INTERMEDIATE PROGRESS REPORT
JULY 2008

CHRIS
Cooperative Human Robot Interaction Systems

2007 - 2013

Grant Agreement number:	215805
Project acronym:	CHRIS
Project title:	Cooperative Human Robot Interaction Systems
Project start date:	01 March 2008
Funding Scheme:	Small or medium-scale focused research project (STREP)
Date of latest version of Annex I against which the assessment will be made:	14th Dec 2007
Period covered: from	01 March 2008
to	30th June 2008

brl Bristol Robotics Laboratory

UWE BRISTOL University of the West of England

University of BRISTOL

MAX-PLANCK-GESELLSCHAFT

CNRS LAAS

iit istituto italiano di tecnologia

Project co-ordinator name, title and organisation:
Prof Chris Melhuish, Director, Bristol Robotic Laboratory (BRL),
University of the West of England, Bristol

Tel: ++ 44 (0) 117 32 86334

Fax: ++44 (0) 117 32 82688

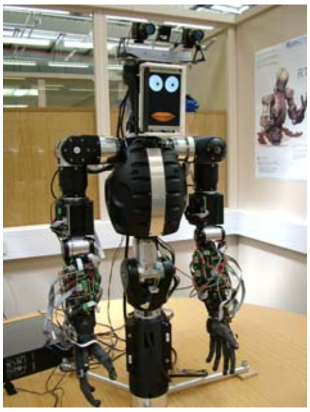
E-mail: Chris.Melhuish@brl.ac.uk

Project website address: http://www.chrisfp7.eu/

Table of Contents

1. PUBLISHABLE SUMMARY

1.1 Project summary and aims



CHRIS is based on the premise that it will be ultimately beneficial to our socio-economic welfare to generate service robots capable of safe co-operative physical interaction with humans. Currently the assistive robotics industry is worth $1bn globally. Analysis by the International Federation of Robotics (World Robots 2007) revealed that over 90% of unit sales are in domestic service robots such as automated vacuum cleaners. However, 80% of the foreseeable market value will be in professional service robotics. Robots working in shared space with humans will provide significant benefits where robot strength, precision, persistence and indefatigability enhance human performance in certain tasks. Examples include dangerous or inaccessible work places (e.g. nuclear decontamination sites, space, search and rescue), precision workers such as engineers or surgeons, and assistive robotics in rehabilitation healthcare. There is therefore, a clear need for assistive robotics and a ready market place.

In order for assistive robots to have the capability required to work with humans in a shared space, certain conditions must be met. Perhaps most importantly, the human must trust that the robot will perform the task appropriately and without harm. To be genuinely useful the robot must be powerful enough to perform the task but inherent in this comes the potential to be dangerous. Consequently the robot must be designed with safety at the heart. CHRIS addresses this directly. CHRIS defines safety through the cooperative interaction with the human, in terms of physically safe (e.g. movements are appropriate and smooth not ballistic or unpredictable), behaviourally safe (e.g. action is largely predictable and understandable by the human), and cognitively safe (e.g. actions are performed following reasoning and planning of the action, evaluation of the possible outcomes and safety implications of the action).

For a robotic platform to be capable of physical, behavioural and cognitively safe operation, major advances in many disciplines must be realised. Issues surrounding safe Human-Robot-Interaction include; communication of a shared goal (verbally and through gesture), perception and understanding of intention (from dextrous and gross movements), cognition necessary for interaction, and active and passive compliance. The design and build of the platform includes on-board mechanically safe features, real-time information processing from multiple sensors for visual, auditory and haptic processing of the current situation, and artificial cognition to both understand the communication with the human and for the decisional planning prior to action. CHRIS is a programme of work designed to investigate and advance these areas, with a holistic and integrated approach to ensure stepwise augmentation of each arising from the synergies afforded through cross-institutional research.

CHRIS will investigate human-human interaction and employ appropriate mechanisms to imbed these principles in human-robot interactions. Engineering principles of safe movement and dexterity will be explored on the available robot platforms, and developed with principles of goal negotiation, communication and decisional action planning for appropriate human robot safe interaction.

1.2 Key measurable objectives through the life of the project

1. Understand how human cooperative action occurs both cognitively and physically within a set of chosen representative application domains (D4)
2. Encapsulate these elements, and implement them on a robotic platform (D8).

3. Assess the safety of human-robot interactions from the aspects of physical safety, behavioural safety, and cognitive understanding, and investigate ways of implementing these as robust features in robot platforms (D6).
4. Develop the engineering principles required to ensure the robot platform is capable of controlled intelligent movement, both gross and dextrous, to perform cooperative tasks with humans (D7, D8).
5. Formal verification for the low-level motor controller code, good engineering practice for the higher levels, special tests to verify the quality of the inputs from sensors (D9, D10).

