ACM Student Research Competition

Roro8: A Fantasy Computer for Computer Architecture and Organization Education

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In Learning computer architecture and low-level programming is a complex challenge for beginners. We introduce Roro8, an 8-bit fantasy computer system designed to simplify the learning process while closely mirroring real-world computer systems. Roro8 comprises an 8-bit microprocessor (RX8), memory-mapped I/O, external peripherals, and an external display (RD6448). This unique feature enables students to become familiar with datasheets of devices, a fundamental aspect of hardware programming.

The core pedagogical goal is to have students implement an emulator, simulators, assemblers, and compilers, providing a hands-on learning experience. They can create games or see their own programs running on the display, making abstract concepts tangible and engaging. Our work addresses the challenge of teaching computer architecture by offering a novel solution. Unlike conventional system-on-chip designs, Roro8 simplifies the learning process while emphasizing practical engagement. This paper outlines the problem, reviews related work, introduces Roro8, and underscores the significance of our approach in enhancing computer science education.

Learning with the Rashomon Augmented Reality Cube (RARc)

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We attempted to address the challenge of effectively conveying the innovative literary device known as the Rashomon effect (tRe), using a digital tool. We opted for Augmented Reality (AR) in combination with MERGE cubes for this purpose. These cubes served as a practical medium for illustrating the complexities of tRe, a narrative technique renowned for its ability to offer multiple perspectives on a single event or storyline. This narrative device is known for its ability to create narrative uncertainty, withholding a clear and absolute truth, and instead exposing the readers to an assortment of interpretations. The Rashomon Augmented Reality Cube (RARc) was designed with two main goals in mind. Firstly, it was created to provide a vivid visual representation of the Rashomon effect. This not only makes storytelling engaging but also serves as a stepping stone for students to explore a variety of interpretations. Secondly, it was conceived as an educational tool for introducing students to key CT principles, such as abstraction, solution design, and computational innovations. By instilling these principles, students acquire problem-solving skills that are increasingly essential in our technology-driven world. This AR tool, known as the RARc, serves as a hands-on digital activity crafted for creative writers, with a particular focus on engaging female participants. It encourages them to unleash their creativity and explore the nuances of storytelling within an immersive and interactive learning experience. In this paper, we share development and implementation strategies that were utilized throughout the design of the RARc.