Production Systems

Components of a production system
- Working memory
- Set of production rules
- Rule interpreter

Example: shapes knowledge base
Example contexts

A Production System
1. Working memory
   - Current state of the world
2. Set of production rules (KB)
   - Condition action pairs (IF THEN)
   - Condition part matched against working memory
   - Action part defines the associated problem solving step if the condition is true
3. Recognize-Act Cycle (Algorithm/Interpreter)
   - Initialize working memory with problem start
   - Repeat examining rules and taking action until the problem is solved or nothing new can be concluded

Example Rule Interpreter Algorithm
1. If the context contains an attribute-value pair whose attribute is the goal attribute, then stop and output the associated value.
2. Find all productions (rules) whose antecedent attribute-value pairs are in the context and mark them applicable.
3. Deactivate any production which will not add a new attribute-value pair to the context.
4. If no productions are applicable then stop and print the message: “Identification unknown”.
5. Execute the action of the lowest numbered (or only) applicable production.
6. Reset the applicability of all productions and return to Step 1.

Shape Rules
1. (IF (sides parallel) THEN (family parallelogram))
2. (IF (sides skew) THEN (shape trapezoid))
3. (IF (sides curved) THEN (family ellipsoid))
4. (IF (angles right) THEN (family rectangle))
5. (IF (family parallelogram) (angles skew) (lengths equal) THEN (shape rhombus))
Shape Rule Base

1. (IF (family parallelogram) (angles skew) (lengths unequal) THEN (shape parallelogram))
2. (IF (family rectangle) (lengths equal) THEN (symmetrical t) (shape square))
3. (IF (family rectangle) (lengths unequal) THEN (shape rectangle) (symmetrical t))
4. (IF (family ellipsoid) (axes unequal) THEN (shape ellipse))
5. (IF (family ellipsoid) (axes equal) THEN (symmetrical t) (shape circle))
6. (IF (family parallelogram) (angles skew) (lengths equal) THEN (shape rhombus))
7. (IF (family parallelogram) (angles skew) (lengths unequal) THEN (shape parallelogram))
8. (IF (family rectangle) (lengths equal) THEN (symmetrical t) (shape square))
9. (IF (family rectangle) (lengths unequal) THEN (shape rectangle) (symmetrical t))
10. (IF (family ellipsoid) (axes unequal) THEN (shape ellipse))
11. (IF (family ellipsoid) (axes equal) THEN (symmetrical t) (shape circle))

Rules for Animal Identification

1. (IF (covering hair) THEN (subclass mammal))
2. (IF (milk t) THEN (subclass mammal))
3. (IF (covering feathers) THEN (subclass bird))
4. (IF (flies t) (eggs t) THEN (subclass bird))
5. (IF (eats meat) THEN (order carnivore))
6. (IF (teeth pointed) (claws t) (eyes forward) THEN (order carnivore))
7. (IF (subclass mammal) (hoofs t) THEN (order ungulate))
8. (IF (subclass mammal) (hoofs t) THEN (order ungulate))
9. (IF (subclass mammal) (hoofs t) (stomachs several) THEN (order ungulate))
10. (IF (subclass mammal) (hoofs t) (stomachs several) THEN (order ungulate))
11. (IF (subclass mammal) (hoofs t) (stomachs several) THEN (order ungulate))
12. (IF (subclass mammal) (hoofs t) (stomachs several) THEN (order ungulate))
13. (IF (subclass mammal) (hoofs t) (stomachs several) THEN (order ungulate))
14. (IF (subclass mammal) (hoofs t) (stomachs several) THEN (order ungulate))
15. (IF (subclass mammal) (hoofs t) (stomachs several) THEN (order ungulate))
16. (IF (subclass mammal) (hoofs t) (stomachs several) THEN (order ungulate))
17. (IF (subclass mammal) (hoofs t) (stomachs several) THEN (order ungulate))
18. (IF (subclass mammal) (hoofs t) (stomachs several) THEN (order ungulate))
19. (IF (subclass mammal) (hoofs t) (stomachs several) THEN (order ungulate))
20. (IF (subclass mammal) (hoofs t) (stomachs several) THEN (order ungulate))

Contexts for Animal Rule Base

1. (covering feathers) (swims t) (wings swimming) (feet webbed) (files f)
2. (covering hair) (eats cud) (legs long) (color tawny) (spots dark) (antlers none) (neck long)
3. (covering hair) (eats meat) (color tawny) (teeth pointed) (claws t) (eyes forward)
4. (eats cud) (milk t) (toes even) (antlers hornlike)
5. (covering hair) (eats meat) (color tawny) (spots dark)