(See Annex I for additional information)

1.3 Work to date

The first two project meetings have taken place. The inaugural meeting was in the Bristol Robotics Laboratory in the UK, establishing the groundwork for the project, focussing on direction and first objectives, updating the team on progress to date and preliminary discussion on functional requirements. The second meeting represented the first decisional milestone of the project and took place at the Fondazione Istituto di Tecnologia (IIT) in Genoa, Italy in month 4. The second meeting allowed work to be done by the project partners to define system engineering for the project and to carry out a "Scripted Scenario Enactment" (SSE) (see section 2 below, and section 3 WP3 below).

Work in progress on the SSE at the second project team meeting:

To ensure integration and coherence are maintained throughout the life of the project and across all partners, compatible video-conferencing systems are being set up at each institution. This level of instant access across the European partners affords the researchers and students instant communication with each other whenever it is required, providing a vital mechanism for integration of WP activities and rapid dissemination of results.

Initial work in this early period of the project has been performed. Workpackages (WPs) 1, 2, 4, 6 and 7 all commenced in month 1, WP 3 commenced month 2, WP 5 commenced month 4, and WP8 is due to commence month 40. As such, early results comprise decisions on integration platforms to be utilized by all partners, early dissemination routes and conference attendance in 2008, procurement of necessary equipment and recruitment of personnel. (Please see section 3 for further details.)

Final results of CHRIS are to enable the available robot platforms to interact safely with a human and perform a cooperative task, the first step in producing commercialisable robot platforms.

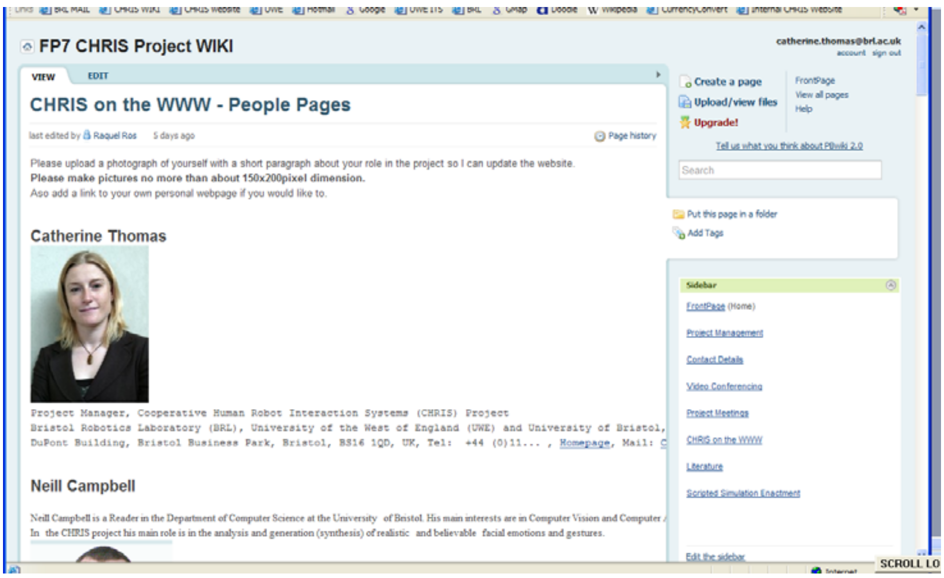
Project Deliverables (months 1-5)

D1 CHRIS WIKI online – The CHRIS project 'wiki' has been set up for internal project communication. A wiki is a collection of web pages designed to enable anyone who accesses it to contribute or modify content. This has been set up so that only project partners can access it and is a place where project management information can be stored and communicated and information about project work can be shared. Originally it was thought that a project wiki would be used for both public and 'private' audiences but at the beginning of the project it was decided that it would be easier to manage public information via a 'normal' website and communicate information between the project partners via a password protected wiki site. The website and wiki make up the projects first deliverable. The website URL for the project is http://www.chrisfp7.eu/. This website is one route that the project will use for disseminating information about the project to the wider public and academic communities.

Below are some screenshots of both the website and the wiki:

The CHRIS Project Website Homepage

The CHRIS Project wiki "People Page" which is used to gather information about the project partners for uploading onto the project website.



D2 Progress Report following Meeting 2, Milestone 1 – This report represents the second EU deliverable for the CHRIS project.

The CHRIS Project Coordinator is Professor Chris Melhuish, Director of the Bristol Robotic Laboratory (BRL) at the University of the West of England and University of Bristol (DuPont Building, Bristol Business Park, Bristol BS16 1QD, United Kingdom, Telephone: 00 44 (0) 117 328 6334, Chris.Melhuish@brl.ac.uk).

