An Educational Game for Data Structures

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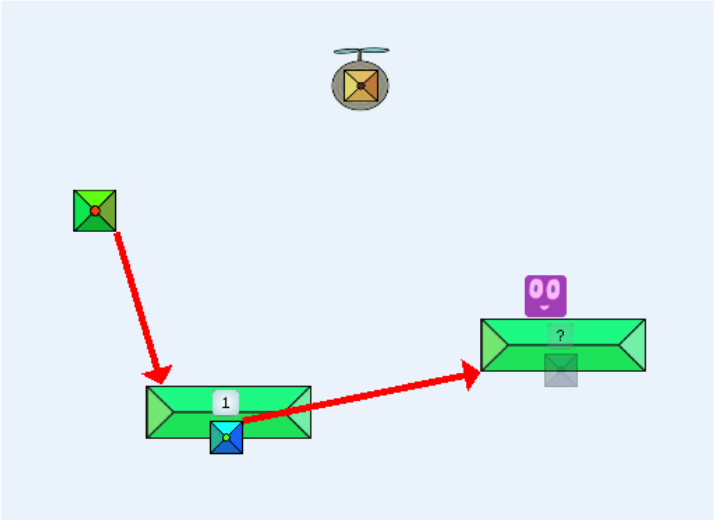
Overview

Educational game for Computer Science

- Objectives
- Related Work
- Design
- Results
- Future Work



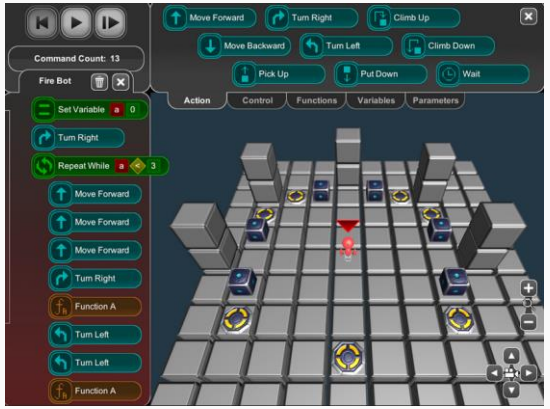
Objectives

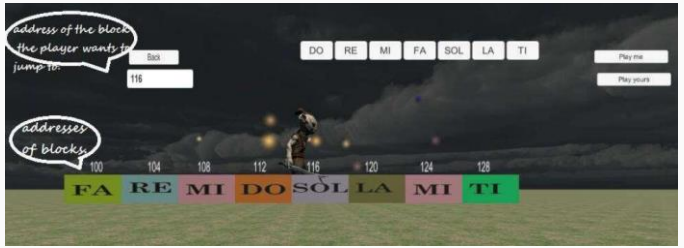
- Help CS students understand Data Structures
- Help players develop a Mental Model

Solution: A game with interactive visual representations of Data Structures

Related Work

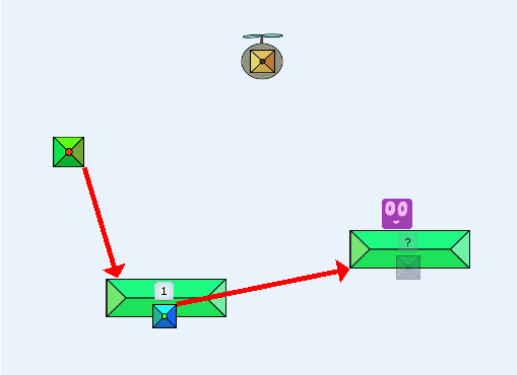
- CS Educational games
  - Dong et al. 2017.
  - Dicheva et al. 2018
  - Sharma et al. 2017.
- Virtual Manipulatives (VM)
  - Moyer-Packenham et al. 2013.

