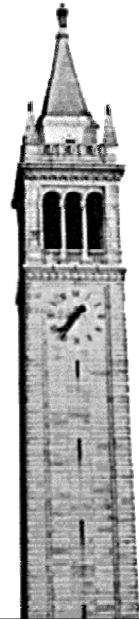


Response to Previous Reviewers' Concerns

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Outline



- Research Plans
- Research Accomplishments
- Education and Outreach
- Project Management
- Future Research and Goals

Research Plans



Helen Gill's Summary:

Reviewers generally found that the first year research plan was on track in all areas. It was noted that some topical changes had occurred and that advances outstripped milestones in some areas.

Research Plans



Two concerns arose: One concern was that the language research seemed disconnected from an otherwise well-integrated project.

- We believe this to be more a result of the style of the presentation and of the general angle taken by George Necula in his talk rather than a lack of coordination.
- In our view, his research fits well in the general area of development of embedded software using high-level language support for preventing errors in embedded code.
- Presentation by Jhala casts the language research in the general context of CHESSE plans

Research Plans



Helen Gill's Summary: The second was that ambitious experimental plans not be allowed to detract from core progress in bridging between the continuous and discrete, the physical and computational. In particular, though sensor nets are an area of opportunity and technical strength in this group, a stronger connection of this work to the main themes of the project was encouraged.

Response (see Applications talk)



- Experimental plans are important to our research since they provide feedback and inspiration to move forward to even more challenging theoretical problems.
- On the other hand, we will by no means renounce to our vocation for a strong theoretical basis for all we do in favor of applications.
- Sensor networks are an important research topic for an increasingly large research community. Berkeley has been at the forefront of this research and it is natural that we took inspiration from the excellent work being carried out on the topic by our colleagues. Our team has had an interest in this topic for a few years and the approaches we are taking to cope with the problem increasingly show an important connection with the embedded world. In addition, most of the applications of sensor networks are related to the monitoring and control of complex systems that are continuous in nature.
- The modeling approach that hybrid systems offer us can become a critical differentiator in our research.

Research Plans



Reviewer A: ...the PIs should review their original plans to make sure deviations are deliberate and that important directions are not left unexplored for too long.

Response



- We have monthly meetings where the state of the project is reviewed and directions assessed.
- The deviations are mostly deliberate since novel applications and/or theoretical results may indicate a particularly interesting aspect that was not considered at the time of the writing of the proposal.
- In few cases, the delays in addressing the research topics are due to the difficulty of the problems coupled with the inexperience of some new graduate students.
- We will report on significant deviations in the yearly review and the annual report.

Research Accomplishments



Helen Gill's summary: The site visit team observed that very strong contributions were being made already. Major advances were noted in interface theory, and the Giotto virtual machine interface. New contributions were also noted in fault tolerance, resource-aware analysis for open systems, and novel application of discount theory for prediction. Tool chain and meta-modeling research was seen as making progress. The project was seen as already very productive and the publication rate strong after one year. Experimental activity is underway and plans are convincing. The site visitors were unanimous in their views that the project indeed exceeds the sum of the parts. The interaction and synergy among investigators across the institutions and students at Berkeley and Vanderbilt was seen as very strong.

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Research Accomplishments (see talk on Industrial Outreach)



Although it is not formally part of the ITR project, the site visitors were hopeful that the ESCHER consortium could enable industrial uptake of open source results.

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Research Accomplishments



Reviewer A: In some areas it would be useful for the Berkeley and Vanderbilt teams to invest a little more energy in comparing and contrasting their contributions to other work outside of CHESS. For example, it was not clear from the presentation on modeling and simulation of sensor nets (Zhao) how the features and performance of the Ptolemy-based tool compared to other network simulators. Similarly, it would be useful to clarify the pros and cons of using schedule-carrying code (Matic) relative to traditional real-time techniques for guaranteeing schedulability (e.g., RMA). In the areas of model-based design and tool architectures, the possibility of building semantic translators needs to be assessed relative to the successes and failures of other point solutions in this domain.

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Response



- We made sure to compare with outside work. In some cases, we did not include a careful comparison for the lack of time given the number of presentations and their duration.

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Research Accomplishments



Reviewer C: Some of the presented research could have been "sold" better as to how it fits into the broader program of study of the foundations of embedded and hybrid systems, and the PIs were informed of this in closed session.

Response



- When presenting our accomplishments, we made a serious effort in this review to cast our work in a better format as to show better the relations of our research project in the overarching theme of the ITR.

Education and Outreach



Helen Gill's summary: The summer outreach programs, SUPERB at Berkeley and SIPHER at Vanderbilt, were seen as a central asset of this project. The aggressive recruitment and tailored involvement of students from underrepresented groups was commended. Planned outreach to California state universities was slower, but reasonable for a first year.

Education and Outreach



One area suggested for improvement is the inclusion of a well-qualified female PI in the research team, which would make an already strong team even stronger and would better ground its diversity goals by example.