2. PROJECT OBJECTIVES FOR THE PERIOD

Key measurable objectives (from Annex 1) start in project month 16. This report is to cover the first four month period of the project, and specifically the decisions taken as Milestone 1. All the objectives for this period are listed in ANNEX 1. See the next section for task progress, which is linked to the project objectives.

In this period, both of the first two project meetings have taken place. Deliverable 1, the project wiki online, was due in Month 4, this has been delivered (along with the project website). Milestone 1, the Wizard of Oz simulation, renamed the Scripted Scenario Enactment (SSE), has taken place as scheduled. Strategic decisions on system functionality were undertaken at this meeting and are detailed below.

This SSE, which occurred at meeting 2, was the first Milestone for the project and a major motivation for the timing of this report was to communicate the details of this. The second meeting enabled the project partners to work together to decide on a specific scenario that would demonstrate a robot and a human working cooperatively together on a task to complete a shared goal. The scripted 'walkthrough' or enactment of this scenario was performed so that the team could deconstruct it to enable them to analyse the different elements of the research, development and integration of this multimodal system. It allowed the initial system engineering requirements to be defined and enabled the assignment of different tasks to different teams.

It was decided that the most appropriate scenario to display system capability for use in the test phase commencing Month 40 (WP8) was that of a robot helping a human to assemble a small simple table in a shared location.

The below table shows part of the breakdown of interaction between a human and a robot that takes place in the scripted scenario:

HUMAN (Bob): Enters room and sits next to robot	Robot recognizes human
ROBOT: "Oh, Hello Bob"	Robot orients to user, and physically and verbally acknowledges his presence
HUMAN: "Give me one of those legs"	Spoken language recognition. Can be provided by the RAD toolkit.
ROBOT: "Sorry, I don't know what a leg looks like" *Access to object database has no entry for lexical item leg*	Handling uncertainty: The Get(X) behavior fails because X is unknown. This activates a contingency in the Get(X) plan.
HUMAN: <shows the robot by pointing> "This is a leg"	Visual following of the hand, and then identification of the closest recognizable object
ROBOT: <Points to the indicated leg> "Is that it?" *Requires visually guided pointing.*	Robot points and uses head orientation to indicate the object. This must be done safely, taking into account the human (avoiding collision, etc.)
HUMAN: "Yes" Robot now associates the word "leg" with this visually recognized object.	Vocabulary acquisition.
ROBOT: "OK, here you go" <picks up the leg and passes it to the human > Requires knowledge of what it means to "give"	Reach to grasp, right arm grasp, pass right
ROBOT: recognizes that the human is too far away, and that is must transfer the object from one hand to another in order to pass it	This requires decisional planning in order to deal with changes in the physical state of execution.
HUMAN: "Now can you hold this table here" <indicates with his own hand where the robot should grasp the table>	Robot visually identifies the user's hand's configuration

ROBOT: <grasps the table> “Like this?”	Robot uses the above in order to guide its own hand to that location to then hold the table.
HUMAN: “Yes that’s good” <attaches the leg to the table>	Confirmation
HUMAN: “Ok you can let go now” <robot releases the table>	

As the successive legs are attached to the table, the robot uses the interaction history to compare ongoing behavior with previous behavior in order to predict and anticipate.

Possible variations on the scenario have also been discussed:

- Need to modify a behavior (passing the leg when the user is out of reach) provided by decisional planning (inserted above).
- Need to modify a learned behavior: User observes that the robot is grasping the leg with a faulty grasp, and so initiates a dialog to edit this behavior.
- Nonverbal communication: Holding the hand extended, palm up, is recognized as a “give me” command.
- Nonverbal communication: Holding the hand extended, palm pointing towards the robot, is recognized as a “halt/pause” command.
- Robot recognizes that it is having a failure (e.g. the torso motor fails to turn) and asks the human to intervene.
- Robot recognizes that it is having a failure and asks human if it should continue in graceful degradation mode.
- Compliant motion: Human and robot hold the table together, and human compliantly guides the robot so that together they place the table in a particular final configuration.

From the SSE, the functional requirements of the robot needed to enact the scenario become clear. The robot will need:

- Visual analysis of behavior, movement and objects
- Body, hand and facial gestures
- Engagement management (includes spoken language interface, including simple verbal and gesture vocabulary)
- Uncertainty management
- Body gesture recognition
- Visually guided motion
- Safe interaction
- “Give” behavior
- Mirroring and imitation
- Decisional planning

It also becomes clear what functional requirements will not be needed, for example, the robot will not need:

- Locomotion
- Gait
- A large vocabulary

3. WORK PROGRESS AND ACHIEVEMENTS DURING THE PERIOD

3.1 Work Package 1 – Management (start Month 1)

Please see below section 5.

