Standard Peer Review

none

Document Status: With Council

Applicant Details

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<tr>
<th>Applicant</th>
<th>Organisation</th>
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<tr>
<td>Dr Alan Smaill</td>
<td>University of Edinburgh</td>
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<td>Dr Simon Colton</td>
<td>Imperial College London</td>
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<tr>
<td>Dr Andrew Ireland</td>
<td>Heriot-Watt University</td>
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Title of Research Project

A cognitive model of axiom formulation and reformulation with application to AI and software engineering

Review Information

Response Due Date: 06/11/2007
Reviewer Reference: 9FFWTL

Research Council Contact Details

EPSRC Administration Contact: Mr Chris Van Roon
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Impact

Significance and Potential of the Research

Comment on the potential impact of the proposed research, in terms of its (1) ability to address a timely problem using the appropriate approach; (2) contribution to the UK’s world research standing; (3) ability to advance research knowledge for the benefit of the research community.

Although the proposed work is at the limits of my expertise, the proposal is well written enough to be comprehensible, and I find the proposed work very exciting indeed. Embodied cognition is causing something of a revolution in thinking in cognitive science at the moment, and the addition of embodied action for generating axioms to a social Lakatosian account for refining axiomatic knowledge sets is extremely creative and very promising. The problem of abstraction is one that needs to be tackled if embodied cognition accounts are to make progress, and the proposal here seems a very smart way of going about it that avoids many of the pitfalls of induction/analogy based approaches. I think the potential benefits to automated theorem proving, cognitive science, software development and robotics are large, and although it is not explored directly in this project, there are potential applications of research findings to education. All in all, a very exciting proposal.

Overall, the significance of the research is: [ ] Unsatisfactory [ ] Adequate [ ] Good [ ] Very Good [ ] Outstanding
My confidence level in assessing this is: [ ] Low [ ] Medium [ ] High

Degree of Novelty or Risk

EPSRC Reference: EP/F037058/1
EPSRC Reference: EP/F036647/1
EPSRC Reference: EP/F035594/1

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Comment on (1) the originality of the proposed research; (2) the degree of adventure and potential to produce a high return in knowledge advances and / or exploitation and; (3) the incremental nature of the research. Where the proposal is more incremental in nature, comment on the degree to which this is essential to the advancement of knowledge for the benefit of the academic community and / or business, and / or in facilitating a multidisciplinary approach.

The research is clearly novel, and the idea of combining embodied action with social influences on idea formulation and testing is very adventurous. However, the researchers have enough in place to provide a clear demonstrator for these complex but achievable ideas.

Overall, the degree of novelty and risk is:  

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My confidence level in assessing this is:  

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People and Development

Comment on the extent to which the proposal contributes to the training and development of highly skilled researchers, considering all levels.

Very smart use of the PhD students, with clearly defined sub-projects that are ambitious but scalable and can stand alone. Proposal also gives a further opportunity for the Post doc RAs to extend their research training in sensible ways.

The degree of researcher training and development is:  

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Collaboration

Comment on the nature, appropriateness and likely value of any partnerships proposed (e.g. with another department or institution, with business or overseas institution, or the absence of partnership).

The proposed use of an external consultant with the expertise and toolsets of Dr Arthan seems a cost-effective way of extending the team's skills set. Given the fundamendal nature of the research agenda, no further collaboration (e.g., with industry) would be appropriate.

Overall, the value of the collaboration is:  

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Applicant

Ability to Deliver the Proposed Research

Comment on the skills and experience of the applicant(s) and team (including any proposed project partners) to ensure delivery of the research described.

An outstanding team, assembled with clear thought to the necessary skill sets required.

Overall, their ability to ensure delivery of the research is:  

<table>
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Planning and Management

Comment on the planning and project management, including timescales, methodology, management of risks and dissemination plans.

Ok, though if there is one point I would like to see a little more description of, it is of the potential for dependencies between work packages - what happens to WPs 6 and higher if progress is not made on 1-5 in a timely fashion?

Overall, the planning and management appears:  

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Resources Requested

Are the resources requested appropriate and justified?

Modest for the ambition of the project and carefully justified.

Potential Contribution to Knowledge Transfer

Where appropriate, comment on the extent to which the proposal contributes to knowledge transfer / exploitation (e.g. in addressing challenges faced by users, in enabling the flow of knowledge between the research base and business, or society, or in proposing plans for the successful transfer and exploitation of the research outputs).

Give the fundamental nature of the research, knowledge transfer is somewhere down the line. That said, the impact on robotics and software specification applications may be quite rapid. In due course, however, it seems likely that the impact on knowledge transfer will be massive: I may be over-stating things based on limited knowledge, but it feels to me that there may be the basis for a paradigm shift in AI as a result of this work (if one excuses my invocation of Kuhn in a Lakatosian-orientated proposal!).

The overall potential for knowledge transfer / exploitation is: [ ] Low, [ ] Limited, [ ] Significant, [x] Major

The overall assessment of this is: [ ] Low, [ ] Medium, [x] High

Overall Assessment

Your Conclusions

Please summarise your view of the proposal.

This is a superb proposal - it is innovative, intelligently argued, well illustrated and extremely well-written. Unless someone with more knowledge of the automated theorem proving literature can point to a major flaw or replication, then I think it is very important that this work receives support. I am not usually given to such glowing praise in my reviews, but this is about the best proposal I have ever reviewed for EPSRC. Although I am not a direct subject expert, the proposal touches on enough areas of knowledge and is well written enough for me to have high confidence in my evaluation.

The overall quality of the proposal, as written, is: [ ] Unsatisfactory, [ ] Adequate, [ ] Good, [ ] Very Good, [x] Outstanding

Recommendations

I believe this project: [ ] Should not proceed as proposed, [ ] Could proceed as proposed, [x] Should proceed

The confidence level in assessing this is: [ ] Low, [ ] Medium, [x] High

Reviewer Self Assessment

Your Area of Expertise

Please indicate the areas of expertise that are relevant to your assessment. Take care not to reveal your identity to the applicant.

Problem-solving, skill acquisition & expertise; deductive reasoning; cognitive science; HCl; design & programming expertise; investigative expertise.