

Sea of Light: A Game 'Based Approach for Evidence-Centered Assessment of Collaborative Problem Solving

Authors : Svenja Pieritz, Jakab Pilaszanovich

Abstract : Collaborative Problem Solving (CPS) is recognized as being one of the most important skills of the 21st century with having a potential impact on education, job selection, and collaborative systems design. Therefore, CPS has been adopted in several standardized tests, including the Programme for International Student Assessment (PISA) in 2015. A significant challenge of evaluating CPS is the underlying interplay of cognitive and social skills, which requires a more holistic assessment. However, the majority of the existing tests are using a questionnaire-based assessment, which oversimplifies this interplay and undermines ecological validity. Two major difficulties were identified: Firstly, the creation of a controllable, real-time environment allowing natural behaviors and communication between at least two people. Secondly, the development of an appropriate method to collect and synthesize both cognitive and social metrics of collaboration. This paper proposes a more holistic and automated approach to the assessment of CPS. To address these two difficulties, a multiplayer problem-solving game called Sea of Light was developed: An environment allowing students to deploy a variety of measurable collaborative strategies. This controlled environment enables researchers to monitor behavior through the analysis of game actions and chat. The according solution for the statistical model is a combined approach of Natural Language Processing (NLP) and Bayesian network analysis. Social exchanges via the in-game chat are analyzed through NLP and fed into the Bayesian network along with other game actions. This Bayesian network synthesizes evidence to track and update different subdimensions of CPS. Major findings focus on the correlations between the evidences collected through in- game actions, the participants' chat features and the CPS self- evaluation metrics. These results give an indication of which game mechanics can best describe CPS evaluation. Overall, Sea of Light gives test administrators control over different problem-solving scenarios and difficulties while keeping the student engaged. It enables a more complete assessment based on complex, socio-cognitive information on actions and communication. This tool permits further investigations of the effects of group constellations and personality in collaborative problem-solving.

Keywords : bayesian network, collaborative problem solving, game-based assessment, natural language processing

Conference Title : ICCTS 2020 : International Conference on Collaboration Technologies and Systems

Conference Location : New York, United States

Conference Dates : January 30-31, 2020