

# Travel Report

Project DSLpc

23th September, 2008

## **Travel Details**

### **Destination**

University of Maribor,  
Slovenia

### **Date**

19 September - 22th September, 2008

### **Visitors**

Pedro Rangel Henriques, Universidade do Minho (Portugal)  
Maria João Varanda Pereira, Instituto Politécnico de Bragança (Portugal)  
Daniela da Cruz, Universidade do Minho (Portugal)

### **Travel Purpose**

The purpose for this visit was to follow up the project “Program Comprehension for Domain Specific Languages”.

### **Financial Support / Grant**

This visit was supported by: FCT – Departamento das Relações Europeias, Bilaterais e Multilaterais (previously GRICES).

## **Travel Report synthesis**

### **Aims & Objectives**

The specific objectives for this travel were:

- to follow up the work on research direction one, including the final revision of the paper to submit to ComSis journal;
- to clarify some basic definitions related with cognitive dimensions;
- to continue the discussion about the difference between program comprehension and program understanding;
- to plan the work on research direction two;
- to sketch the next papers.

### **Achievements**

The objectives above were fulfilled as detailed in next section;

## Travel Report details

In the first day, the paper *Program Comprehension on Domain Specific Languages*, to submit to ComSis Journal, was discussed in detail taking into account the proof-reading by a english native speaker. After careful revision, the paper is now submitted.

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The main differences between *program understanding* and *program comprehension* were discussed again. It was said that *program understanding* is more concerned with software engineering tasks, like software maintenance and that *program comprehension* is just related with the comprehension of a program, with no specific goal. Anyway, it was concluded that program understanding is needed to program comprehension (is a step necessary to fully comprehend a software system); so we decided to keep the title and the area of work of this project in the context of *program comprehension*.

Another discussion topic was the relationship between the Cognitive Dimension Framework (CDF) and the usability of DSLs. Starting with the statement on slide 12 (title: DSLpc project - how easy is to understand DSL prgs) *The CDF has been used to assess the usability of visual programming languages, while no such study exists for DSLs. Our purpose is to identify the aspects among the CDF that enhanced in the context of DSL.* some basic ideas and concerns were clarified.

The concept of *usability* is used in our context in the sense of whether it is easy to learn the language, to develop a program, and to evolve a program. So, as it is not the common sense, we have decided, instead of “usability”, to talk about the “use” of DSLs.

Concerning the dimension *abstraction gradient* the following definition was accepted:

An abstraction is a grouping of elements to be treated as one entity, whether just for convenience or to change the conceptual structure. Programming languages can be grouped as abstraction-hating, abstraction-tolerant, or abstraction-hungry, based on their minimum starting level of abstractions and their readiness or desire to accept further abstraction.

Considering this definition, we considered (in the table) that the influence is zero, this is, we don't know its influence.

We sustain an additional discussion on some other dimensions of the CDF, namely *error-proneness* and *abstraction gradient*, in order to make them

clearer.

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The questions to study the use and comprehension of DSLs were extended to cope also with GPLs. Also, new concrete questions were introduced, corresponding to the templates accorded previously (Braga meeting).

For each question-template there were created 2 instances at DSLs level and at GPLs level. In the case of DSLs, they are in different domains.

We have agreed that it is important that each inquired student answers both questions about DSL and GPL, however they should refer to different domains. For example, a student that have to answer questions about the *sound system* in DSL case, should answer questions about the *menu* in case of GPL.

After a long discussion, we also concluded that it would be better to have 3 different groups to answer the questions: one to answer only about DSLs questions; another one to answer only about GPL questions; and another one to answer to both DSLs and GPL questions.

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After those preliminar topics, we started one of the main goals for this meeting. We went through the actual text of each question in order to relate each one with cognitive dimensions to fulfil the table 1 conceived during Braga meeting but not completed.

The items below map the *question type* mentioned in the table 1 into the text of the respective concrete question.

- (a)Syntax — Please select syntactically correct statements.
- (b)Semantics — Please select program statements with no sense (unreasonable).
- (c)Meaning — Select valid program with given result.
- (d)Understanding — Please select correct results for the following program.
- (e)Meaning — Please calculate and select number results.
- (f)Compare — Select programs with same result.
- (g)Expand — Expand program with new functionality.
- (h)Remove — Remove functionality from program.

- (i)Replace — Change functionality of a program.

After building and filling this table and discussing it, we conclude that we need two more questions: to test *secondary notation* (tip: use question similar to comprehension but using comments inside); to test *consistency* (tip: use question similar to comprehension also). We also conclude that we will not measure dimension *progressive evaluation*, because it requires tools. Hopefully the pattern in columns respect the criteria *learn, comprehend and evolve* and the table built in the previous meeting.

According to the conclusions above and respective tips, some more questions were written to complete the study of the cognitive dimensions *secondary notation* and *consistency*.

It was also discussed a practical way to implement questionnaires in Slovenia and Portugal simultaneously.

I was agreed that a short tutorial will be provided by the Slovenian part. This tutorial will include one or two examples. The tutorial will be given to students in their mother language but the questionnaire will be in English. It was decided to apply the questionnaires to a training set in order to get feedback. This feedback will be used for tuning the questions before applying them to the final set of students.

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We decide to go on writing the second planned paper (related with the second research direction); however, we will wait for the first outcomes of the work done in the first task before writing the first planned paper.

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Concerning the second research direction, we decided:

- to start the research on the applicability of traditional approaches to DSL comprehension tools development;
- to identify how to improve the PC tools taking profit from the explicit domain of DSL;
- to develop a prototype of a DSL comprehension tool based on an adaptable version of Alma; the implementation of the prototype will be focus on the visualization improvement of the problem domain.

These tasks will be assigned to a master student (Nuno Oliveira).

## **Future work**

- To finish the questionnaire for FDL;
- To create new questionnaires for XAML, Graphviz, LINQ, and JavaFX applying the same approach;
- To apply questionnaires and acquire the data from the questionnaires results;
- To start the basic studies for the second task, namely to look for methods and techniques to improve the Program Comprehension Tools for DSLs, specially focusing in visualization;
- To start implementing the prototype of the editor for domain centric DSL visualization;
- To start the paper on tools;

## **Next meeting**

The next virtual meeting (via NetMeeting or Skype) will be at November 14, at 11am (Maribor local time).

Question Type	Syntax (a)	Semantics (b)	Meaning (c)	Understanding (d)	Meaning (e)	Compare (f)	Expand (g)	Remove (h)	Replace (i)
Closeness of mapping	x	x	x	x	x	x	x	x	x
Viscosity	0	0	0	0	0	0	x	x	x
Hidden dependencies	0	0	x	0	0	x	0	x	0
Hard mental operations	0	x	x	x	x	0	0	0	0
Imposed guess-ahead	0	0	0	0	0	0	x	0	x
Secondary notation	0	0	0	0	0	0	0	0	0
Visibility	0	0	x	x	x	x	0	0	0
Consistency	0	0	0	0	0	x	x	0	x
Diffuseness	x	x	x	x	x	x	x	x	x
Error-proneness	x	x	x	x	x	x	x	x	x
Progressive evaluation	0	0	0	0	0	0	0	0	0
Role expressiveness	0	x	x	x	x	x	x	x	x
Abstraction gradient	0	0	x	x	x	x	0	0	0

Tabela 1: Classification