

CSC 425/525 Homework #5 (Chapter 8)

Due: Monday, February 27

Word process all answers. Figures may be hand drawn. Undergraduates, answer questions 1 and 2 and three others. Graduate students answer all six questions.

1. For each of the following problems, identify the problem solving category that it most closely matches (from slides 3-4 from the chapter 8 power point notes). If it matches multiple ones, say so and if matches none, say so. Explain your answers.
  - a. A teacher grading homeworks
  - b. A train conductor trying to decide when to start decelerating as a train is about to enter a depot.
  - c. A person trying to remove a flat tire and replace it with a spare tire.
  - d. A driver trying to avoid bad traffic on I-75 by looking for an alternate route.
  - e. A police detective trying to piece together the clues of a murder.
  - f. Mark Watney (from the book/movie The Martian) trying to figure out a way to make his food rations last longer.
2. Study the disease hierarchy in slide 16 and the classification hierarchy in slide 17 of the chapter 8 power point notes. Define your own hierarchy that could be used (by an expert system or a person) to debug types of logical errors in computer programs. For instance, errors might be “wrong output”, “does not terminate”, “terminates abnormally” and within these perhaps errors for “wrong output” like “incorrect computations”, “reversed logic”, “reading wrong data file”, etc. Do not try to make a complete hierarchy but come up with one that is at least 3-4 layers deep with at least 15 total nodes.
3. We want to build an expert system that can automatically generate new programs given a case library of previous programs. This is a planning system, similar to Chef (although program coding is no doubt more complicated than cooking!) How would this problem differ from what Chef did? Consider slide 28 from the chapter 8 power point notes and specifically how would the anticipator, retriever, modifier and storer all differ (if at all) in this new domain? Would you suggest using entire programs for the case (plan) library or just portions of code (such as individual loops, individual if-else clauses, individual functions/methods, etc)?
4. We want to build an expert debugging program that can determine if a loop will terminate or not. Our choices are to implement this system using rules, model-based reasoning, functional reasoning, or case-based reasoning. Which would you suggest and why? Your answer should compare the capabilities of the different approaches.
5. Consider the following problem. You want to clean your kitchen including beneath your appliances. You plan on cleaning the surfaces (table and counter tops, which might result in things falling onto the floor), sweeping the floor and mopping. In your kitchen is a kitchen table and chairs plus a refrigerator and a stove. Moving any item may result in making the area dirtier than it was.

- a. Provide STRIPS-like operators for the various steps involved in cleaning the kitchen. For each, indicate its pre- and post-conditions.
  - b. For this problem, can we use linear planning like STRIPS or would we need to use non-linear planning? If the former, provide an example of carrying out the cleaning steps the results in everything being cleaned. If the later, example with an example.
6. Research one of the following expert systems and provide details that include: What problem did it solve and in what domain? What representation(s) and problem solving methodology(ies) did it use? How long did it take to construct? How successful was it? You can provide more information if you can find it.

Aircyl

CADUCEUS

Dendral

Internist

MACSYMA

MDX or MDX 2

Molgen

MPA (mission planning assistant)

ONCONCIN

PIP

Prospector

Reactor

RedSoar (a revised version of an earlier system called Red)

SOPHIE