MONET2

Project Full Title: Network of Excellence on Model-based Systems and Qualitative Reasoning.

Contract: Concerted Action / Thematic Network

Contract No: IST-33540

Deliverable MPR1:

MONET Project Roadmap

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1 Introduction

1.1 Purpose of this Document

The purpose of this document is to set out the future of the MONET2 Project.

2 MONET Project

2.1 History

MONET has now been funded through two rounds of European Commission funding. MONET1 (ESPRIT Project Number 22672) was funded through Framework Programme 4 and ran from 1997 to the end of 2000. MONET2 (IST-33540) was funded through Framework Programme 5 and ran from the beginning of 2002 and will end at the end of March 2005. MONET1 was focused on the development of the Community and the emerging technologies of Model-based Systems and Qualitative Reasoning. MONET2 focused on specific goals in each application area covered by the Project (Automotive, Education and Training, Biomedical, Fault Detection and Diagnosis) and also on continuing to develop the Industrial and Academic community responsible for further developing these technologies.

2.2 Future

If there was to be a third round of European Commission funding we would build on the success of MONET2 by focusing on developing areas which have shown real potential such as:

- Biomedicine
- Ecology
- Education and Training
- Socio-Political Modelling

as well as continuing to build the Industrial and Academic development and User Communities.

As there appears to be no prospect of further Commission funding we have been considering other way in which we could take the work of this Project forward. MONET could go forward on three separate levels depending on the funding that could be found.

- Fully Funded Commercial Project
- Mid-level Information and Service Provider
- Low-level Community Support

3 Specialist Areas Needs

3.1 Biomedicine

The Biomedical Task Group was involved in the development of the World's first fully digital pacemaker, (produced by MONET Member Vitatron) which incorporates MBS&QR technology into the patient analysis tool. Because of this work, Peter Lucas (of MONET Member, Radboud University Nijmegen, NL) was invited to present model-based reasoning to a Vitatron Symposium and thus has disseminated these methods and technologies to a much wider audience. It is through this work that Dr Lucas was presented with the 'Best Technical Paper' Award at this year's European Conference on Artificial Intelligence (ECAI'04).

Perhaps the most important challenge remaining in this area is for the work on the new projects to provide positive cases for the use of model-based reasoning in biomedical domains. In the case of Vitatron, where the work has already been successful, the challenge is to use it as a springboard to encourage work on similar problems in other biomedical areas. Genomics, metabolomics, etc. are fast developing areas of bioinformatics, and possibly the best judge of success for MBS&QR would be to have them seen as a core technique for research in these areas, linked with other AI approaches such as machine learning and Bayesian nets.

3.2 Ecology

Following the Jena Workshop (December 2002) a group of potential QR users worked together to establish funding to develop QR in education. This resulted in the QRSER (Qualitative Reasoning for Stream Ecosystem Restoration and Recovery) proposal (originally submitted April 2003) and an updated version, called REDIME (Qualitative Reasoning for Education and Decision Support: Integrated Modelling Environment for Understanding Sustainable Development and Restoration of River Ecosystems). REDIME will be funded by the EU as a STREP and will integrate with the Naturnet proposal. Within the project the REDIME part will focus on developing a collaborative qualitative workbench that users can utilize to develop conceptual understanding of issues relevant to sustainable development. Again this will potentially be linked with the QR Web-Portal, utilizing this as a focus for the Educational / Ecological QR community throughout Europe.

This is a complex area to research as much (if not all) environmental data is incompletely known. Another problem is that the area is one of a vast cross / inter-disciplinary nature. Work in this area involves MBS&QR experts solving (or suggesting solutions too) the problems faced by Ecologists and Environmentalist. For this area to develop more experts on either side need to be aware of the problems and issues faced by the other and also of the benefits of complementing approaches and techniques.

3.3 Education

The Education and Training Task Group has been especially successful over the last year and has essentially built, from nothing, a community dedicated to the development of Educational applications of QR. Since the second MONET Summer School, there has been a group of around 10 people actively creating models for educational purposes, mainly on ecology, plus one group working in building physics models.

This work has been complemented by a slight change in direction for Deliverable ED3 (Review on Integration of MBS&QR Technologies with the WWW). This Deliverable was originally planned as a review of how to integrate MBS&QR technologies with the World Wide Web. The Task Group, however, decided to investigate this through implementation of a system which achieved its goal and so they built an on-line Web-Portal for using QR technology in education. This contains an introduction to the technology and software, has downloads of the software itself, and help files on how to use the software. They are currently adding more modelling examples as well as assignments for students and teachers alike. We expect this Portal to become a significant resource for work in the area.