3.2 Work Package 2 - Dissemination and Exploitation (start Month 1)

A CHRIS project 'wiki', a collection of web pages designed to enable anyone who accesses it to contribute or modify content, has been set up for internal project communication. The original idea was that the WIKI would contain public and private areas. At the first Project Meeting it was decided that the WIKI would be more appropriate for use by the project partners for internal communication and a separate external website would be set up for publicity and dissemination activities. The website for the project is up and running at: http://www.chrisfp7.eu/ and has been populated with information about news reports on the CHRIS project, people involved and other project information of interest to a public audience.

Filming about the project has taken place at the BRL UK, by the Discovery Channel for broadcasting towards the end of 2008. The project has been reported in the media on New Zealand and Australian radio, by the BBC, on "Engadget", a multilingual technology weblog about consumer electronics, and by local news groups in Bristol (UK). The project manager is working with the project partners to keep the website content up to date and fully populated with these dissemination routes and others.

At the first Project Meeting, it was agreed each institution will manage their own web content concerning published articles and conference attendance, the main page will be managed centrally by the project manager, with links to each partner institution. It was agreed that the project needs a relevant logo which has now been created:

Prior to institutions uploading papers to the CHRIS website, the team must agree on the content of publications. Journal published papers will require permission from journals for pdf access on the website. All CHRIS information will acknowledge funding support from EC.

At the second project meeting (IIT, June 08) there was discussion about running workshops and showcasing sessions as part of conferences. Two conferences were specifically mentioned; the "Humanoids conference" in 2009 and the "Towards Autonomous Robotic Systems (TAROS) - TAROS 2008" conference. Actions have been made to set up our presence at these conferences.

3.3 Work Package 3 - Systems Engineering (start Month 2)

At the first project meeting it was agreed to adopt the YARP[1] (Yet Another Robot Platform) architecture which will enable a level of commonality and integration across the platforms, and can be compiled on Windows, Mac and Linux. YARP is a platform for long-term software development

[1] G. Metta, P. Fitzpatrick, L. Natale. YARP: yet another robot platform. In the International Journal on Advanced Robotics Systems, Special Issue on Software Development and Integration in Robotics. March 2006 (http://eris.liralab.it/viki/images/2/2b/YARP.pdf)

for applications that are real-time, computation-intensive, and involve interfacing with diverse and changing hardware. It is an open-source project that encapsulates lessons from experience in building humanoid robots. The goal of YARP is to minimize the effort devoted to infrastructure-level software development by facilitating code reuse, modularity and so maximize research-level development and collaboration. Low level architecture will be independent of this and remain isolated on the platforms; YARP will be a language to communicate with the system, access to ports or an entry point into the robot to have higher level access. The D3 Functional Requirements and Interface document, will be based around YARP. All partners are learning about YARP, with some attending a 'YARP Summer School' in July 2008.

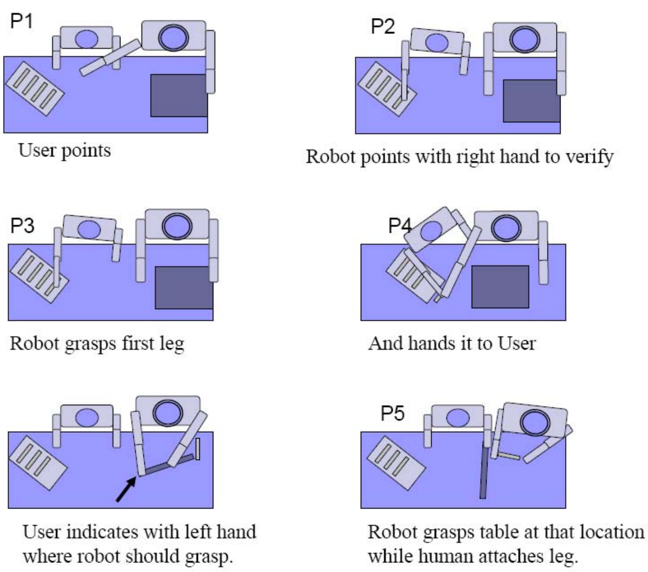
Initial discussions also took place at the first project meeting about investigating adopting common torque sensors for the robot platforms which would give a greater integration between the robot platforms.

T3.1 a CHRIS-WIKI to contain definitions for general software architecture and specification of modules has been created. All project partners can access and comment on this.

