CSC 3310 Concepts of Programming Languages

Fall 2017

Assignment Name	Prolog Programming Assignment
Due Date	November 22nd, 2017
Delivery Method	Through Canvas Only
Points	10% of final grade

Motivation

Artificial Intelligence has gotten more attention in recent years. There are more AI tools available to the public than ever before: Alexa, Siri, etc. not to mention services like Google Cloud Machine Learning, Deep Learning on AWS, IBM Cognitive, etc. One of the early attempts to deal with AI was the development of "AI specific" languages. This is the case of Prolog, a declarative language that stores facts and rules (and other constructs as well), and has an interface where the user can query and make questions that Prolog's engine will answer inferring from the facts and rules that where stored.

Another motivation for this assignment is to expose students to a completely different paradigm of programming. Up to this moment, most of the students have been working and coding with imperative and object oriented languages, and a declarative language should pose a new challenge, as it requires a different way to think.

Description

Write a Prolog program that stores information about geometric objects. You must construct the geometric objects basing on simpler forms. The objects to construct are:

- 2D Point
- Segment, can be represented by two 2D Points, or one 2D Point, a slope and a length
- Square
- Rectangle
- Circle

The program must be able to answer the following questions:

English	Prolog

Is this segment parallel to this other line?	`parallel(`
	`segment(point2d(x,y), point2d(x,y)),`
	`segment (point2d(x,y), point2d(x,y)))`

Is this segment perpendicular to this other line?	`perpendicular(`
	`segment (point2d(x,y), point2d(x,y)),`
	`segment (point2d(x,y), point2d(x,y)))`

Is this segment contained in this polygon?	`contained(`
	`segment(point2d(x,y), point2d(x,y)),`
	`circle(point2d(x,y),r))`

Is this polygon contained in this other polygon?	`contained(`
	`square(point2d(x,y), length),`
	`circle(point2d(x,y),r))`

English	Prolog

Does this polygon intersects this other polygon?	`intersects(`
	`square(point2d(x,y), length),`
	`circle(point2d(x,y),r))`

Is this segment vertical?	`vertical(segment (point2d(x,y), point2d(x,y)))`
Is this segment perpendicular?	`perpendicular(segment(point2d(x,y), point2d(x,y)))`
Is this point on the figure?	`on(point2d(x,y), segment(point2d(x,y),` `point2d(x,y)))`
Is this point in the figure?	`in(point2d(x,y), circle(point2d(x,y),r))`

Assignment Requirements

- Good programming practices
    - Meaningful atoms and rules naming
- This is an strictly individual assignment
- The program must create the objects indicated at the end of this document, failure to create these objects will have a negative impact on the grade, and this is because the test queries are going to be based in these objects.
- Use the rules names given in the table above.

Delivery Method

- Files to be uploaded
    - figure2d.pl   [You MUST name your program this, failure will result in zero grade]
- Uploaded in Canvas

Assessment and Grading

Assessment will consider the following factors in the grading of the project:

- Adherence to instructions
- Correct function of the program
- No runtime errors
- Late deliveries will have a zero mark
- Plagiarism will have a double zero mark (in addition to losing 15% of your final grade, the group that plagiarizes will lose an additional 15% of their final grade), besides there will be a report filed in the students' academic record.
- Each program will be loaded in Prolog and test it to check if the functions are in working order.

Extra Challenge (13 points, 3 bonus points)

Use Prolog more advance features in this project: Lists, IO and Structures. You will need to send the test queries to try your code while grading.

Create at least these objects:

```
segment(point2d(5, 4), point2d(5, 5))
segment(point2d(4, 12), point2d(6, 10))
rectangle(point2d(9, 16), point2d(16, 14)) %Upper Left and Lower Right corners
rectangle(point2d(3, 6), point2d(10, 3)) %Upper Left and Lower Right corners
square(point2d(3, 13), 4) %Upper Left corner and length of side
square(point2d(11, 6), 2) %Upper Left corner and length of side
circle(point2d(12, 4), 3) %Center, radius
point2d(12,2)
point2d(4, 13)
point2d(20 ,1)
```