Travel Report

Project Quixote

28 November, 2010

Travel Details

Destination

University of San Luis (UNSL),
Argentina

Date

20-29 November, 2010

Visitors

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

Travel Purpose

The purpose for this visit was to follow up the project "Quixote - Desenvolvimento de Modelos do Domínio do Problema para inter-relacionar as Vistas Comportamental e Operacional em Sistemas de Software".

Financial Support / Grant

This visit was supported by:

- FCT – Departamento das Relações Europeias, Bilaterais e Multilaterais
- MinCyT – under contract PO/09/38.

Travel Report synthesis

Aims & Objectives

The specific objectives for this travel were:

- to follow up the work on program comprehension (PC) tools under development by Argentina partner;
- to discuss all the basic readings done by both partners about ontologies and concept extraction from source code for PC;
- to setup the future research direction and start a joint paper to submit to ICPC2011 (deadline Jan.31).

Achievements

The objectives above were fulfilled:

- We listened to the three Argentinian students that developed the following projects:
  - *Evaluación de Funcionalidades de Visualización de Software provistas por Librerías Gráficas* by Enrique Miranda.
    The project is concerned with a comparative study of several visualization libraries in order to established a ranking that allows to select the most appropriate for a specific problem domain. The method used to obtain the ranking is LSP (Logic Scoring Performance).
  - *Extracción de Información Dinámica en Programación Orientada a Objetos* by Hernán Bernardis.
    The project aims at porting PICS instrumentation strategy from C to Java. The goal is to provide a tool to extract by inspection dynamic information from object-oriented (Java) source code. This information will be used to build relations between program and problem domains.
  - *Lenguajes Específicos del Dominio Visuales* by Mariano Luzza.
    The project started with a study about the domain specific languages and visual languages. The objective is to create a visual tool for teaching programming concepts to young students.
- Two other projects underdevelopment were discussed by Mario Berón:

- *El Análisis Comportamental como una Estrategia para Mejorar la Comprensión de Programas* by José Albanes del Instituto Universitario de San Martín provincia de Mendoza. The main goal to relate dynamic information with the concept of the use case of the system.
- *Incrementando la Semántica de la Herencia en Lenguajes Orientados a Objetos* by Martín Aristaraín del Instituto Universitario de San Martín provincia de Mendoza. The main goal is to add a new feature to improve multiple inheritance mechanisms.

- A set of slides about ontologies (ontology formal representation, ontology-based systems, ontology extraction tools) and concept location were presented. From that, a fruitful discussion took place in order to decide the use of ontologies for improving program comprehension tools. Then the future research steps were defined and a paper was sketched as described above.

- We set down a new thesis proposal for a fourth student Ignacio El Kadre about *Symbol Table Visualization and Ontological Navigation for Java programs.*
  The basic idea is to extracted a complete identifier table from Java programs and create a user friendly visualization to display it. Then to build a mapping between identifiers and the language ontology. A navigation feature over that mapping should be provided in order to improve the program comprehension process.

- Other proposals were sketched:
  - *Extender el Esquema de Instrumentación de Código con el Objetivo de Inspeccionar Funciones Recursivas* (Continuación del Proyecto de Hernán Bernardis).
  - *Análisis de Técnicas de Resumen de Trazas de Ejecución.* The main idea is to collect several execution traces in order to detect software components.
  - *Visualization, navigation and filter of graphs to explore ontologies.* The main idea is to create a visual interface to explore ontologies represented by graphs.
  - *Identifier Analysis to abstract problem domain concepts.* Given a domain ontology and an identifier, the objective is to find a concept associated with the identifier according to a similarity

function. This function is not based just on lexical analysis but also on contextual information.

- Moreover we also discuss with the responsible for post-graduation:
  - The possibility to prepare a proposal to the ministry of education about a PhD Program on Software Engineering;
  - The possibility to sign a bilateral agreement for a double titulation PhD Program;

Future Research Steps

The proposal refered above consists of the following parts:

1. given a program create an abstraction with all the identifiers located on the source code
2. create a map between those identifiers and the concepts of the programming language ontology
3. create a map between those identifiers and the concepts of the problem domain ontology
4. infer from those mappings a conection between program domain concepts and problem domain concepts

Step 1 and 2 can be implemented by a lexical, syntatic and semantic analyser using traditional compiler techniques. Step 3 deserves further research but based on bibliography review we believe that it can be implemented as identifier analysis. This analysis is supported by natural language processing, graph and text mining, contextual analysis, etc. Step 4 is straight forward using the identifiers as the connection points.

Next meeting

We planned a visit of Mario Berón (15days) to Braga during next February.