T3.2, the Wizard of Oz Scenario, re-named at meeting 1 as the Scripted Scenario Enactment (SSE), has been carried out. The SSE enables the team to:

- investigate the important behaviour required to implement in the project
- insure all behaviours are represented in the scenario for demonstration
- define hardware and software required to enable the capability
- assess the feasibility of the scenario(s)
- decide which team/WP is most appropriate to develop which capabilities.
- validate the scenario in terms of capturing the behaviours that are pertinent to the project
- identify the functional requirements of the desired system
- identify from the outset the difficulties we will encounter
- identify the functions that will implement this behavior, and allocate those functions to tasks within the technical work packages.
- define the interfaces between the functions

PFD first defined the scenario for the SSE in terms of a cartoon and accompanying text, over the first few three months of the project. The scenario involves a human and a robot working together to build a small table with a flat rectangular top and four legs.



Schematic overview of initial portion of the interaction scenario

Peter FD (NCRM) visited IIT for preliminary work on the SSE between the first and second project meetings. In close cooperation, IIT and NCRM carried out initial testing and recorded this by video in month 3. This video was uploaded onto the wiki for the rest of the team to comment on additional behaviour and limitations. This preliminary work on the scenario enabled the SSE, a scripted walkthrough of the scenario, to be completed (Milestone 1) during meeting two (month 4) on the iCub platform. This enabled validation of the global concept that the project is aiming to implement and provided a real time enactment of behaviour with a robot, by all project partners. It also allows a clear definition of current state and specific requirements of WP4-8. As well as all of the project team together discussing the SSE, team members from BRL and from CNRS had detailed discussions about the SSE and about how their work would be integrated. Also, at meeting two, it was demonstrated that the spoken language processing software that NCRM use can be used to control the iCub, the platform used at IIT, for the SSE work.

The full details of the SSE are in section 2 of this document.

NCRM have started the next phase of the systems engineering activity, which involves identifying the functional components of the system and allocating them to the responsible work packages. PFD has uploaded a preliminary Systems Analysis document onto the wiki for feedback from work package leads. The document is a first pass in the progress towards D3. D3 is the Functional requirements and interface agreement document, due in Month 8 and which will be generated as a result of the SSE exercise.

CNRS have also started the development of a software environment system for SSE use of the Jido mobile manipulator.

3.4 ***<u>Work Package 4 – Motor control and mirroring (start Month 1)</u>***

IIT (as part of the collaboration with University of Genoa) have started investigating software safety using formal verification (low-level robot controller). This involves:

- started the development of a DSP-C to ANSI-C translator which, among other things, should contain various serialization strategies (to be able to use model checking tools for sequential code) and handling of the machine model (assembly in-lines, etc.);
- preliminary experiments to assess the relative strengths of various software model checking tools.

IIT have carried out initial testing of the force control and had discussions with NCRM about the SSE (formerly known as the Wizard of Oz scenario).

T4.1 proceeding as planned. For the motor invariance (representation), a strategy to minimize the required parameters for trajectory representation in order to optimize tracking precision and simultaneously the communication bandwidth occupancy has been established. The developed code is currently under test. Development of proper tools for forward/inverse kinematics is ongoing.

Force control to allow safe exploratory robot behaviors for the iCub is being developed. Using a force sensor mounted on the arm of the robot (between the shoulder and the elbow), external forces can be detected using a dynamic model. The model is developed through learning. Avoidance strategies are under investigation. The control strategy uses a potential force field approach in joint space.

T4.2 is proceeding as planned, part of the motor invariance representation (T4.1 and T4.2 share the same representation and low-level code).

3.5 Work Package 5 - Decisional Planning (start Month 4)

This work package begins in month 4 (June 08) so all objectives are scheduled for delivery after the date of this report.

There has been work on identification of key issues for human-robot decisional interaction.

There has been study of relevant literature (recent conferences dealing with Human-robot interaction), input into the SSE at the second project meeting and finalisation of a software environment for the SSE experiments using the Jido mobile manipulator robot.

A visit by two researchers from LAAS-CNRS to MPG is planned for month 5 to collaborate on work related to decisional planning and cooperative coordination and a visit by researchers from LAAS-CNRS to BRL is planned for month 9 or 10.

3.6 Work Package 6 – Cooperative coordination (start Month 1)

The objective for the initial work is to determine the different components of human capacity to engage in cooperation by performing empirical studies using young children to obtain the most basic forms of human cooperation. This will enable an explaniation of the interplay between biological predisposition and social learning that enables successful participation in cooperative activities.

There has been a literature survey on cooperation in children, MPG have created a bibliography of core literature on cooperation, all available online on: http://www.eva.mpg.de/psycho/staff/steinwender/bibliography_coop_list.html

For the experiments on coordinated problem solving among children, MPG have:

- Developed four tasks to test coordination in problem-solving peers
- Built four pilot-apparatuses
- Begun pilot-testing with child participants

For the experiments on problem-solving and sharing in children, MPG have:

- Started a literature survey
- Begun the design of the study and building of the apparatuses
- Started the first pilot testing with child participants

CNRS have exchanged literature with MPG and have started discussion on the basic notions of interaction.

