# Second Laboratory Assignment Guide

Artificial Intelligence
2009/2010 Fall Term

2 de noviembre de 2009

## Introduction

The goal of this assignment is to deal with a problem that needs expert knowledge to be solved. To solve the problem it is necessary to address problems of analysis and or synthesis

The specific goals of this assignment are:

- To analyze the nature of the problem and to identify the sources of knowledge that are needed to solve the problem.
- To use the methodology for the analysis and implementation of knowledge based systems explained in the theory classes.
- Formalize and represent the knowledge needed to solve the problem. A methodological approach to the building of the ontology has to be used ant the decisions taken have to be properly justified. The result has to be an ontology that can be used for the solution of the problem.
- To identify the kind of problem solving methodology more adequate for the problem and to define the solution of the problem using this methodology.
- To implement the solution of the problem using a rule based language.
- To apply the software engineering methodologies for rapid prototyping and incremental development
- To choose adequate and demonstrative test cases to show the functioning of the solution and to explain the results of the tests.
- To have contact with languages for knowledge representation and knowledge based systems development. A certain proficiency and maturity on the use of the CLIPS language has to be shown.

With respect to the **evaluation** of the assignment, you have available a rubric with the criteria that will be used and a description of the grade levels of each criteria.

## First week: CLIPS/Assignment description (November 9th)

This first week has to be devoted to read and comprehend the assignment description and to have the fist contact with the CLIPS language.

You have to use this week to read the documentation about the CLIPS language and to look into the simple examples that you have available. You have a FAQ (in spanish/catalan) linked from

laboratory web page. This FAQ has been elaborated by past students from the course and probably will answer the majority of your questions during the development of the assignment, you also have some practical advice about how to develop your program.

You have to keep in mind that CLIPS is different from the programming languages you are used to, because of that, is important that you get acquainted with the language as early as you can and look into the examples. This will save you time when you start the development of the assignment.

While you are making yourselves comfortable with the language it would be interesting that you start thinking about the domain of the assignment and on the ontology that you will need.

You can start designing it on paper, thinking about the concept and attributes that could be interesting to have. You can read the paper "Ontology Development 101" that you have in the theory web page on the additional material on theme 3 to have some points about what methodology use.

If it was important during the first assignment to plan your work ahead, in this assignment it is even more important. Do not let the time pass and start working too late, seriously.

## Second week: The specification of the problem (November 16th)

This week is assigned for the specification of the problem. You need to have a clear vision about the elements that you will need to build the ontology for the domain of the assignment. Given that the idea is to use an incremental development approach it has not to be the final ontology.

This week in the laboratory class the functioning of the CLIPS environment will be explained. It is important that you look into the examples that you have available, specially the solutions of past semesters assignments. You can also try to execute them, the description of the assignments they correspond to are available on the "other material" web page.

This week the tool Protègè will also explained. It is fairly easy to use. You can use it to design the ontology and to export it to the language that CLIPS uses. You can also generate the documentation of the ontology exporting it to HTLM. It exports the ontology hierarchy and the description of the classes and attributes. Obviously you have to include the documentation of every element in Protègè first.

You can also browse the ontologies of past semesters assignments.

Before beginning the development of the ontology read first the documentation available about how to develop an ontology.

## Third week: The ontology (November 23rd)

During this week you should have a good idea of what are you going to include in the ontology. As it was said before, it has not to be the final version, probably you will need to make some changes while development advances.

You will need also to create some instances. It is not necessary to include all the instances you need from the beginning. You can have as first goal to solve a limited set of simple problems and to decide what concepts from the ontology will be required, creating the instances accordingly.

Keep always in mind the philosophy of incremental development, divide the problem in modules and subproblems and focus on building an initial functioning prototype that you can extend to the final system.

## Fourth week: Subproblems decomposition/Initial prototype (November 30th)

One of the key point to start the implementation of the system is to obtain a decomposition of the problem in subproblems that give the different steps that lead to a solution.

You should keep in mind that some of the problem solving methodologies explained in theory classes has to be applied in the implementation of the assignment. This means that the problem decomposition has to be embedded in the phases of these methodologies. You can use the methodologies as a guide form the decomposition.

When you write the assignment report you will have to explain the decomposition of the problem (conceptualization) and how the subproblems are embedded in the problem solving methodologies (formalization).

From this decomposition you can implement a few rules that solve a simplified version of the problem. This will be the initial prototype that will allow you to evaluate the decisions taken so far and give some guidance about how to extend and complete it. The goal of this initial prototype is to detect in the early stages of development any problems in the ontology or in the design of the system.

It is a good idea to choose some test cases that the system should be able to solve and focus the development in creating the rules to solve them.

## Fifth week: Extension of the prototype (December 7th)

At this time you should have a pretty good idea of the design of the system and should have validated all the design decisions taken.

- The ontology should be final
- The problem decomposition should have resulted in the rule modules of the system
- You should have a set of test cases to develop the initial prototype and its extensions

From now on you have to extend the prototype to include new cases. The cases should be chosen in order to obtain a set of test cases diverse enough to test the different possible scenarios of the problem.

Do not forget to work on the assignment report, it is not a good idea to wait until the last moment. You can start documenting the final ontology, do not only describe its classes and attributes, explain how you designed it, indicate the necessary justifications for your decisions and do not omit any decision you have made.

## Sixth week: Final prototype (December 14th)

At this time all the design decisions should be final.

You should think about the test cases and see that the result that the system gives are correct. The test cases should be representative of the different scenarios that the problem can have and your system can solve.

The test cases should be diverse enough respect the possible elements from the domain and their complexity. You can use these test cases also as the test cases you will show in the documentation of the assignment, so you are killing two birds with a stone. Save the results that you obtain and document them adequately. You should be able to explain the results of the test from the knowledge that has the system and the information that represent the case.

Do not forget about the documentation, do not let the time pass and think that it has to show the work you have done.

## Seventh Week: Test cases and documentation (December 21st)

This week you need to have the results of the test cases that you have decide to include in the documentation. The results have to be documented adequately, explaining the test case and the results that the system obtain.

The rest of the documentation has to describe the development of the assignment. The documentation has to be structured following the phases of the development methodology that has been explained in theory class.