Ph.D. Second Year Report

Lancaster University

September 1999

CELTIC

Collaborative Electronic Language Translation for Information Control

Luís Manuel Borges Gouveia

Report and Portfolio of documents

Ph.D. funding support by University Fernando Pessoa
Fernando Pessoa Foundation - 1997 - 2000

End of Second Year Report

Luís Manuel Borges Gouveia
CSEG Group
Computing Department
Lancaster University
England
luis@comp.lancs.ac.uk

Supervisor: Prof. Thomas Rodden
tom@comp.lancs.ac.uk

September 1999

1. Introduction

This section introduces the report context and structure. In addition, some of the base assumptions for the work are presented.

This report is prepared for the second year assessment in the context of the Ph.D. studies at the Computing Department, Lancaster University. The main goals of this report are: (i) summarise work in progress; (ii), plan for the final year, and (iii) deliver a portfolio of documents produced during the period. The portfolio of documents is a select group of representative documents produced in the second year of Ph.D. studies.

Two central work areas are Information Visualisation and Educational Applications. A proposed title to summarise the ongoing work and prototype development can be *"Collaborative Electronic Language Translation for Information Control", for short, CELTIC.*

As an emerging discipline, Information Visualisation can offer technologies that improve the way humans perceive and use large and complex datasets, and help manipulate information [1]. Stuart Card and others introduce visualisation as the process of transforming data, information, and knowledge into visual form making use of human's natural visual capability [2]. Visualisation can also provide an interface between the human mind and the computer.

Information space is another work key concept. An information space is an information design in which representations of information objects are situated in principled space. In this kind of space, the location and direction makes sense in a way that permits mapping and space navigation [3].

The work on the CELTIC project explores information visualisation potential to produce information space representations that can be shared and used to support search and browse activities.

The text is divided in five sections, each one, with a specific purpose:

- *introduction*: gives the report context and structure.
- *research*: resumes current research goals, problem and expected results.
- *portfolio of documents*: lists the document collection in the end of this report, proposing a structure for its organisation.

- *current project status*: presents current project status.
- *final year plan*: proposes a working plan for the final year.

2. Research

This section presents the revised research problem and goals to be followed in the final year.

The research explores ideas from Information Visualisation and proposes a system that takes advantage of Information Visualisation, proposing a Collaborative Electronic Language Translation for Information Control, called, in short, CELTIC system. The proposed system has two main characteristics:

1. uses a two part information visualisation design, one dealing with context and other with focus, and
2. uses a top-down principle for information visualisation where different users share a common collection of agreed concepts (rely into abstraction as a common ground to get real data).

From a common information space, each user can integrate the CELTIC system with locally available databases and World Wide Web resources. The described two characteristics provide a different approach: to the use of information visualisation techniques in one design. Another novel approach of the CELTIC system is visualising high abstraction information generated as a result of users interaction and not mapping it from data sources.

Main research problem

The main research question that motivates the Celtic system development is:

> *Can computer mediated 3D visual representations be useful in helping each individual understanding and the communication between individuals?*

Why consider Information Visualisation as the main research topic? We need better tools to deal with complex data sets, ill structure and dynamic information settings that characterise actual systems to deal with communication needs, understand and learning problems, info-glut, information overload, among others [4]. Visual representations are more natural for humans and can be used to improve their perception to learn and as an aid for search and computation.

Norman proposes that external representations, especially ones that can be part of a workspace shared with others, require some sort of constructed device to support them: an artefact [5].

The main research tasks are:

- model a workable set of parameters to represent useful knowledge representations, for an information visualisation design that use 3D facilities;
- develop an usable set of 3D symbols to serve as demonstrators for supporting the 3D information space as an information visualisation design;

- select an application where the Celtic system can be tested. The particular model will set-up a learning environment to support and generate workable knowledge representations as information visualisations;

- use an enabling set of technologies to prototype the 3D information space for (i) individual control and (ii) for sharing by several users.

3. Portfolio of documents

This section presents the portfolio of documents and groups then by their utility. A general description and documents structure are given.

Published papers in refereed international conferences:

- Gouveia, Luís. *Shared Visualsation and Virtual Environments for Co-operative learning*. Doctoral Consortium. ECSCW'99. Copenhagen, Denmark. 12-16 September, 1999.
- Gouveia, Luís. *Is there any space for presence teaching in a digital world? A proposed framework for Web usage*. Challenges'99 International Conference ICT in Education.12-14 May, 1999. University of Minho. Portugal.

Project presentations for discussion in local research groups:

- Gouveia, Luís. *Shared Visualisation and Virtual Environments for Co-operative Learning*. Postgrad'99 conference. Lancaster University. 24-25 May, 1999 - poster.
- Gouveia, Luís. *CELTIC - Collaborative Electronic Language Translation for Information Control.* First Series of Internal Seminars. Departament of Science and Technology, Fernando Pessoa University. 20 May, 1999.