Ethical Considerations and best practise
All experimental studies on humans will be carried out following the ethical standards established in the Declaration of Helsinki (1964) and its successive emendations. All experiments will be performed in adequately equipped laboratories and conducted by qualified scientists. All laboratories have undertaken to follow guidelines and best practise when undertaking the scenario testing phase of CHRIS. Each institution will seek approval by local ethics committees prior to commencement of testing. MPG will ensure all ethical considerations are reviewed. The Max Planck Institute for Evolutionary Anthropology complies with the Max Planck Society's Rules of Good Scientific Practice (http://www.mpg.de/pdf/rulesScientificPract.pdf) as well as with all legal requirements for the conduct of research in the relevant areas.

Ethics Best Practise

- Participants will be volunteers selected at random.

- Participants (or their appropriate carers) will be fully informed of the nature of the study, procedures undertaken, inherent risks involved, and insurance and liability arrangements in place to protect both themselves and the laboratory
- Participants will be informed they have the right to withdraw at any time without prejudice, at which point any data already recorded will be destroyed
- Participants (or their appropriate carers) will provide written consent to participate in the research activity
- Participants personal data will be anonymised in order that they cannot be identified directly from their data
- All data will be stored securely

(More information is in Annex 1 in section 4)

3.7 <u>Work Package 7 – Safety for Interaction (start Month 1)</u>

For T7.1 (and in preparation for T7.2)

The safety critical part of the robotic system under development needs to be a real time application and therefore it has been decided to develop, and also run it, on the Linux RTAI operating system, as it has a preemptive kernel and guarantees that higher priority processes can quickly interrupt lower priority processes.

The robotic system is also going to communicate with several desktop PCs, some of which came with the gaze and motion capture equipment, and are Windows based machines. At the moment it is planned to employ at least 3 PCs connected to the robotic torso plus an additional file server.

One PC will operate under Windows, dealing with signals from gaze recognition cameras (FaceLab, SeeingMachines), one Windows based machine will function as a motion capture system for gesture recognition (VICON), and one governing PC will coordinate all subsystems running under RTAI Linux. Besides that, there are 2 laptop PCs on which the software development (coding) will take place.

The described PCs need to be connected into a local network with the compilers, development environment (optional), version control systems, and clients needing to be set.

From the IT arrangements described above, the following has been achieved so far:

- Linux Ubuntu 8.04 Hardy Heron installed on the File Server PC and development laptop
- Sub-version repositories for source code and project documentation created on the file server.
- Sub-version clients (SVN Workbench) installed on the File Server and on the development laptop.
- Sub-version server set on the File server PC and the working folders created on the development laptop.
- A shared folder for file exchange has been organized on the File Server.
- Sub-version client (Tortoise SVN) has been installed on the Windows based development laptop.
- Integrated Development Environment (“Code::Blocks”) installed and tested on the Linux development.
- The motion capture system needed some minor rearrangements which have been done.
- The gaze tracking system has been tested with several optical arrangements and integration into our robot control architecture has been shown

T7.2 - From a hardware perspective, developmental and building work on the robot torso BERT continues. The controllers for the major joints are Maxon EPOS 24/1 and 24/5. Torque/current control tests for a single joint have been carried out. Based on a 1 Mbit/s CAN system, it has been concluded that external update rates of 100 Hz are feasible when the CAN bus is split into four separate subnets. One subnet is needed for each arm to give 7 Degrees of Freedom (DOF), one for the Trunk (4 DOF) and one for the fingers (18 DOF). A PCI interface which provides 4 separate CAN controllers (Kvaser PCIcan, 4x SJA1000) has been identified. This card will be installed on the Linux RTAI system. Prototype torque sensors for the major joints have been developed in conjunction with our mechanical engineering partner Elumotion Ltd. First tests show high linearity within the operational range. We purchased capacitance based pressure sensors (PPS, www.pressureprofile.com) which could function as a first testbed for touch detection, which is an important safety feature of our torso. This is an ongoing development and we are still exploring alternatives. Initial discussions took place at the first project meeting about investigating adopting common torque sensors for the robot platforms which would give a greater integration between the robot platforms, this is being explored along with the other options.

The preliminary experimental research on the proposed hardware and software architecture will inform the preparation of the requirements specification document (internal deliverable D7.1)

T7.3 - A first version of an expressive digital head has been developed and tested. Features include 2x2DOF eye movements, blinks and 7DOF lip movements. It has been integrated with our gaze tracking system using a TCP/IP link and the robot is therefore able to follow the human gaze (eye and head rotations with 2DOF) and mimic it, if appropriate. The mechanical design of this prototype will be finessed and, in the coming weeks, eyebrows will be added.

