Collaborative Programming Exercises in Virtual Worlds

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Abstract

Organizing a Programming 101 course for a thousand computer science freshmen poses a challenge. One major problem is the high dropout-rate due to insufficient social interactions and the missing feeling of presence. Collaborative home assignments can help to overcome such issues. However, due to scheduling conflicts not all students are able to meet in person to work together. Many tools support collaborative online programming, but have several disadvantages in comparison to face-to-face meetings. This work presents a virtual world environment, where student groups can meet online, but experience the advantages of face-to-face interactions. They can commonly use different tools for collaborative problem solving at one shared virtual location. They experience the feeling of presence, which increases the individual contribution, even from distant sites. Furthermore, the environment provides facilitated possibilities for tutor meetings, where students can discuss and present their solutions. In this work a first prototype of the environment is described. In addition advantages as well as potential issues or difficulties are discussed.

Introduction and Background

„Coming together is a beginning, staying together is progress, and working together is success " (Henry Ford)

- Teaching Computer Science often requires students to team up in groups to work together on assignments such as programming exercises.
- Several studies emphasize the positive effect of collaborative learning and working. [1][2][3]
- However, traditional group assignments in large scale classes have limitations
  - insufficient evaluation possibilities of the contribution of individual team members
  - limited possibilities to work together remotely with regards to social interactions [4][5]
  - organizational problems to organize group or tutor meetings which are feasible for all group members

In Virtual Worlds students can arrange a three-dimensional working environment and place different tools and resources, so that they are visible and usable for all group members at the same time and can invite external persons such as tutors for presentations and meetings.

Objectives

- Reduce drop-out rates in large-scale courses
- Support online collaborative software engineering activities, and online meetings
- Explore interactive and immersive forms of programming education

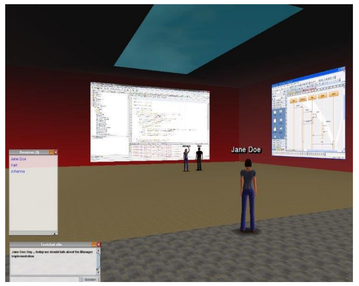
Virtual Worlds for Programming Courses

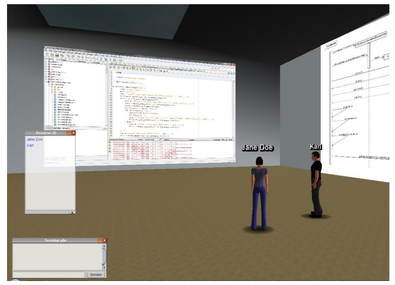
- Communication possibilities: Text Chat, VoIP, Gestures
- Collaboration: Whiteboards, In-world Applications (e.g. Netbeans, UML diagram drawers, project management tools,..)
- Presentation: PDF Viewer, Virtual Seminar Rooms
- Interactivities: Visualizations, Simulations, Animations

openwonderland

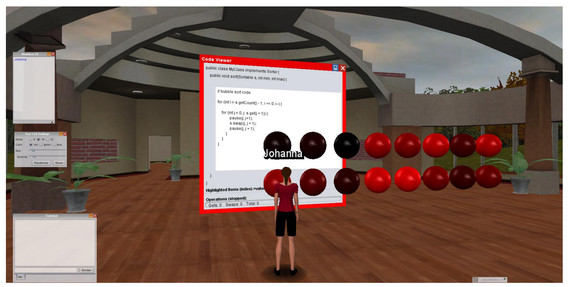
Collaborative Programming Exercises

Meetings with groups to work design, implement, and test the code together [7]



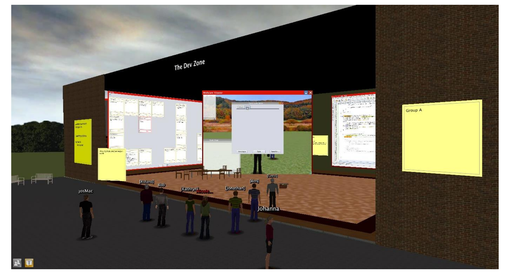


Common use of tools in different areas of the virtual world environment



Interactive visualizations to enhance motivation and conceptual understanding [7]

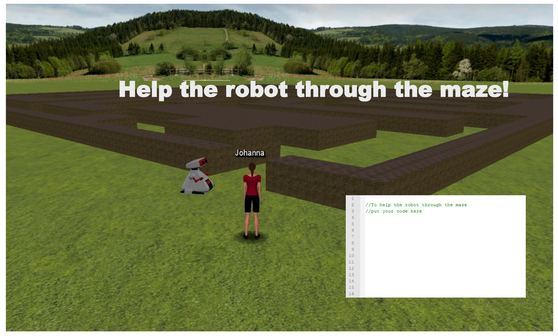
Collaboration in a big scale..



Code-a-thon in Open Wonderland. In Virtual Worlds different spaces for different working packages can be created [7]

Future Work

- First evaluations
- Game-based exercises
- Enhanced interactivity and advanced use of the 3D elements
- Integration of assessment strategies



Fun elements and challenges can help learning programming in a more engaging way. Collaborative games (e.g. students work together on the robot problem) or competitive games (e.g. groups program the robot together and than compete with other teams)

Acknowledgements

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