Development of Robot-enhanced Therapy for Children with Autism Spectrum Disorders

Project No. 611391

DREAM
Development of Robot-enhanced Therapy for Children with Autism Spectrum Disorders

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D3.4.1
System Integration Progress Report

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Dissemination Level		
PU	Public	**PU**
PP	Restricted to other programme participants (including the Commission Service)	
RE	Restricted to a group specified by the consortium (including the Commission Service)	
CO	Confidential, only for members of the consortium (including the Commission Service)	

Contents

Executive Summary

Deliverable D3.4 is an annual progress report of the integration of the software developed in work packages WP4-WP6, including results of tests, any remedial actions required as a consequence of the results of these tems, and the outcome of these actions. This is the Month 12 progress report.

At time of writing, no software has been integrated into the DREAM system. However, documentation and software resources have been developed to support the development and integration process. In particular, they provide detailed instructions on how to set up, run, and develop the DREAM software. These resources supplement those contained in Deliverables D3.1 System Architecture, D3.2 Software Engineering Standards, and D3.3 Quality Assurance Procedures. The documents are available on the DREAM wiki [1] and the software is available in the **DREAM/release** and **DREAM/working/HIS** directories.

Principal Contributors

The main authors of this deliverable is David Vernon, University of Skövde.

Revision History

Version 1.0 (DV 20-04-2015)
First draft.

1 Introduction

At time of writing — end of year 1 — no software has been integrated into the DREAM system. However, documentation and software resources have been developed to support the development and integration process. In particular, they provide detailed instructions on how to set up, run, and develop the DREAM software. These resources supplement those contained in Deliverables D3.1 System Architecture, D3.2 Software Engineering Standards, and D3.3 Quality Assurance Procedures. The documents are available on the DREAM wiki [1] and the software is available in the **DREAM/release** and **DREAM/working/HIS** directories.

The following are the wiki DREAM Developer Guides.

- Software Installation Guide
- Software Update Guide
- Software Users Guide
- Software Development Guide
- Software Integration Guide
- System Architecture Guide

Additional wiki pages mirror the information contained in Deliverable D3.2, i.e. the DREAM Software Engineering Standards:

- Mandatory Standards for File Organization
- Mandatory Standards for Internal Documentation
- Mandatory Standards for Component Functionality
- Mandatory Standards for Testing
- Recommended Standards for Programming Style
- Recommended Standards for Programming Practice

The mandatory standards are contained in Appendices A, B, and C (File Organization, Internal Documentation, and Component Functionality, respectively), as well as Section 4 on Testing. The recommended standards are contained in Appendices D and E (Programming Style and Programming Practice, respectively).

In the following, we provide a very short summary of the material provided in each of the wiki DREAM Developer Guides. We follow this with an overview of the software that has been made available on the DREAM SVN repository to complement the material in the developer guides. We refer to this software as the DREAM Prototype Software.

2 DREAM Developer Guides

2.1 Software Installation Guide

This guide provides a step-by-step guide to downloading, installing, and checking the software required to develop DREAM software and write and run DREAM robot applications.

2.2 Software Update Guide

This guide provides a step-by-step guide to periodically update the DREAM software once it has been installed (by following the instructions in the Software Installation Guide). In fact, this guide is a selective subset of the instructions in the installation guide.

2.3 Software Users Guide

This guide explains how to use YARP and YARP tools to manage and run DREAM robot applications comprising a collection of components.

2.4 Software Development Guide

This guide explains how to set up a project in the **DREAM/working/** directory so that developers can compile their own components and run applications in exactly the same way as the component in the **DREAM/release/** directory (see DREAM Software Repository). It also describes in detail two examples of how to develop a YARP-based component that is compliant with the DREAM standards for software engineering.

2.5 Software Integration Guide

The software integration guide describes the procedures for unit testing of individual components and submitting them for integration. It also includes the checklist of conditions the component must satisfy — i.e. the quality assurance procedures described in Deliverable D3.3 — to qualify for inclusion in the release version of the DREAM software.

2.6 System Architecture Guide

This guide provides an overview the DREAM system architecture, as described in Deliverable D3.1.

The DREAM software system comprises three main sub-systems, corresponding to work-packages WP4 (Sensing and Interpretation), WP5 (Child Behaviour Analysis) and WP6 (Robot Behaviour). Initially, these three sub-systems have been implemented by three place-holder components, as follows.

1. **sensoryInterpretation**
2. **childBehaviourClassification**
3. **cognitiveControl**

The functionality of each sub-system will be developed incrementally as the project progresses and as new components that implement part of the functionality encapsulated in the place-holder components are developed and integrated into the system.

In addition, a fourth place-holder **component systemArchitectureGUI** is provided. This component is a Graphic User Interface (GUI) to facilitate external control of the robot by a user (either a therapist or a software developer) and to provide the user with an easily-to-understand view on the current state of the robot cognitive control. It also provides a graphic rendering of the child's behavioural state, degree of engagement, and degree of performance in the current intervention. All of the cognitiveController input and output ports can be connected to this GUI as well as the output ports from the childBehaviourClassification component.

All four place-holder components have been implemented are available in the DREAM SVN software repository, together with an example application. On-line documentation is available in the Component Reference Manual.

During integration, white-box testing will be performed on a system-level by removing the driver and stub functions that simulate the output and input of data in the top-level system architecture, i.e. in one of the three components above, allowing that source and sink functionality to be provided instead by the component being integrated.

3 DREAM Prototype Software

The prototype software complements the material in the developer guides and provides examples of the implementation and in-line documentation of software that adheres to the DREAM software engineering standards. There are three categories of software.

1. Templates for component development (in the **/DREAM/release** directory):
    - **protoComponent** component and test applications
    - **protoComponentGUI** component and test applications
    - **imageSource** component and test applications
    - **guiUtilities** library
2. Prototype system place-holder architecture components (in the **DREAM/release** directory:
    - **childBehaviourClassification** component and test applications
    - **sensoryInterpretation** component and test applications
    - **cognitiveControl** component and test applications
    - **systemArchitectureGUI** component and test applications
3. Example project in the **DREAM/HIS/working/attention** directory:
    - **selectiveTuning** component and test applications
    - **laplacianOfGaussian** component and test applications
    - **fourierVision** library

Documentation for all the components in the **DREAM/release** directory has been created with the Doxygen tool and is available on-line. It is accessed from the wiki in the Component Reference Manual.

References

[1] https://dreamproject.aldebaran.com/projects/dream/wiki/Wiki.