

Master Theses

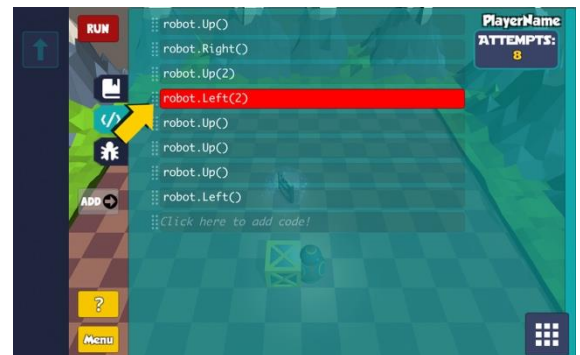
Improving Human-Computer Interactions in a Game-Based Learning Environment

Student: Martin Sackl

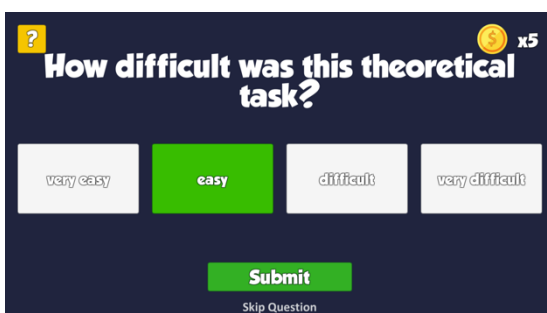
Supervisor: Christian Gütl

Co-Supervisor: Alexander Steinmaurer

This thesis covers the further development of the serious game sCool. Developed in 2017 in a cooperation between Graz University of Technology and Westminster University, the game's aim is to teach the basics of computational thinking. In a concept-learning part, players learn the basics of programming by playfully answering programming-related questions. After learning these concepts, the gained knowledge can be applied in a practical coding part. Players must write actual code in the Python programming language by using code blocks. Both concept-learning tasks and practical tasks can be created over the web platform for educators. Thus, the sCool system creates highly adaptive learning content.



To learn programming, a good understanding of constructs and concepts is required. In learning games, this can only be achieved, if the learner experiences the learning method well and does not get distracted. Serious games often show issues in their interaction styles and interfaces. This research should show if improved interfaces in such games affect the learning behaviour of players and their human-computer interaction in a positive way. A second research question is dealing with surveys integrated into learning games. It should be shown if such in-game surveys are affecting the players' game-flow or presence in the game, and how players perceive such integrated modules in a learning game.



In a usability study with 20 participants, which were students from an Australian University and students from an Austrian University, optimizations of the interface of sCool have been evaluated. Students played the game and were asked to fill out an online questionnaire afterwards. While the evaluation showed positive effects on players' learning experience, it also revealed a low participation rate in answering the questionnaire. Therefore, the integration of surveys into the

sCool game environment has been implemented and evaluated. Not only was the goal to ask questions in the game, but also to integrate a reward system and to use the concept of gamification. In-game questionnaires should therefore be an engaging and playful way to answer questions. To evaluate this approach, two studies have been conducted: An A/B user study with 22 students from an Austrian University and an expert study with 14 experts from different scientific fields. The revised version of sCool shows improved engagement in playing the game and answering questions, but also shows a higher learning outcome.