Using Artificial Intelligence and Learning to direct Stimuli Generation in Functional Verification: Intelligent, agent-based testing (supported by Infineon Technologies UK Ltd)

**Type of award**  PhD Research Studentship

**Department**  Computer Science

**Scholarship Details**  Scholarship covers full UK/EU (EU applicants who have been resident in the UK for 3 years prior to application) PhD tuition fees and a tax-free stipend at the current RCUK rate (£14,296 in 2016/17; £14,553 in 2017/18), enhanced by an additional industrial top-up subject to contracts. EU nationals resident in the EU may also apply but will qualify only for PhD tuition fees

**Duration**  3.5 years

**Eligibility**  Home/EU applicants only

**Deadline**  Must be able to start mid-September 2017

**PhD Topic Background/Description**

Functional verification ensures the correct functioning of complex semiconductors. Companies invest heavily in functional verification, e.g. to ensure a good user experience, to comply with regulators, to avoid the considerable costs of recalls and litigation and, in safety critical applications, to prevent the loss of life.

The two state-of-the-art approaches to functional verification are constrained-random verification and formal verification. The former is inefficient, with many simulation cycles spent exploring the same state space in much the same way; guiding the tool into the interesting corner cases present in complex systems typically requires considerable input from engineers. On the other hand, formal verification can find corner cases with little manual steering, but complexity limits mean that it can only be applied exhaustively to relatively small designs.

We aim to use AI techniques and learning to direct the generation of stimuli so that the interesting corner cases on a large complex design can be reached in an automated way. In this project we will develop intelligent, agent-based test methods, exploiting multi-agent systems for model-based test generation. An agent-based approach offers high-level, goal directed planning. Augmented with learning, based on reward and punishment, agent-based test generation can be further automated. The effectiveness of this technique has already been demonstrated in the context of human-robot interaction, where the goal is to execute an (unknown) sequence of actions to achieve a desired task. We now aim to transfer our agent-based stimuli generation approach from robotics into semiconductor design verification. In particular we will investigate how this approach can be used to automatically generate effective instruction sequences for processor verification, e.g. to achieve an...
architecturally defined state in a difficult to reach situation. We expect that this technique significantly reduces the need for hand-written constraints and random generation.

**Further Particulars**

**Candidate Requirements**
We are looking for an enthusiastic student with at least a 2.1 or first class degree in Computer Science, Computer Systems Engineering or a similar discipline.

Excellent programming skills and a good understanding of computer architecture are essential. You are able to quickly pick up new programming languages and you are willing to learn how to use state-of-the-art professional EDA tools. You are a competent presenter, writer and communicator. You seek an intellectual challenge and aim to achieve excellence in your research.

**Scholarship Details**
Research Council £14,296 p.a. in 2016/17 (£14,553 p.a. in 2017/18) plus an industrial top-up (amount to be finalised) subject to contracts.

**Informal enquiries**
Please email Prof Kerstin Eder (Kerstin.Eder@bristol.ac.uk)
For general enquiries, please email gsen-pgrs@bristol.ac.uk

**Application Details**
To apply for this studentship submit a PhD application using our online application system [www.bristol.ac.uk/pg-howtoapply]

Please ensure that in the Funding section you tick “I would like to be considered for a funding award from the Computer Science Department” and specify the title of the scholarship in the “other” box below with the name of the supervisor.

**Closing date for applications 25 May 2017.**

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