A visit by two researchers from LAAS-CNRS to BRL is planned for month 9 or 10 to collaborate on work related to decisional planning and safety for interaction.

3.8 Work Package 8 – Scenario testing (start Month 40)

Work on WP8 is scheduled to being in month 40 of the project.

During meeting 2 in Genoa IIT presented the YARP architecture and defined it as an architecture for sharing modules. It was decided to adopt a modular architecture inspired by the one developed in the Robotcub project[2]. The software architecture will be designed as a collection of modules; each module will be described in terms of the functions it performs. This functional description will include a specification of the module input and output data. This will allow people to work on certain modules that are the main focus of the project while keeping simplified implementations of the other parts of the architecture. With time this simplified modules will be substituted with better implementation, when available. YARP could be used to implement new modules (if one wishes), or simply as a “glue” (or interface) between different parts of the software architecture.

[2] http://www.robotcub.org/

4. DELIVERABLES AND MILESTONES TABLES

4.1 Deliverables (excluding the periodic and final reports)

TABLE 1. DELIVERABLES[3]

Del. no.	Deliverable name	WP no.	Lead participant	Nature	Dissemination level	Due delivery date from Annex I	Delivered Yes/No	Actual / Forecast delivery date	Comments
D1	CHRIS WIKI online	3	NCRM	O	PP	Project Month 4 (June 2008)	Yes	22/05/2008	CHRIS WIKI was created on the 22/05/2008. Anne Bajart (EC) given access on 11/06/2008. https://fp7-chris.pbwiki.com/
D2	Progress report following meeting 2, including dissemination routes, ethical standardisation.	1	UWE	R	CO	Project Month 5 (July 2008)	Yes	28/07/08	

4.2 ***Milestones***

TABLE 2. MILESTONES

Milestone no.	Milestone name	Due achievement date from Annex I	Achieved Yes/No	Actual / Forecast achievement date	Comments
M1	Meeting 2, the Wizard of Oz simulation	Month 4, June 2008	Yes	27th June 2008	The Wizard of Oz simulation was renamed to “Scripted Scenario Enactment” at project meeting one as it more accurately reflected the nature of the activity.

5. PROJECT MANAGEMENT

A Project Manager has been hired, to be based at UWE-BRL for 0.5 full time equivalent (the post holder was in place from the 2nd June). The project manager is instigating effective management procedures instilled in the Consortium Agreement, overseeing the progress of work packages, monitoring deliverables, IP, and monitoring existing and potential risks to the project.

5.1 Consortium management tasks and achievements

The project manager is ensuring timely delivery of deliverables, meetings, and milestones, forward planning future meetings, tracking progress, setting up systems for monthly reporting and meeting with management accounts at the lead institution. The project is in its infancy and is all going to schedule. So far there are no deviations from the planned milestones and deliverables. The wiki is being successfully used as a management tool for the project.

5.2 Integration activity

Communication via video conferencing is being instigated. Details about videoconferencing specifications have been entered onto the wiki site and all partners agreed at meeting two that at least one video conference between at least one other partner would occur before meeting three. Video conferencing between researchers is being strongly encouraged by the work package leads to enable good integration to occur at all stages of the project. A videoconferencing system has been installed at MPG and tested successfully with UWE-BRL, which is the first step to establishing this connectivity across these geographically distal locations.

At meeting two a ‘showcasing’ session was built into the schedule to enable all partners to present their research in a broad context and also with specific reference to the CHRIS project. Running an ‘integration workshop’ as part of meeting 3 has been discussed. Visits, additional to the project meetings and videoconferencing sessions, have taken place, or are planned, between researchers at MPG and LAAS-CNRS, between NCRM and IIT, BRL and IIT and between LAAS-CNRS and BRL and detailed additional discussions took place after meeting 2 between BRL and NCRM.

The YARP (Yet Another Robot Platform) architecture has been adopted by the project partners which will enable a level of commonality and integration across the platforms (see work package 3, Section 3 above for more details).

5.3 Use of dissemination activities during this period

With the project partners the Project manager is supporting dissemination to relevant research communities and potential stakeholders. The project website has been set up and it contains a page specifically for news reported on the project. There are links on this page to press articles written about the project.

5.4 Changes in the consortium

Felix Warneken is to leave MPG in Spring or Summer 2009. He has already identified a person at MPG to take over his role in the project, so continuity on the project will not be disrupted. Peter Ford Dominey is to move from the Universite Lumiere Lyon 2 (NCRM) to INSERM U846, Stem Cell and Brain Research Institute. Negotiations are underway to ensure a smooth transition.

