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DR 9.5: Final Version of Software Toolkit

Jeremy L. Wyatt¹

¹*BHAM, Birmingham*
<jlw@cs.bham.ac.uk>

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This document gives a brief summary of the publically available software toolkits created and maintained in CogX. These are available from sites listed in the document such as SourceForge.

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Executive Summary

This document gives a brief overview of the four public software releases that are maintained by the CogX team. This work addresses Task 9.6 *Develop Software Toolkit: maintain and document a publically available toolkit for prototyping cognitive robotic systems.*

Role of software toolkits in CogX

CogX has a strong dissemination programme, and releasing and maintaining software toolkits is part of this. Software toolkits are a key part of the productivity of CogX in systems terms. By building modular architectures we allow exchange of components between different systems. In addition we have been able to promote the research in CogX by public availability of toolkits.

Contribution to the CogX scenarios and prototypes

All the toolkits released have been incorporated in one or more CogX systems. Without the use of these toolkits the building of the systems would not be possible.

1 Tasks, objectives, results

1.1 Planned work

The planned work was to maintain and periodically release the CAST toolkit. A release of this was made at the end of CoSy, and we planned to maintain and update this as part of CogX. We committed to open source releases.

1.2 Actual work performed

The project aimed to produce a single software toolkit for building cognitive system architectures, called CAST. This is an evolution of a software toolkit started in the CoSy project. In fact we have gone considerably beyond this in terms of software toolkits released. To date we have released and maintain the following software toolkits:

- **CAST** <http://www.cs.bham.ac.uk/research/projects/cosy/cast/>: a software toolkit to support the developments of intelligent systems based on a space of possible architecture designs. CAST is a software implementation of the CoSy Architecture Schema designed to allow researchers (primarily in the fields of AI and robotics) to develop instantiations of the schema. The toolkit supports C++ and Java on Linux and OSX, and provides a communication framework for distributing an instantiation across a network. Its primary scientific purpose is to maintain a separation between a system's architecture and the content of its architecture, allowing one to be varied independently of the other. As of 2009, CAST has been upgraded to use Ice instead of CORBA. This has resulted in a 2.0 release which is incompatible with the previous 1.* releases. The current public release is 2.1.16, and the latest version is available on sourceforge. Future development will be on the Ice-based release, although support will still be given for previous versions. To date there have been 1,534 downloads of the toolkit to date. Tutorials and a FAQ are available from the home site. In addition CAST is currently used in two other FP7 projects: NIFTi (where it has been combined with ROS), and ALIZ-E.
- **BLORT** <http://users.acin.tuwien.ac.at/mzillich/?site=4>: is a software toolkit for robot vision systems. BLORT stands for Blocks World Robotic Vision Toolbox. The vision and robotics communities have developed a large number of increasingly successful methods for tracking, recognising and on-line learning of objects, all of which have their particular strengths and weaknesses. A researcher aiming to provide a robot with the ability to handle objects will typically have to pick amongst these and engineer a system that works for their particular setting. The aim of BLORT is to simplify this task and to

allow handling of diverse scenarios, though of course it has its own particular limitations. The toolbox is aimed at robotics research and as such we have in mind objects typically of interest for robotic manipulation scenarios, e.g. mugs, boxes and packaging of various sorts. BLORT does not cover articulated objects (such as walking humans), highly irregular objects (such as potted plants) or deformable objects (such as cables). The system does not require specialised hardware and simply uses a single camera allowing usage on many robots. The toolbox integrates state-of-the art methods for detection and learning of novel objects, and recognition and tracking of learned models. Integration is currently done via our own modular robotics framework, but of course the libraries making up the modules can also be separately integrated into own projects. The current stable release of BLORT is 2.2. The home site includes videos and references to the key papers underpinning the toolkit.

- **Nurbs Fitting in PCL** <http://www.pointclouds.org/downloads/>: as part of CogX we have created a NURBS fitting tool which works as part of the Point Cloud Library project. Our NURBS fitting code is currently available as part of the trunk at PCL <http://svn.pointclouds.org/pcl/trunk>, and will be included in a future release.
- **Tarot** <http://talkingrobots.dfki.de/software/tarot/>: The Talking Robots Toolkit provides functionality for building robots capable of communicating with human users using natural spoken dialogue. Tarot is based on a core API which provides the primary functionality for building up processes for comprehending and producing spoken dialogue. In addition, Tarot provides language resources like the MOLOKO grammar, and there are several implementation examples which illustrate the use of Tarot. Tarot allows content planning, by construction of a logical form for a sub-dialogue (e.g. an utterance) from an input proto logical form. The MOLOKO CCG grammar is an OpenCCG-style Combinatory Categorical Grammar for use with Tarot. The grammar specifies a large collection of grammatical families, each defining a syntactic category, and its corresponding meaning. Meaning is expressed as an ontologically richly sorted, relational structure (hybrid logic dependency semantics). Tarot is currently on revision 188, and full documentation is available at the home site.