Rule-based Systems

IE562 Computational Foundations of Smart Systems

Juxihong Julaiti

Sep, 2018

Outline

- Rule-based Systems
- Forward and Backward Chaining
- Packer
- Identifier
- PyKown
- Homework

Rule-based Systems

Major components:

- Rule base (Brain)
- Database of facts (State or observations)
- Inference engine (a function that maps state to conclusion(s) using “brain”)

RBS: facts->conclusions via. a match-resolve-act cycle

Similar to a mathematical function

$f(x): \mathbb{R} \rightarrow [0,1]$ $\mathrm{f(x)} = \begin{cases} 1 & \text{x>=0} \\ 0 & \text{x<0} \end{cases}$

Or mathematical proofs:

- Given conditions, expand the conditions, until goal is reached

Forward and Backward Chaining

- FC
  - Start from facts (LHS)
  - Check rules (RHS)
    If LHS matches RHS (triggered): execute the action (fired), update the LHS
    If the goal is reached: stop
    else if: LHS is not updated, stop
    else: check rules

BC:

  - Start from hypothesis
  - Check facts:
    - If facts support the hypothesis: stop
    - If need to check another hypothesis: check facts against it
    - Else: stop

Packer

- Observations/facts/state:
  - Suitcase content
  - Suitcase space size
  - Mound
  - Essentials
  - Articles
  - Article size
  - Mate
  - Step (checking or putting)
- Rule base:
  - 6 rules, see the lecture note
- Inference engine:
  - match-resolve-act cycle

Identifier

- Observations/facts/state:
  - If each of the hypothesis/evidence is true or unknown
    - Final hypothesis
    - Intermediate hypothesis
    - Evidences
- Rule base:
  - 10 rules, see the lecture note
- Inference engine:
  - match-resolve-act cycle

PyKown and Homework

- PyKnown: Check notebook and documentation
- Homework: Will be sent out tonight