

Master Thesis Proposal (30 ECTS credits): Debugging Reactive Programs in Virtual Reality

Lab: Software Languages Lab (SOFT), VUB.

Advisors: Elisa Gonzalez Boix, Florian Myter

Period: Academic year 2019/2020.

Domain interests of the candidate: debuggers, programming languages, reactive programming, virtual reality

Context:

Debugging programs is a cognitively demanding task which requires the programmer to keep a mental model of the state and execution of the application being debugged. Luckily, debuggers greatly simplify this task by visualising the memory, the currently executing line, the call stack etc. Unfortunately, traditional visualisation techniques do not scale well for debugging event-driven applications because the program's execution flow depends on external events, i.e. every time an external event is triggered the application's execution flow is altered.

Prior work at the Software Language Lab has studied online debugging support for reactive programming using 3D virtual reality. This resulted in a first prototype debugger called VRken which allows developers to inspect and control the execution of a reactive program by manipulating a virtual dependency graph. VRken has been developed using WebVR support for the HTC Vive headset. A demo of the existing debugger is available at <https://www.youtube.com/watch?v=FjV9SfSD3yo>

Proposal:

The goal of this thesis proposal is to further explore visualization techniques for debugging reactive programs. We foresee the student will first conduct a literature study on graph visualization techniques using both 3D stereoscopic environment and 3D layouts. The student will then implement its own debugger embodying the most compelling 3D technique for dependency graph visualization. As base programming language in which reactive programs can be written, prior work from the lab on reactive programming language support can be reused. In order to validate the new debugger, a user study could be conducted with researchers and master students with expertise in reactive programs.

Studying at Brussels and SOFT:

Brussels is the official capital of Belgium and unofficial capital of Europe. From the city in which Charles V was declared king of the unified Spain, to hosting the headquarters of the European Union today, Brussels has always played an important political role and is defined by a vibrant mix of old and new. Brussels is also a cosmopolitan city like no other. 31% of its population is of foreign origin, and this makes for a unique atmosphere in which cultures interact easily with one another. As such, VUB receives every year international students in the context of different programs such as Erasmus, Socrates or International Masters.

SOFT is active in the design, formalisation, implementation and application of new programming languages and new software engineering technologies. This includes inventing, improving and applying state-of-the-art programming technologies, software components, and development tools to support the software construction process of the future. SOFT aims to cover all aspects of this domain varying from (formal) foundational research up until industrial applications. SOFT currently has a headcount of 5 full-time professors (V. Jonckers, W. De Meuter, E. Gonzalez Boix, C. De Roover, D. Devriese), 3 part-time professors, 6 post-docs and 25 pre-docs. The lingua franca of the lab is English as many of its current members come from different countries such as Kenya, Cuba, Italy, and USA. The SOFT lab organizes regular group meetings next to the weekly progress meetings with the supervisor(s) to follow up on the work conducted by master students.

More information:

- Read more about SOFT <http://soft.vub.ac.be/>
- Read more about VUB <http://www.vub.ac.be/en/>
- Questions on the proposal? Mail Elisa Gonzalez Boix egonzale@vub.be (in Catalan/Spanish/English)