Lab 2 Symbolism

This lab consists of 2 parts. You can use either CLIPS or Prolog to finish this lab. You may use different programming languages for different parts, but you may not use different programming languages in the same part.

Part 1 Logical Problems (25%)

1. Crossing River (5%)

Eight people come to the edge of a river, including a policeman, a criminal and a family of six people, which consists of a father, a mother, two sons and two daughters. They need to cross the river. There is a boat at the river's edge, which can carry two people at a time. Only the policeman, the father and the mother can row.

When crossing the river, the following situations must be avoided. The situations can happen on either edge of the river or on the boat.

(1) If the policeman is not with the criminal, the criminal will harm the family of six people.

(2) If the father is not with the mother, the mother will scold the sons.

(3) If the mother is not with the father, the father will scold the daughters.

Write code to figure out how to make all eight people arrive safely on the other side of the river. You should find the optimal way, i.e. the way with the minimum crossing times.

2. Einstein's Puzzle (10%)

Variations of this riddle appear on the net from time to time. It is sometimes attributed to Albert Einstein and it is claimed that 98% of the people are incapable of solving it. Some commentators suggest that Einstein created such puzzles not to test out intelligence but to get rid of all the students who wanted him as an advisor. It is not likely that there is any truth to these stories. Wherever this comes from, it is a nice riddle.

With Prolog, this riddle can easily be solved.

(1) There are five houses of different colors next to each other on the same road. In each house lives a man of a different nationality. Every man has his favorite drink, his favorite brand of cigarettes, and keeps pets of a particular kind.

(2) The English lives in the red house.

(3) The Swedish keeps dogs.

(4) The Danish drinks tea.

(5) The green house is just to the left of the white one.

(6) The owner of the green house drinks coffee.

(7) The Pall Mall smoker keeps birds.

(8) The owner of the yellow house smokes Dunhill.

(9) The man in the center house drinks milk.

(10) The Norwegian lives in the first house.

(11) The Blend smoker has a neighbor who keeps cats.

(12) The man who keeps horses lives next to the Dunhill smoker.

(13) The man who smokes Blue Master drinks beer.
(14) The German smokes Prince.
(15) The Norwegian lives next to the blue house.
(16) The Blend smoker has a neighbor who drinks water.
The question to be answered is: Who keeps fish?

3. Which Car Do Each Man Own? (10%)

Read the following information.
George is a mechanic. His co-workers, Jimmy and Tito, and their friend Doc often hang out together and talk about their cars. In no particular order, one of the men owns a Ford, one owns a Chevrolet, one owns a Dodge, and one owns a Toyota. They also talk about their gas mileage, and which of their cars is most fuel-efficient. One of the cars does really well and gets 30 miles per gallon of gasoline. Another of the cars gets 25 miles to the gallon. Another car gets 20 miles per gallon. And the last car gets only 15 miles per gallon.
When they talk about their cars, all four of the friends are truthful when they speak about who owns which car. However, the two men whose cars have the lowest gas mileage (20 and 15 mpg) are a little embarrassed and will always lie when they talk about gas mileage, whether they are talking about their own car or their friends' cars. The two men who get the highest gas mileage (25 and 30 mpg) have nothing to hide and will always tell the truth about who gets what mileage, no matter which friend they're talking about.
One night in a bar, the following conversation was heard.
Tito said: Doc gets 20 miles per gallon of gas. George's gas mileage is better than Jimmy's.
Jimmy said: Doc doesn't drive a Toyota. Tito's gas mileage is higher than the guy who drives the Dodge.
George said: The guy who owns the Ford is getting 30 miles per gallon. The guy who gets 20 miles per gallon doesn't own a Chevrolet.
Doc said: My gas mileage is 20 miles per gallon.
Question: What kind of car does each man drive and what gas mileage (mpg) does each car get?
Your answer should be in the following order: George, Doc, Tito, Jimmy.

Part 2 Expert System (75%)

Design and implement a prototype of expert system. You can choose what kind of expert system you attempt to develop by yourself, but should discuss the system and its functionalities with the teacher by personal communication. The system must contain at least fifty rules and can answer five different types of questions. You are encouraged to be creative in choosing your topic.
Grading:
(1) The implemented code of expert system (including five use cases): 30%.
(2) The scale of the knowledge base and the difficulty of the problem: 20%.
(3) Interface design of the system (usability and friendliness): 10%.
(4) Document: 15%.

Documents

1. You should write a document for each part of this lab (one document for part 1 and one document for part 2). You can use either English or Chinese to write your documents.
2. The document for part 1 should contain the following: which language do you use (CLIPS or Prolog), how do you solve each problem, and how to run your programs. You should also write the answer for each problem in natural language in your document.
3. The document for part 2 should contain the following: which topic do you choose for your expert system, what functionalities does your expert system contain, and how to use your expert system.
4. If you have any creative thoughts, you are welcome to write them in your documents.

Interview and Hand in

There will not be an interview for part 1 of this lab. However, if there is trouble in running your program, an interview may be necessary.

You should hand in your codes and documents for part 1 to ftp://10.132.141.33/classes/14/161 智能系统原理与开发/WORK_UPLOAD/Lab2_Part1. All the files to be handed in should be packed into a zip or rar file with your student ID and name as the file name (e.g., 14302010005-姜卓立.rar).

Deadline for part 1: 23:59 November 20th, 2016.

Late submission for part 1: 5% penalty per 12 hours. No marks for submitting 60 hours after deadline.

There will be an interview for part 2 of this lab for everyone. You can come to the interview at any time during the interview time period available. Make an appointment with your TAs to make sure that they are available.

After the interview, you should hand in all the code and documents for this project to ftp://10.132.141.33/classes/14/161_智能系统原理与开发/WORK_UPLOAD/Lab2_Part2. All the files to be handed in should be packed into a zip or rar file with your student ID and name as the file name (e.g., 14302010005-姜卓立.rar).

The following are the matters needing attention.

1. Deadline for interview is 21:00 December 12th, 2016. If you do not attend the interview on time, you will not get marks for part 2. So DON'T BE ABSENT!

2. Deadline for hand in is 23:59 December 12th, 2016. Make sure that you hand in all the required files before deadline, or you will not get marks for part 2.

3. Everyone has ONLY ONE chance of interview, and NO DEBUGGING IS ALLOWED during the interview. Make sure that you are well prepared before attending the interview.

Caution: No plagiarism is permitted. If spotted, both plagiarist and the one being plagiarized will get 0 marks for this lab and lose 5 marks in the total score of this course. We recommend those who would like to plagiarize not to submit their code.

If you have any question for this project, contact your TAs Haoyuan Peng (15212010016@fudan.edu.cn) or Yi Chen (15212010033@fudan.edu.cn).