FP7 Collaborative Projects, Networks of Excellence, Coordination and Support Actions

TECHNICAL REVIEW REPORT

Project Acronym: EyeShots

Period covered by the report:
 from …1/3/2009… to …28/2/2010……..

Date of review meeting (if applicable): 19 May 2010

Name(s) of expert(s):
- Dr Bernd Porr
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Individual report ☐
Consolidated report ■

1. OVERALL ASSESSMENT

a. Executive summary

Comments,
Highlight in particular the scientific/technical achievements of the project, its contribution to the State-of-the-Art and its impact.

The goal of this project is to develop a novel approach to robotic vision articulated around three key objectives: 1) a robotic system for stereopsis based on visual fragments, 2) a model for the representation of the 3D space and 3) a human/robot collaborative workspace. In this period, progress towards these objectives has been significant including in some WPs new methods or data that advance the state of the art. The project is having substantial scientific impact especially evidenced by a high number of high quality publications and there is clear potential for further scientific and technological impact.

b. Overall recommendations (e.g. on overall modifications, corrective actions at WP level, or re-tuning the objectives to optimise the impact or keep up with the State-of-the-Art, or for other reasons, like best use of resources, re-focusing…).

With the scientific impact of the project already being substantial, the focus of our recommendation is on addressing the technical and industrial impact of the project. We are aware that this project is not aiming towards a specific product or device. However, there is excellent potential for technological impact if the consortium demonstrates their new algorithms on the available hardware platforms and shows that this works reliably with real world data. If successful such demonstrators would be effective in convincing the industry to use the algorithms and the hardware in a technological context. There are two hardware platforms in the consortium that should be used to demonstrate this: First the non-conventional eye system (UGE) needs to be completed (irrespective of whether it is M30 or M36). The mechanical system offers very interesting perspectives, e.g., exploring the so-called 'structural consequences' of the design to address what is usually considered a 'control problem'. And there may be interest using such a platform to study eye pathologies, e.g., strabism.
Second, partner UJI, which is the only partner with access to a complete system (head/eye, torso, arm, hand), needs to develop a demonstrator integrating the novel perceptual and visuomotor processes developed by UGE, KLU and WWU. Given the short time frame remaining in the project, we recommend that UJI be requested to submit a roadmap document outlining how they will implement this recommendation. This roadmap should outline a list of tasks by which the different algorithms from the workpackages will be integrated one by one in an order that minimises delays. We expect that UJI will liaise with all partners and collect their code but ultimately we expect that UJI take care of the adjustment of the code so that the different modules can work seamlessly together and with the hardware. UJI should not expect from other partners to write new code but should expect a well-documented code base and in case of problems should expect prompt replies to their requests for clarification. In this way it should be possible to achieve a good level of integration in a fairly short period of time. In summary, this document should include:
(i) A list of tasks with a timeline prioritising in which order the different results from WP1 – WP3 are to be integrated into a coherent hard/software system so that delays are minimised. (1 page)

(ii) A description of the nature of the planned demonstrator, including a scenario. No prescription is made regarding the nature of this scenario but a requirement is that it demonstrates that the developed algorithms work well with real world images and that they are actually running in a concerted manner on a hardware platform. (1 page)

The reviewers believe that the actual development of an integrated demonstrator would enhance the impact of the project: a successful implementation of the processes developed in a VR environment would demonstrate the validity and scalability of the proposed method to real-world therefore enhancing its impact in a community that is simulation-wary as well as possibly making it an attractive proposition to the industry. Negative results, by which we mean that use in the real world of the developed techniques makes it possible to identify particular scenarios or conditions under which the proposed methods are not as effective as in VR, would open new lines of scientific investigation for partners UGE, KLU and WWU therefore furthering the scientific impact of this project.

The reviewers will be available to look at this roadmap document and provide feedback. Prior to submission, we would expect the consortium to discuss this roadmap internally with the different groups that produced the relevant software components as well as with the coordinator.

c. Assessment:

☐   Excellent progress (the project has fully achieved its objectives and technical goals for the period and has even exceeded expectations).

2.   OBJECTIVES and WORKPLAN

a. Have the objectives for the period been achieved? In particular, has the <u>project as a whole</u> been making satisfactory progress in relation to the Description of Work (Annex I to the grant agreement)?

Yes.

b. Has each work package (WP) been making satisfactory progress in relation to the Description of Work (Annex I of the grant agreement)?

Yes. However, the characterisation of the work of deliverable D4.2a in p 67 of the periodic report as 'the first to exploit real stereo vision in eye-arm coordination' should be removed. There is extensive literature in this area, most commonly under the term eye-hand coordination. For example, see work by MIT with COGS in the mid nineties. We accept that there is potential for new work in this area, e.g., we understand suggestions have been made by WWU regarding the use of gain on basis function to reflect some known physiology, however, in the current state, it is inappropriate to claim novelty.

c. Have planned milestones and deliverables been achieved for the reporting period?

For all planned deliverables, separate detailed reports were received that are all of a high standard and that demonstrate that the consortium has achieved their objectives for the reporting period.

D1.2: Motor control strategies for eye movements were analysed in great detail and the results have been presented a conferences.
D1.4a: A virtual reality simulator has been developed for testing and benchmarking, and has been used extensively within the consortium.
D2.1: A control model for vergence has been developed and benchmarked.
D2.2a: An algorithm for disparity estimation has been developed which does not need precise calibration. A MATLAB package has been made available to the other partners.
D3.1b: The visual processing from V1 to higher areas has been modelled successfully, which allows robust object detection.
D3.3a: A working memory model has been developed. The code is written in C++ and is available to the partners. The results have been submitted to Frontiers in Neuroscience.
D4.2a: A 3D visuomotor description of the peripersonal space has been developed which uses saccades as inputs.
D5.1: Neurons in the region V6A of the medial parieto-occipital cortex of the macaque have been measured. The results show that they carry information related to directing the eyes to a visual target in depth.
D5.3a: Psychophysical experiments have investigated how motor parameters and the type of stimulus influence the perception of fragments.

