Standard Peer Review

none

Applicant Details

<table>
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<tr>
<th>Applicant</th>
<th>Dr Alan Smaill</th>
<th>Organisation</th>
<th>University of Edinburgh</th>
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<tbody>
<tr>
<td>Applicant</td>
<td>Dr Simon Colton</td>
<td>Organisation</td>
<td>Imperial College London</td>
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<tr>
<td>Applicant</td>
<td>Dr Andrew Ireland</td>
<td>Organisation</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 | 30/11/2007  
Reviewer Reference: 1RTT79

Research Council Contact Details

| EPSRC Administration Contact: Mr Chris Van Roon | Email: chris.vanroon@epsrc.ac.uk | Telephone: 01793 444033 |

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.

The aim of the proposed work is to develop a cognitive model of axiom formulation and apply it to AI and software engineering. The proposal critiques previous approaches to automated theory formation for failing to take cognitively plausible input and for failing to shed light on the processes by which humans form axioms. In response, the proposal is to formulate a new theory that consists of a stream of research on embodied axiomatisation and a stream on societal axiomatisation.

1. The problem addressed by the proposal, and as defined by Lakatos (1976) and Lakoff and Nunez (2001) is interesting. However, the proposed computational methodology needs to be complemented by an empirical approach if it is to provide evidence to support the stated goal of developing a cognitive model. Unfortunately, there is not an adequate statement in the proposal of how the cognitive plausibility of the developed theories will be evaluated by comparison to data concerning human behaviour.

2. The proposal addresses a problem that is recognised internationally and the research team includes established international reputations.

3. There is evidence that the foundations of the proposal have been established with conference papers, books, and book chapters, though not journal publications, published by the authors. To this extent the proposed work could plausibly advance research knowledge.
Overall, the significance of the research is:

- [ ] Unsatisfactory
- [x] Adequate
- [ ] Good
- [ ] Very Good
- [ ] Outstanding

My confidence level in assessing this is:

- [ ] Low
- [x] Medium
- [ ] High

Degree of Novelty or Risk

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 aims of the proposed work are strongly motivated by Lakatos (1976) and Lakoff and Nunez (2001). Since their respective publication dates these two pieces of work have been highly influential. It is unclear how the proposed work relates to and differs from the vast range of research that has been motivated by the same sources in the intervening years.

Overall, the degree of novelty and risk is:

- [ ] Unsatisfactory
- [ ] Adequate
- [ ] Good
- [ ] Very Good
- [x] Outstanding

My confidence level in assessing this is:

- [ ] Low
- [x] Medium
- [x] High

People and Development

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

The proposed work would offer an excellent opportunity for two highly promising researchers to further their careers.

The degree of researcher training and development is:

- [ ] Unsatisfactory
- [ ] Adequate
- [ ] Good
- [x] Very Good
- [ ] Outstanding

My confidence level in assessing this is:

- [ ] Low
- [x] Medium
- [x] High

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).

Partnerships are appropriate but greater diversity of research backgrounds might be helpful. E.g. Researchers with a background in human cognition.

Overall, the value of the collaboration is:

- [ ] Unsatisfactory
- [ ] Adequate
- [ ] Good
- [x] Very Good
- [ ] Outstanding

My confidence level in assessing this is:

- [ ] Low
- [x] Medium
- [x] High

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.

The project team offers a good mix of experience.

It was unclear from the proposal that the applicants have a track record of recent high quality international and journal publication in the proposed field of investigation.

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

- [ ] Unsatisfactory
- [ ] Adequate
- [ ] Good
- [x] Very Good
- [ ] Outstanding

My confidence level in assessing this is:

- [ ] Low
- [x] Medium
- [x] High
Planning and Management
Comment on the planning and project management, including timescales, methodology, management of risks and dissemination plans.

The project plan looks feasible.
As I have said, I am unsure about the appropriateness of hte methodology.

Overall, the planning and management appears:  

<table>
<thead>
<tr>
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<th>Adequate</th>
<th>Good</th>
<th>Very Good</th>
<th>Outstanding</th>
</tr>
</thead>
</table>

My confidence level in assessing this is:  

<table>
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<tr>
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<th>High</th>
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Resources Requested

Are the resources requested appropriate and justified?

fine

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).

The proposal offers an appropriate model of dissemination through journal publication. Less is said about exploitation or transfer to business but this is appropriate for this kind of proposal.

I would encourage the applications to be more ambitious than to focus their symposium efforts on AISB. It would be worth considering higher profile and international conferences.

Overall, the potential for knowledge transfer / exploitation is:  

<table>
<thead>
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My confidence level in assessing this is:  

<table>
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Overall Assessment

Your Conclusions

Please summarise your view of the proposal.

The strength of this proposal is that it brings a highly skilled research team together to address an important problem. However, while others may disagree, I do not believe that the proposed methodologies are adequate for addressing the stated problem.

To repeat a comment that I made earlier: The problem addressed by the proposal, and as defined by Lakatos (1976) and Lakoff and Nunez (2001) is interesting. However, the proposed computational methodology needs to be complemented by an empirical approach if it is to provide evidence to support the stated goal of developing a cognitive model. Unfortunately, there is not an adequate statement in the proposal of how the cognitive plausibility of the developed theories will be evaluated by comparison to data concerning human behaviour.

The overall quality of the proposal, as written, is:  

<table>
<thead>
<tr>
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Recommendations

I believe this project:  

<table>
<thead>
<tr>
<th>Should not proceed as</th>
<th>Could proceed as proposed</th>
<th>Should proceed</th>
</tr>
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</table>

My confidence level in assessing this is:  

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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.

My expertise is in cognitive science. In particular, I am interested in empirically grounded, computational understandings of how people adapt, problem solve, and learn.