Exploring Approaches To Engage K-12 Students In Learning Computational Thinking Using Collaborative Robots

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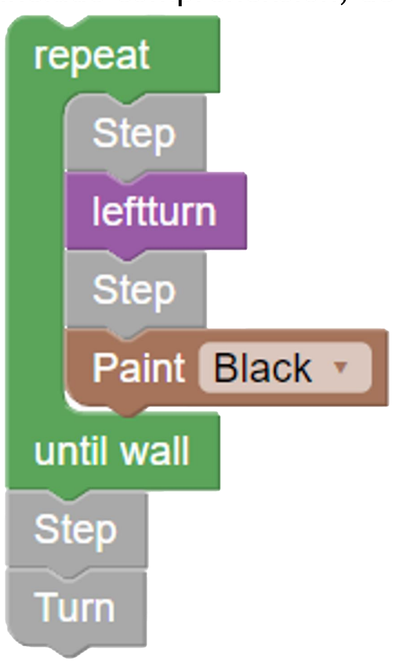
ABSTRACT

Minority students are largely underrepresented in the STEM field. The goal for this project was to develop a program which promotes the inclusion of computation skills among students and help them work collaboratively with the use of human – robot interaction. Robots are such a strong tool that can be used to enhance computational thinking and engage students towards a technical field. Through workshops and readings about computational thinking I worked on building a block-based program that introduces the uses of robots as teaching tool for computational thinking.

BACKGROUND AND TOOLS

I started this project by going through a few readings about computational thinking (CT) and the challenges that come with it. There are three main areas of focus when it comes to teaching computational thinking. They include comprehension, design & problem solving.



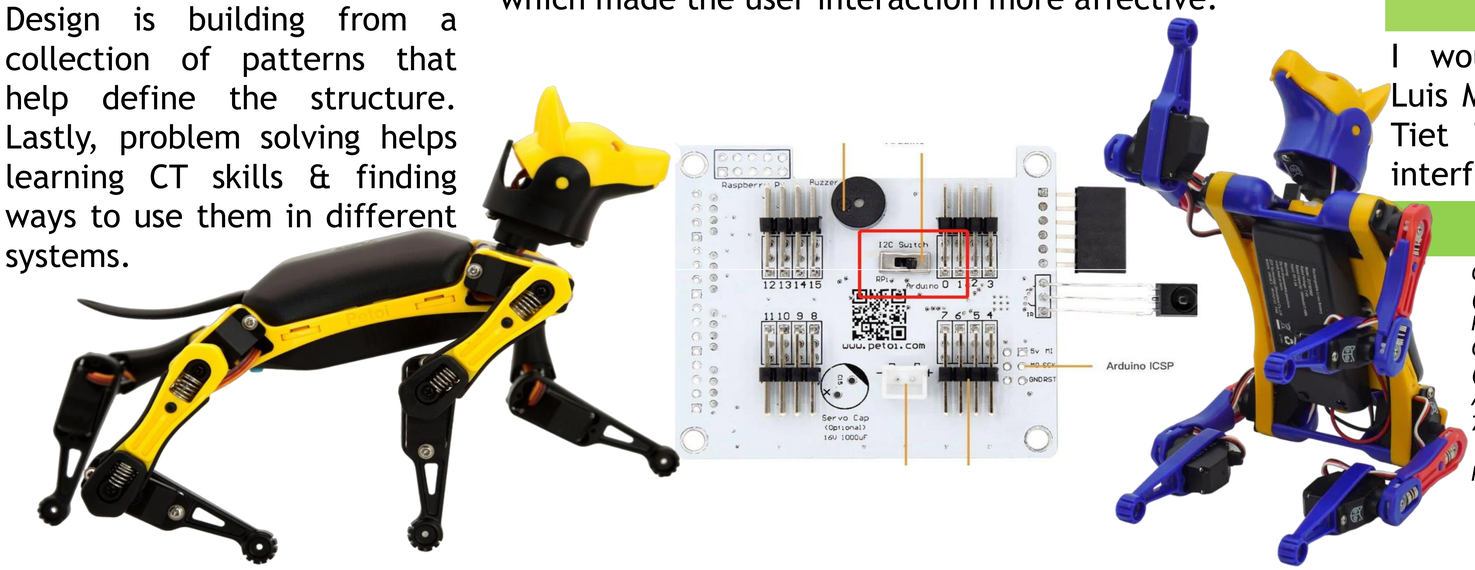
Comprehension focuses on understanding & making small changes wherever necessary. Design is building from a collection of patterns that help define the structure. Lastly, problem solving helps learning CT skills & finding ways to use them in different systems.

APPROACH

First, started off by holding workshops for middle and high school students that were geared towards learning how they interacted with an introductory block-based programming application called SpiderWorld which focused on understanding the fundamentals of coding. Through this I was able to recognize that students performed better when they worked collaboratively with each other and worked well with a simple block-based programming tools which followed simple tasks.

Then spent the next phase of my project towards developing collaborative capabilities in Petoi Robots. For that I needed to learn how the robot calibrated on different surfaces and what skills it already had and what I could add to make it work better.

Finally, spent the next few weeks working with a Bluetooth API and creating a program that allowed the user to implement simple worded commands to make the robots achieve certain tasks. Then with the help of some fellow Computer Science students created a GUI which made the user interaction more affective.



DISCUSSION OF RESULTS

- Created a java-based program that uses an open-sourced library allowed the perform certain tasks in a row for a period each.
- One downside of working with the robot was when its battery life was low it would sometimes perform abruptly.

FUTURE GOALS

- Creating a curriculum that links the collaborative robot alongside instructional approaches to help students frame problems in ways that can be represented as computational steps or algorithms to be performed by a computer.
- Work on building an outreach program that allows students to interact with the project.

ACKNOWLEDGMENTS

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