rover, SuperRover
- ▶ Play against your own creature
- ▶ Will need a way to log and save everything once execution completes.
- ▶ Note: Your creature will not be allowed to read from file during competition, so your case base will need to be in Java code

Miscellany

- ▶ You can use the same case base for all your creatures
- ▶ You can use a similar structure to pass messages between your own creatures so you can get swarm behavior
- ▶ You can define different objectives/strategies for your creatures if you like – they will need to be able to distinguish what kind of a creature they are though

Summary



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