Enhancement of visual programming environment
for robot programming on mobile devices

Type: Bachelor Thesis or Semester Project
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Goal

In the last years, we have developed a visual programming environment for the Thymio mobile robot (see bottom, left). This environment has been successfully used to introduce children to programming, in schools and homes worldwide (15,000 robot units distributed). However, this environment was designed to run on desktop/laptop computers and is not easy to use on mobile devices such as tablets and phones. Since last year, we have been developing a mobile version (see bottom, right), taking advantage of the touch-based interface of mobile devices. A prototype exists, but several features must be added before release.

The goal of this project is to improve the visual programming environment for Thymio on mobile devices. The current prototype proposes a rich view of the program allowing to build state machines; the student should complement this view with a simpler mode, similar to the desktop version. In addition, new blocks should be developed, for instance to record and replay sound on the tablet. If time allows, a feature enabling the user to create her/his own blocks would be a useful addition.

Throughout the project, a collaboration with Mobsya, the Thymio producer, will allow to validate the development with a broad range of users, including teachers, children and parents. This project will be implemented mostly in Qt-QML, with some minor contributions to the underlying C++ code and the script of the robot.
Context

In the last 10 years, EPFL, ETH Zurich, and écal (an art school in Lausanne) have teamed up to develop the Thymio educational robot and related software tools. The Thymio robot (http://thymio.org) is an open source mobile robot which is employed to teach programming and computer science concepts, both in schools and at home. The Thymio project is successful and 15,000 units have been distributed so far; half of them in schools around the world.

However, there has been an increasing demand for a mobile version. Tablets and phones have very different interaction possibilities than desktop computers, and therefore a redesign of the interface was necessary. Moreover, the experience acquired with the desktop version lead us to design new features for the upcoming mobile app, such as the possibility for the user to create state machines. This student project will contribute to this effort. As the project will be tightly integrated with the overall development of the app, the student will be asked to conduct her/his work in a professional setting, including following a proper work-flow using git. The supervisors will provide dedicated support including code and design reviews.

The work of the student will also be used in an augmented reality gamified tutorial, called Thymio Programming Adventure (see below). Therefore, the interface should be as sleek and intuitive as possible, matching the quality of the video game industry.

Tasks

1. Review the existing environment for desktop and the mobile app prototype, as well as related work and competitors.

2. Implement a simple mode that allows beginners to build programs by creating associations of an event block and several action blocks.

3. Design a user study and collaborate with Mobsya, the Thymio producer, to collect results.

4. Implement new blocks based on the feedback of the user study.

5. Implement a feature allowing the user to create and reuse her/his own blocks.

Outcome for the student

At the end of the project, the student will have strengthened her/his knowledge in interface and interaction design for children, Qt-QML, C++ and robotics.

In addition, her/his contribution will be used by thousands of children worldwide who will, thanks to that contribution, have the chance to learn programming while having fun.