Computational Thinking in Multiple Representations

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Introduction

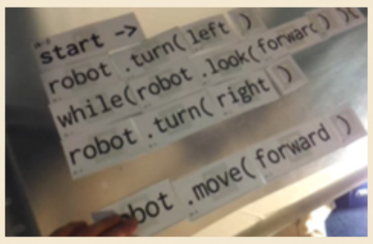
Some computational thinking concepts are easily taught using tangible or pictorial media, while others are best expressed with conventional textual languages. Teachers often combine different media and programming styles – our goal is to identify ways that multi-representation systems can support this.

Engineering Applicability

CSUnplugged
↓
Flowcharts
↓
Toon Talk
↓
Scratch
↓
UML
↓
Alice
↓
Python
↓
Java
↓
C++

Paper-based Environments

COMPUTER SCIENCE Unplugged



Visual language-based Environments

Text-based Environments

BlueJ

Small Basic

GreenFoot

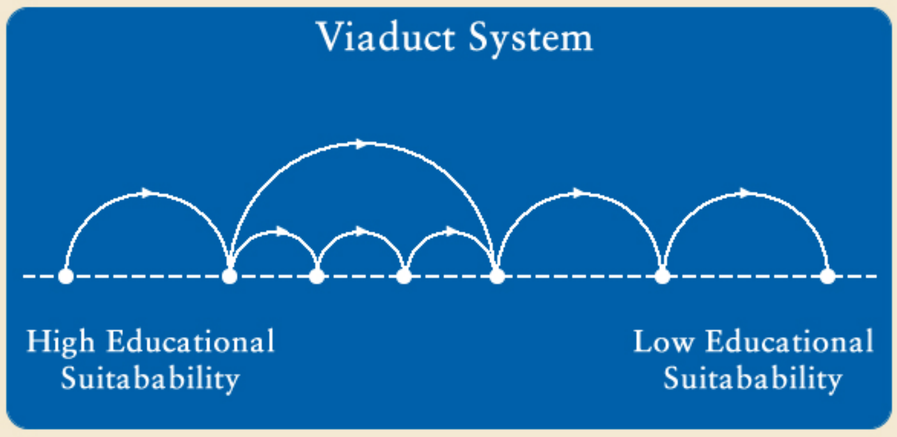
Media Tangibility

CS Unplugged
↓
CodeCards
↓
Raspberry Pi
↓
Smartphone
↓
PC

Each tool uses a different representation that is particularly suited for teaching appropriate CT concepts. During student learning, there are **two** transitions -- educational suitability, and tangibility of the supporting system.

Research Methods

- Each change of representation brings new concepts and barriers.
- We can reduce these barriers by supporting students' needs using an appropriate representation for their understanding, and ensuring the transition between representations is smooth and well-supported.



- We are currently conducting semi-structured interviews with teachers regarding current tools and practices. The results will inform the design of the system and its use of representation.
- We have developed a prototype demonstration that uses three representations. We hope to gain early feedback on design.
- We are investigating whether it is possible and appropriate for higher-ability students to skip representations.

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