

RobotStudio: a Universal Teaching IDE for Undergraduate Computer System Courses Funded by UMass PDG Grant

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1 Introduction

In the RobotStudio – a PDG funded project, we propose to develop and deploy RobotStudio IDE software which will provide a comprehensive teaching environment using educational robotics for undergraduate computer system courses. In this report, I will discuss the work that has been done on RobotStudio development and our teaching practice of using it in undergraduate Computer Science Compiler Construction class at UMass Lowell. I will describe the progress we have made and highlight our new publications in premier Computer Science education conferences resulting from the work of this project.

2 Project Achievements

As proposed in the RobotStudio project, we have made the following achievements and contributions:

- Develop RobotStudio core software. We have developed the RobotStudio core application using the open source Eclipse RCP (Rich Client Platform). RobotStudio IDE has a modular and extensible architecture which allows teaching modules to be built and integrated into the IDE through the Eclipse plug-in mechanism. RobotStudio leverages the advanced Eclipse user interface components and provides a powerful and easy to use IDE for robot programming. Underneath the user interface, RobotStudio integrates a compiler, simulator and hardware device programmer for complete robot project development. RobotStudio can run on all major computer platforms, including Windows PC, MacOS and Linux. RobotStudio software can be used as a universal teaching platform in a wide range of computer system courses.
- Develop teaching modules as RobotStudio plug-ins. We have developed teaching modules using RobotStudio plug-ins: reference compiler plug-ins are built on top of RobotStudio core and we also provide sample plug-in project with source code for students to learn to build their own plug-ins for RobotStudio.

- Design student project sequence using RobotStudio and use RobotStudio as primary teaching aid. We designed the four-project sequence based on RobotStudio and has integrated into UMass Lowell undergraduate Compiler Construction class. Students use RobotStudio to build key components of a real embedded compiler and realize their own IDE at the end the semester.
- Conduct student surveys to evaluate RobotStudio effectiveness. We have conducted multiple student surveys at UMass Lowell. We use the survey results to evaluate RobotStudio and gather feedback. Based on the survey results, we will make improvements on the RobotStudio prototype.
- Publish papers on Computer Science education conferences to promote RobotStudio technology. We have published three papers on leading Computer Science education technology conferences [Xu07a, Xu07b, Xu07c]. We will present the papers in the ACM SIGCSE 2007 and CCSCNE 2007 conferences.

3 Future Work

As proposed in the project, we have developed the RobotStudio teaching framework and successfully used it in UMass Lowell CS classes. We will continue to improve RobotStudio and use it to support CS courses: we will analyze the student survey results we collected, evaluate the current prototype, and make enhancement to improve the features of RobotStudio. We will also expand the use of RobotStudio in both colleges and also in K-12 Science and Math education. We currently explore partnerships with Boston-area public schools to use RobotStudio in high-school classes. We plan to develop funding proposals for federal education grant programs.

References

- [Xu07a] Li Xu. Project the wiki way: Using wiki for computer science course project management. *Journal of Computing Sciences in Colleges*, 2007.
- [Xu07b] Li Xu. Robotstudio: A modern ide-based approach to reality computing. In *SIGCSE '07: Proceedings of the 38th SIGCSE technical symposium on Computer science education*, pages 313–317, 2007.
- [Xu07c] Li Xu. Robotstudio: a universal ide for teaching undergraduate computer system courses. *Journal of Computing Sciences in Colleges*, 2007.