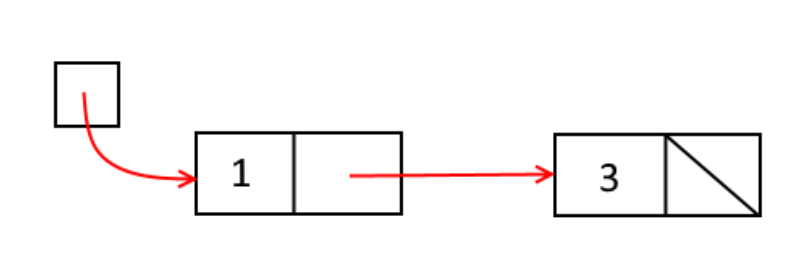




Design - Virtual Manipulatives

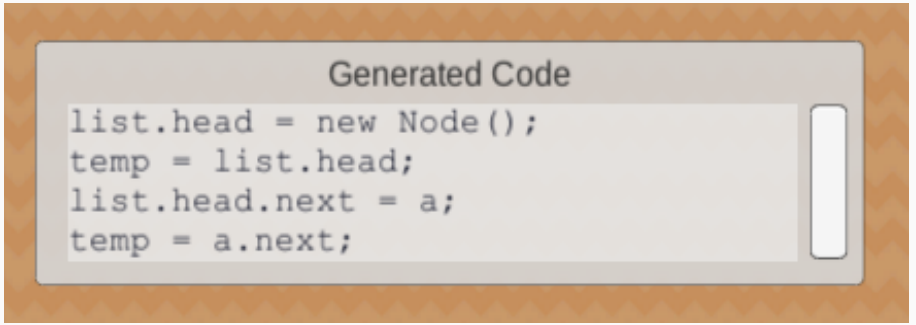
- VMs visually represent an abstract concept
- Structurally Similar to Linked Lists
- Solving puzzles requires understanding VM





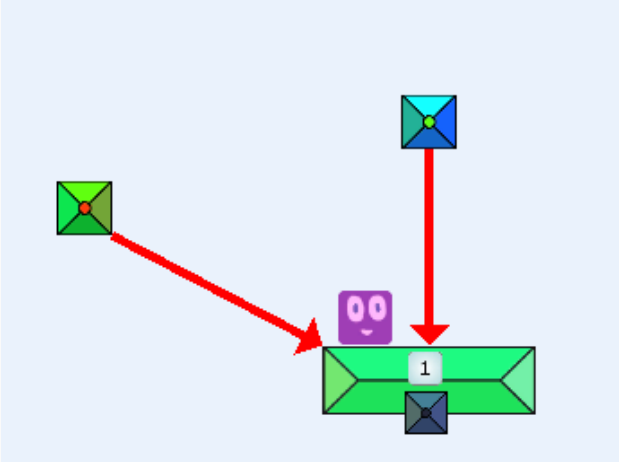
Design - Analogy Hints

- Generated Code Window
- Info Panels



Future work

- Improve Design
- Improve Feedback
- Encourage Open Source Contributions



References

P. Moyer-Packenham and A. Westenskow, “Effects of Virtual Manipulatives on Student Achievement and Mathematics Learning,” International Journal of Virtual and Personal Learning, vol. 4, pp. 35–50, 2013

V. Sharma, R. Musarrat, S. Chimalakonda and Y. Reddy, “Muse: A Musically Inspired Game To Teach Arrays and Linked Lists”. Proceedings of the 25th International Conference on Computers in Education, pp. 802-807, 2017.

Y. Dong and T. Barnes, “Evaluation of a Template-based Puzzle Generator for an Educational Programming Game” Proceedings of the 12th International Conference on the Foundations of Digital Games, pp. 40, 2017.

D. Dicheva and A. Hodge, “Active Learning through Game Play in a Data Structures Course” Proceedings of the 49th ACM Technical Symposium on Computer Science Education, pp. 834-839, 2018.

J. Zhang, M. Atay, E. R. Caldwell and E. J. Jones, "Reinforcing student understanding of linked list operations in a game," IEEE Frontiers in Education Conference, pp. 1-7, 2015.

Questions? Comments?