DELIVERABLES LIST STATUS			
No.	Title	Status (Approved/Rejected)	Remarks
D1.2	**Non-visual depth cues …**	**Approved**	
D1.4a	**Bioinspired stereovision …**	**Approved**	
D2.1	**Convolutional network …**	**Approved**	
D2.2a	**Algorithm for 3D scene …**	**Approved**	
D3.1b	**Demonstration of object …**	**Approved**	
D3.3a	**Working memory model**	**Approved**	
D4.2a	**Generating visuo-motor …**	**Approved**	
D5.1	**Report on neural discharges...**	**Approved**	
D5.3a	**Respective influence of …**	**Approved**	

d. Are the objectives for the coming period(s) i) still relevant and ii) still achievable within the time and resources available to the project?

Yes, the objectives for the coming period are very relevant.
A major integrating effort will have to be made by UJI. Resources in terms of PMs available to UJI to complete the project is a concern (19PM), however, it is our understanding that UJI has already committed to adding extra resources (externally funded PhD students).

We are hoping that UGE will be able to complete the implementation of their non-conventional eye system by M30 and that this platform can be made available to other partners in the consortium. The latter point isn't critical however since (a) integration was made possible by the development of the VR platform, thus, lightening the burden on UGE

to complete their prototype in time and (b) the consortium could benefit from the newly acquired humanoid head available at UJI.

e. For Networks of Excellence (NoEs) only:

Has the Joint Programme of Activities been realised for the period, with all activities foreseen satisfactorily completed?

Not applicable

3. RESOURCES

a. In your estimation, have resources used, i.e. personnel resources and other major cost items, been (i) utilised for achieving the progress, (ii) in a manner consistent with the principle of economy, efficiency and effectiveness. Note that both aspects (i) and (ii) have to be covered in your answer.

Yes on both accounts

b. if applicable, please comment on major deviations with respect to the planned resources.

There are no major deviations. As explained by the coordinator, apparently major deviations expressed in % in Table 6.2 correspond to small deviations in real terms. In the case of WWU for example, the deviation of 434% on item 'other costs' correspond to subject fees for experiments.

4. IMPLEMENTATION OF THE PROJECT

a. Has the project management been carried out as required?

Yes.

b. Has the collaboration between the beneficiaries been effective?

Mostly yes. There is clear evidence of collaborative work between most of the partners, in particular, UGE, KLU and WWU, for WP1-2-3. This appears to be a result of the decision by the consortium to develop a VR simulator that made it possible for these partners to work on a common platform. There is further evidence of more localised interactions between partners, e.g., between UNIBO and GE, WWU and UJI. A significant proportion of the consortium's publications involve authors from more than one partner. The collaboration between UJI and the rest of the consortium in terms of UJI integrating findings from the rest of the consortium has not been as effective as desired up to this point. We are hoping that with our recommendation progress can be made in this respect.

c. Is there any evidence of underperforming beneficiaries, lack of commitment or change of interest of any beneficiaries?

No.

5. USE AND DISSEMINATION OF FOREGROUND

a. Is there evidence that the project has/will produce significant scientific, technical, commercial, social, or environmental impacts (where applicable)?

Yes. The project is already making significant scientific contributions (see section regarding publications). These contributions take a number of forms. New methods have being developed which have been validated on simulated data (UGE, KUL, WWU). New neurophysiological data have been obtained (UNIBO). New psychophysics data have been obtained providing a new interpretation to published findings (WWU). The project is expected to also make a significant technical contribution with the design of a non-conventional eye system (UGE).
We are also hopeful that with our recommendation, an integrated demonstrator could be produced which would represent a substantial technical realisation that would enhance the technical and industrial impact of the project as well as further research.

b. Is the plan for the use of foreground, including any update, appropriate? Please comment on the plan for the exploitation and use of foreground for the consortium as a whole, or for individual beneficiaries or groups of beneficiaries and its progress to date.

Not applicable

c. Have the beneficiaries disseminated project results and information adequately (via publications, conferences…)?

Yes. The publication output of the consortium has been excellent. There have been a number of journal publications in major outlets across the whole board. There have been a number of conference papers and a summer school has been organised.

d. Are potential users and other stakeholders (outside the consortium) suitably involved (if applicable)?

Not really applicable. This is a pre-industrial project and focused on making progress on foundational issues, however, there is evidence of interest from potential stakeholders in the form of an expression of interest for the results of the project by e-ISOTIS, an international organisation supporting people with disabilities and interested in the service robotics potential of EYESHOTS.

e. Is the consortium interacting in a satisfactory manner with other related Framework Programme projects or other R&D national/international programmes, standardisation bodies (if relevant)?

Not applicable.

6.   OTHER ISSUES

a.   Have policy-related and/or regulatory issues been properly handled (if applicable)?

Yes	Partially	No

Not applicable

b.   Have ethical issues been appropriately handled (if applicable)?

Yes	Partially	No

Yes. UNIBO and WWU are carrying out animal and human studies respectively and appear to be following the appropriate procedures.

c.   Have safety issues been properly handled (if applicable)?

Yes	Partially	No

Not applicable

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Date: 15/06/2010

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