***Reviewer D:** Lack of female participation across the board (one female listed as token PI - did not present, no female grad students, no female undergrads, no females on advisory boards).*

Response



- We are in active discussion with a potential new hire who would be an ideal candidate to be a PI. While we cannot at this time make any precise reference to the person, we hope that she will accept to come to Berkeley.
- Prof. Baicsy is certainly not a token PI! She has a very important role in the College of Engineering as the CITRIS Director and has been active in working in areas that are pertinent to the Chess activities. She had joined the team shortly before the first review and for this reason she preferred non to present.
- There are a few female graduate students supported by Chess: Elaine Cheong, Farinaz Koushanfar, Yang Zhao, Rachel Ye Zhou. Also, Yang Zhao, a female student of Prof. Lee's group, presented. Farinaz Khousanfar, Rachel Zhou and Elaine Cheong had posters. **Thus we do not really understand Reviewer D comments about no female presenters or grad students.**
- In terms of under-represented groups, Douglas Densmore and Marc McKelvin working with Professor Sangiovanni-Vincentelli are African-American graduate students.

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Project Management



Reviewer C: Could be even more impactful if more PIs at UCB were involved in SUPERB.

Prof. Sangiovanni Vincentelli and Sastry have joined Professor Lee in sponsoring a number of SUPERB students during the summer.

Reviewer C: Would like to see more current thinking of UCB in terms of curricular reform ideas as they achieve more and more success in the classroom.

We are now starting to plan for an undergraduate course on embedded system design that joins the graduate courses EE249, Modeling, Verification and Synthesis of Embedded Systems, started by Prof. Sangiovanni Vincentelli four years ago, and EE290A, Hybrid Systems, to form an embryo of a complete curriculum for embedded and hybrid systems. Alberto Sangiovanni Vincentelli is co-hosting a special issue of the ACM Transaction TODAES on education issues and curriculum development for embedded systems.

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Education and Outreach (see Talk this afternoon)



Reviewer D: What is the status of the curriculum development component beyond the new course. The proposal called for evaluation of the curriculum and determination of development needs/plans in the first 6 months. We did not hear about this on the Berkeley side. Vanderbilt also has a significant curriculum development activity? How are the two sides related? Shouldn't they be coordinated in some way?

- We organized a presentation on education at this review.

Project Management



- *Helen Gill's summary: The site visit team was very pleased with the management structure and first-year operation of the project. Extensive involvement of industry in a Board of Advisors was commended as a management component of this ITR project. Leadership, including the Executive Board structure, and integration of the research team was judged to be very strong.*

Project Management



An upcoming challenge is the expected absence of Dr. Henzinger from UC Berkeley as he takes leave for 1-2 years at the University of Lausanne. It is unknown whether this will become a permanent arrangement, however it is expected that Dr. Henzinger will retain a major role in the project. Nonetheless, adjustments will need to be made. Arrangements are not yet final.

- Tom has indicated that he will remain engaged in the research program possibly through joint EU-US research projects such as Columbus. He still has several PhD students at Berkeley whom he will continue to advise (Vinayak Prabhu on hybrid systems, Ranjit Jhala on software model checking, Arindam Chakrabarti on interfaces, and Slobodan Matic on distributed Giotto).
- The presence of Alberto S-V in Europe part time would create a strong link with the program since the interaction between Tom and Alberto could be enhanced by the simultaneous presence of both of them in Europe.
- We are actively recruiting in an area that is overlapping with Tom's expertise.

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Future Research and Goals



Helen Gill's summary. The focus of this review was on first-year research accomplishments and directions. However, the project was viewed as on track. Team members urged the PIs to remain focused on the difficult but central problems, compositional integration of discrete and continuous control and semantic tool integration, so that later efforts would not be delayed.

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Response



- Reviewer B has caught our attempt to balance things: *I think the distribution of talks on the four focus areas is quite appropriate. First of all, the key issue of the whole project is foundations, so it is good to have many theory talks. Second, as the project progresses, I would expect theoretical results to migrate into new tools that then can be showcased. Third, advanced tool architectures and experimental research take a long time to do, and the project has only been underway for a year.*
- Reviewer D sensed an emphasis on theory and seems to indicate that we will need to focus on implementation more: *Mostly theoretical - but are there plans for some practical implementations and experimentation.*
- The focus of new papers from the group is on theories that support the framework underlying our tools such as xGiotto, Ptolemy II and Metropolis. In this year review, we give more emphasis to the theoretical foundations of our work versus tools and applications.

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Future Research and Goals



Reviewer A: *It would be helpful in future reviews to present a roadmap for the project so that progress and deviations from original goals can be assessed more easily. Although there was reference to a regular meeting of the project directors, the lack of an overarching structure and rationale for most of the presentations conveyed the impression that the work is a collection of individual projects that are loosely coupled through tool sharing and informal technical exchanges.*

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Response



- We prepared the review meeting with this concern in mind. As Reviewer A also points out, we try to shy away from being too prescriptive in giving directions to our colleagues for their research work. The calibration between direction and freedom is an important issue since we are working with a group of very gifted researchers who could produce revolutionary results of great impact to the goal of the project in unexpected ways.