5.5 Risk Register

The risk register first presented in Annex I, is being monitored and updated regularly by the Project Manager. Felix Warneken’s move from MPG and replacement and Peter Ford Dominey’s changes of institution are both entered into this. In addition, low level risks and mitigating actions have been identified and include in the register for monitoring and evaluation.

5.6 Project Website

The website for the project is up and running at: http://www.chrisfp7.eu/. This website is one route that the project can use for disseminating information about the project. (Details mentioned above in the report). The Project Manager is managing content for the website, requesting information from partners and uploading this to the website. The website is being hosted by the lead partner, UWE-BRL.

5.7 Project Meeting Details

Completed Project Meetings:

MEETING 1	Month 2 (23rd April 08)	BRL, UWE, Bristol, UK	Initial Project Meeting - inaugurated the project and began formulation of the SSE
MEETING 2	Month 4 (25th-27th June 08)	IIT, Genoa, Italy	Project monitoring and WP Systems Engineering discussions – specifically the SSE

Planned Future Project Meetings:

MEETING 3	Month 8 (20th-21st October 08)	CNRS, Toulouse, France	Project monitoring and system and capability discussions.
MEETING 4	Month 12 (2nd-3rd February 09)	MPG, Leipzig, Germany	Project monitoring and annual report discussion

5.8 Finance

In accordance with Article II.2.3 of the Grant Agreement, the first monies have been distributed as listed in the table below:

Distribution of CHRIS Project Pre-Financing (Less 5% Guarantee Fund)

No.	Partner Name	Short Name	Total Funding	Guarantee Fund 5%	Pre-Financing	Amount to Distribute
1	University of the West of England	UWE	1,342,899.00	67,145	537,160	470,015
2	Centre National de la Recherche Scientifique	CNRS	666,681.60	33,334	266,673	233,339
3	Fondazione Istituto di Technologia	IIT	599,579.00	29,979	239,832	209,853
4	Max Planck Gesellschaft zur Foederung der Wissenschaften e. V.	MP	428,017.00	21,401	171,207	149,806
5	University of Bristol	UOB	56,898.00	2,845	22,759	19,914
6	Universite Lumiere Lyon 2	LYON2	555,924.00	27,796	222,370	194,573
			€ 3,649,998.60	€ 182,500.00	€ 1,460,000.00	€ 1,277,500.00

5.9 Personnel

All personnel have now been identified for the project. The majority have already commenced work on the project with the exception of a post doc at IIT who isn't due to start until January 2009, and a post doc and an RA who are due to start at NCRM in August/September 2008. Below is a table of all the staff working on the project:

Partner number	Name & Address	Staff	Start Date
1	University of the West of England, Bristol UWE-BRL UK	**Chris Melhuish (WP1 Lead)**	01 March 08
		Tony Pipe (WP7 Lead)	01 March 08
		Cath Thomas (PM)	01 June 08
		Alex Lenz (RA)	01 March 08
		Sergey Skachek (RA)	01 June 08
		Said Ghani Khan (PhD)	18 July 08
2	Centre National de la Recherche Scientifique CNRS France	**Rachid Alami (WP5 Lead)**	01 March 08
		Raja Chatila	01 June 08
		Thierry Simeon	01 June 08
		Felix Ingrand	01 June 08
		Akin Sisbot	01 June 08
		Raquel Ros Espinoza	01 June 08
		Aurélie Clodic	01 June 08
		Amit Pandey (PHD)	01 June 08
3	Fondazione Istituto di Tecnologia IIT Italy	**Giorgio Metta (WP4 & WP8 Lead)**	01 March 08
		Lorenzo Natale	01 March 08
		Armando Tacchella	01 March 08
		Ugo Pattacini	01 March 08
		Matteo Fumagalli	01 March 08
		Claudia Peschiera (not CHRIS funded)	
		Post Doc	January 09
4	Max Planck Gesellschaft zur Foerderung der Wissenschaften e. V. MPG Germany	**Felix Warneken (WP6 Lead)**	01 March 08
		Maria Gräfenhain (WP6 Lead from 2009)	2009
		Jasmin Steinwender (PhD)	01 March 08
		Katharina Hamann (PhD)	15 May 08
5	University of Bristol UoB-BRL UK	**Mike Fraser (WP2 Lead)**	01 March 08
		Stuart Burgess	01 March 08
		Neill Campbell	01 March 08
6	Universite Lumiere Lyon 2 NCRM France	**Peter Ford-Dominey (WP3 Lead)**	01 March 08
		Jocelyne Ventre-Dominey	01 March 08
		Stephane Lallee (RA)	September 08
		Zhen Li Lu (Post Doc)	September 08