

to get new resources in the market. The system is modelled using intelligent agents that operate based on rule-based fuzzy systems. The fuzzy systems contain sets of rules that store domain knowledge in order to control changes in the system. ERISKGAME is browser-based and persistent. Thus, players can access the system at any time and independently from platform. The simple graphics included in the game make it light enough to run even in low processing power machines, such as mobile devices.

ERISKGAME is being validated as a support teaching tool in software engineering courses at two universities.

As future work, we intend to improve the system based on feedback from students and professors who use the system by adding new functionalities and updating and tuning the fuzzy knowledge bases.

Acknowledgments

This research is funded by the Brazilian National Council of Technological and Scientific Development - CNPq.

References

- [1] J. L. Brewer. Project managers: can we make them or just make them better? In ACM, editor, *6th Conference on Information Technology Education*, pages 167–193, 2005.
- [2] Gil Taran. Using games in software engineering education to teach risk management. In *Conf. on Software Engineering Education & Training*, pages 211–220, 2007.
- [3] Robert W. Wagner. Edgar dale: Professional. *Theory Into Practice*, 9:89–95, 1970.
- [4] A. R. Dantas, M. O. Barros, and C. M. L. Werner. A simulation-based game for project management experimental learning. In *Int Conf on Software Engineering and Knowledge Engineering*, pages 19–24, 2004.
- [5] R. Agarwal and D. Umphress. A flexible model for simulation of software development process. In *48th Annual Southeast Regional Conference*, pp. 1-4. ACM, 2010.
- [6] A. M. C. Campos, A. Signorett, P. Lima, E. Luis, M. Fontes, and K. Dantas. A game for project management practice. In *Brazilian Symposium on Informatics in Education*, 2011. (in Portuguese).
- [7] F. M. Muller T.G. Silva, G. Bernardi. Software test teaching support approach based on serious games and virtual worlds. In *Brazilian Symposium on Informatics in Education*, 2011. (in Portuguese).
- [8] G. J. Klir and Bo Yuan. *Fuzzy Sets and Fuzzy Logic - Theory and Applications*. Prentice-Hall, 1995.
- [9] L.A. Zadeh. Fuzzy sets. *Information and Control*, 8:338–353, 1965.
- [10] K. Ayas and N Zeniuk. Project-based learning: Building communities of reflective practitioners. *Management Learning*, 32(1):61–76, 2001.
- [11] R. C. Hsu and W. Liu. Project based learning as a pedagogical tool for embedded system education. In *Int. Conf. on Information Technology: Research and Education*, 2005.
- [12] .-J. Kuo. How does an online game based learning environment promote students' intrinsic motivation for learning natural science and how does it affect their learning outcomes? In *Digital Game and Intelligent Toy Enhanced Learning*, pages 135–142, 2007.
- [13] K. L. McClarty, A. Orr, P. M. Frey, R. P. Dolan, V. Vassileva, and A. McVay. A literature review of gaming in education. In *Gaming in education*, pages 1–35, 2012.
- [14] E. Hall. *Managing Risk: Methods for Software Systems Development*. Addison-Wesley, 1998.
- [15] M. A. Ould. *Managing Software Quality and Business Risk*. John Wiley & Sons, 1999.
- [16] S. L. Pfleeger and J. M. Atlee. *Student Study Guide for Software Engineering: Theory and Practice*. Prentice Hall Press, 2009.
- [17] I. Sommerville. *Software Engineering*. International Computer Science. Addison-Wesley Longman Publishing Co., 8 edition, 2006.
- [18] S. Franklin and A. Graesser. Is it an agent, or just a program?: A taxonomy for autonomous agents. In *Int. Work. on Agent Theories, Architectures, and Languages*, pages 21–35, 1996.
- [19] A. Dziuk and R. Miikkulainen. Creating intelligent agents through shaping of coevolution. In *IEEE Cong. on Evolutionary Computation*, pages 1077–1083, 2011.
- [20] A. A. Pontes and G. A. L. Mendes Neto, F. M. and Campos. Multiagent system for detecting passive students in problem-based learning. *Adv. in Soft. Computing*, 71:165–172, 2010.
- [21] W. V. Leekwijck and E. Kerre. Defuzzification: criteria and classification. *Fuzzy Sets and Systems*, 108-2:159–178, 1999.
- [22] S. Shahzad. Learning from experience: The analysis of an extreme programming process. In *Int. Conf. on Information Technology: New Generations*, pages 1405–1410, 2009.
- [23] K. Schwaber and M. Beedle. *Agile Software Development with Scrum*. Prentice Hall, 2001.
- [24] V. A. Zeithaml, L. L. Berry, and A. Parasuraman. The behavioral consequences of service quality. *The Journal of Marketing*, 60 (2):31–46, 1996.