Unpublished papers already submited but not accepted, considered here because they represent relevant work issues:

- Gouveia, Luís. *Using an information space to share structured information. Current experience on design by user involvement*.
- Gouveia, Luís. *Information Visualisation and Direct Manipulation issues for human systems development.*

Celtic prototype description, includes three documents that describes the prototype implementation. Notice that the first document is still on development:

- Gouveia, Luís. *A two part information visualisation design to allow user collaboration. The CELTIC system propose.*
- *Celtic prototype - the server - application interface & functionality*. Version 2, August 1999.
- *Files listing for Server prototype*. 31, August, 1999

Activity reports, describing the work path during the last 12 months:

- Activity report, August-31, 1999.
- Activity report, May-20, 1999.
- Activity report, January-31, 1999.
- Activity report, November-30, 1998.
- Activity report, November-2, 1998.

4. Current project status

This section gives a brief description of the work already done and what is on development for finish the development phase and starting evaluation.

A detailed work progress is shown in the activity documents section from the portfolio of documents. The main results and the prototype description are presented in the papers, presentations, unpublished papers, and in the prototype description sections from the portfolio of documents.

From the described research tasks, it is possible to make a current status position:

- model a workable set of parameters to represent useful knowledge representations, for an information visualisation design that use 3D facilities;

The parameters, algorithms and information design model is presented in detail in the *Collaborative Electronic Language Translation for Information Control. The Celtic system propose paper*, from the prototype description of the portfolio of documents.

- develop an usable set of 3D symbols to serve as demonstrators for supporting the 3D information space as an information visualisation design;

The 3D symbols, their coding relative to the algorithms and model from research task one are also presented in the *Collaborative Electronic Language Translation for Information Control. The Celtic system propose paper*, from the prototype description of the portfolio of documents.

- select an application where the Celtic system can be tested. The particular model will set-up a learning environment to support and generate workable knowledge representations as information visualisations;

The evaluation phase is on development. The necessary permissions to use a first semester class for an undergraduate course has been already granted and necessary equipment (server and clients computers) have also been devised. A proposal for the testing environment, base assumption, questions to be asked, and what issues to evaluate are under research. To support this proposal the author will attend during September a Tutorial in the ECSCW'99 international conference about evaluation in virtual worlds.

- use an enabling set of technologies to prototype the 3D information space for (i) individual control and (ii) for sharing by several users.

The prototype has been made using Java technology. For the 3D rendering, Java 3D was used. More information about the server side of the CELTIC prototype is available in the prototype description section from the portfolio of documents. The two parts information visualisation have been developed and implemented and can be tested and used. The integration of the different CELTIC client prototype is already under progress, and one more work month is needed to finish the task. To use the system in share mode, among users, full functionality of RMI technology must be provided (some problems exist with RMI's Java JDK 1.2 version). An alternative is to use the socket notification server already implemented and tested.

5. Final year plan

The last section of the second year report presents a plan for the last year of Ph.D. studies. It considers the main activities to be taken during that time to present the Thesis in December 2000.

The following tasks are planned for the third year:

- finish the prototype: one month work to complete the client implementation and the networking function; this may force to pass the Java Development Kit from version 1.2 to 1.3 to correct some of the RMI problems that occur with the current version on use.
- plan the evaluation of the information visualisation design: the current month (September 1999) serves to plan and design the evaluation of the information visualisation. It includes a presence in a tutorial about virtual world evaluation.
- prepare the evaluation environment: this will occur in the October and November months (1999). Serves also to set up the experiment to be observed, using the system
- execute the evaluation phase, collecting observation data: one month - December 1999.
- prepare and analyse collected data from evaluation phase. To be done in January 2000. Using statistics methods and proper software (like SPSS)
- writing thesis: from February until July 2000. Start from developing a previous structure and fill it with already existent material (around 200 A4 pages written in September 1999).

This plan allows one month holiday (August) and more four months (September, October, November and December, 2000) as backup time - slack - to deal with some problems that may occur in the planned phases. This will lead to the goal of delivering the thesis in December 2000 - late date.

References

[1] Card, S. and Mackinlay, J. and Shneiderman, B. (1999*). Readings in Information Visualization. Using vision to think*. Morgan Kaufmann.
[2] Card, S. and Eick, S. and Gershon, N. (1998). *Information visualization* in Interactions, ACM, March + April, volume V.2, pp9-15.
[3] Foltz, M. *The Jair information space*. Artificial Intelligence Laboratory - MIT. Internal Report. 1997.
[4] Forrester, T. (1987). *High-Tech Society*. Blackwell.
[5] Norman, D. (1993*). Things that make us smart, defending human attributes in the age of the machine*. Addison Wesley.