For further development of this web-portal and its goals, wider acceptance and utilisation is essential. This involves people from all of the target user groups being aware of the existence of the portal, and a process of interaction which is reported and fed back to the portal designers to ensure a constantly updated and expanding resource that fits with user requirements both now and in the future.

3.4 Socio-Political Modelling

This is a relatively uncharted area for QR&MBS, but one which shows a good deal of promise. Representation and reasoning in such areas is, by, necessity, qualitative, as there are no numerical values for how one faction or country feels about another one. There has been some interesting early work in representing situations such as the tension in the Middle East, or a difficult family relationship in terms of qualitative models. This work provides the potential of being able to represent such situations appropriately and possibly being able to reason about what might be done.

4 Funding Levels

4.1 Fully Funded Commercial Project

Whether RTD or Commercial funding, this level of the project would take all of the successes of the MONET2 Network and continue them and would require funding at a similar level to MONET2. The gap in funding between MONET1 and MONET2 meant that much of the momentum that was initiated in MONET1 was sadly lost by the time MONET2 started and so we witnessed a slow start to the second phase of this project. However the momentum is high again and at the end of the Project we are now finding more and more Companies and Industrial areas becoming aware of these technologies and approaching us for assistance with problems that can not be solved with the use of conventional technologies.

A fully funded project could build on this momentum and keep it going, we would be talking to Companies with specific problems and assisting then to build solutions, as well as continuing to assist and encourage the development community in both Industry and Academia.

On top of this work, we would propose to develop and build a model-based design platform that could apply these technologies to as wide a set of problems as possible. This would then be made available as ‘open-source’ software to any European Institution. Alongside this work would then be workshops and seminars given freely to train users in the software platform that we provide. Such a Project would have the prospect of increasing Europe’s lead in the take up of these technologies and knowledge based technologies in general. However it looks unlikely that this level of funding will become available.

4.2 Mid-level Information and Service Provider

With a medium level of funding the Project could be kept going and continue development of the Community and interaction with Industrial and Academic developers would ensure a continually wider application base. This would lead to a greater community and more reliance on these technologies by Commercial Institutions; as wider acceptance would lead to these technologies being viewed as ‘Science’ and not ‘Science Fiction’.

In this size of project we would drop a lot of the travel costs and the publications, the latter to be replaced with electronic versions. It is estimated that this would require some £60 thousand (€85 thousand) a year which might be gained from Company subscriptions, however the 2004 sustainability survey suggested that this amount of money is unlikely to become available from this source.

4.3 Low-level Community Support

Support from an Academic Institution and Community contributions of work will allow the Project to continue at a low level at the very least and act as a backbone to the QR and DX Communities. The website and MIR Database will act as an information storage facility for papers and references, and

the email lists will keep contact between the members, whilst the project Administrator will devote some of her time keeping these up to date and assisting the communities in any way she can.

The University of Wales, Aberystwyth is prepared to provide this support and will also be opening up the MIR Database for any person who wishes to register themselves as a user. The DX and QR communities have discussed support for a regular newsletter, and intend to appoint a newsletter editor who will compile relevant news for distribution via the email list and the web site.

5 Conclusion

We have considered the different possible sources of funding, and what could be provided at that level of funding. We have reluctantly reached a conclusion inline with our initial assertion, that any injection of funds large enough to support our present types of activity would be impossible to obtain.

However, both University of Wales Aberystwyth and the QR/DX community in general have made available resources that will allow MONET to continue to operate at a low level for the foreseeable future, with a web presence and an electronic newsletter.

The most important extra item that is needed if further funding was available is a public-domain qualitative reasoner that could be used by QR novices to explore the technology and build their first application. Such a tool would lower the entry cost to using the technology enough to attract many new users. It could be built for a few hundred thousand Euros, and could then be made available as OpenSource software.

6 References

Jena

Sustainability Report

ED3

MBD4

MBD5

Web-Portal http://www.qrser.de/

QRSER http://hcs.science.uva.nl/QRM/

7 Document History

Version	*Date*	*Changes made to document*	*Changed by*
1.0	15th February 2005	Initial Document creation	RIR
1.1	18th February 2005	Updated and amended	RIR
2.0	3rd March 2005	Document focused on Future of Network	RIR
2.1	11th March 2005	Updated after review	CJP
2.2	23rd March 2005	Insertion of Purpose of Document Section	JNT