CPSC 449: Prolog Assignment

Winter 2021

Due: Thursday, April 15th (2021) at 11:59 PM midnight
(no late submissions this time!)

For this assignment you are expected to develop the last two programs of the exercise sheet which are collected below. In addition, as a mini project, you are asked to develop an English sentence parser/generator using a definite clause grammar system.

You should, as usual, comment your code indicating, in particular, from where you got the solution if it is not your own or the idea, in the case of the parser.

Please name your predicates according to what is prescribed below.

1. Write a Prolog program to solve the following logic puzzle. There are five houses in a row, each of which are a different color and are owned by men of different nationalities, who own different pets, prefer different drinks, and play a different sport.

(a) The Irishman lives in the first house on the left.
(b) The man who plays baseball lives in the house next to the man who keeps a tiger.
(c) The occupant of the house, next to the house where the owner rides a horse, plays soccer.
(d) The squash player drinks gin.
(e) The Frenchman plays rugger.
(f) The Irishman lives next to the blue house.
(g) The Englishman lives in the red house.
(h) The Spaniard is often seen taking his dog for a walk.
(i) Beer is brewed (and drunk in large quantities) in the green house.
(j) The Scotsman drinks whiskey and is often tipsey.
(k) The green house is immediately to the right of the white house.
(l) The tennis player owns snakes.
(m) Soccer is played in the yellow house.
(n) A lot of wine get consumed in the middle house.

Who owns the hamster? Who drinks orange juice?
2. Solve the Josephus problem.

Josephus, a Jewish historian living in the 1st century was in the siege of Yodfat. He found himself with an accomplice as one of \( n \) soldiers trapped in a cave by the Romans. The soldiers after some discussion chose suicide over capture and settled on a serial method of committing suicide by drawing lots. They stood in a circle and counted down clockwise from a given number \( N \) (and a starting position): the man who uttered 0 then killed himself and the circle as a result shrank and the whole procedure was repeated starting at the man who stood (clockwise) next to the spot just vacated.

Josephus states that by luck – or possibly by the hand of God – he and his accomplice remained until the end. Then, when only he and his accomplice were left alive, they decided the whole suicide pack business was a bit crazy, and that they had a much better idea: they would surrender to the Romans!

The problem is where in a circle of \( n \) men given a countdown from \( N \) should Josephus and his accomplice place themselves?

3. Develop a natural English language parser/generator to/from a parse tree using the definite clause grammar rules of Prolog. The system should be no more than 100 lines of code (excluding vocabulary and examples). Your system should, in particular, account for noun subject agreement and different tenses. To develop this you can search the internet for examples of such systems to get you started. However, it is your responsibility to modify the system and to provide the vocabulary, and to demonstrate the versatility of the system through examples.

This will be a hand graded mini-project!