The Application of LeJOS, Lego Mindstorms Robotics, in an LMS Environment to Teach Children Java Programming and Technology at an Early Age

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This project is designed to enhance the interest of teenagers in the fields of robotics and programming. LeJOS© and Lego® Mindstorms® Robotics were used to create and implement a Java programming curriculum in a Learning Management System (LMS). Skills in the STEM fields are required to succeed and grow in the modern job market, so children should learn about technology and programming early on. The project goal was to create a comprehensive and easily reproducible learning program that taught kids about programming and robotics in an engaging way. The course was targeted towards children ages 10-13 with no prior programming or robotics knowledge. The usefulness of the course was tested at a local middle school and an after-school center, measuring how fast students completed the course, how difficult they thought it was, and the effect of the course on students' desire to pursue programming and robotics. Survey results showed more kids were enthusiastic about pursuing programming or robotics as a career as opposed to before taking the course. The course met a 90% student satisfaction rate. For future work, a larger sample size and a refined curriculum should be implemented for an even better success rate. Also, implementing and testing the validity of this course in schools would be a big step, to see how it works in a large scale learning environment. Assistance for acquiring resources was provided by Science Cosmos®, a STEM education facility in Virginia.

Index Terms - Java, Learning Management Systems, Robotics.

Introduction

The purpose of this project is to get kids interested in robotics and programming at an early age, since they are such fast growing fields. The goal was to create a method that would be most effective at conveying this to the target audience. Lego Mindstorms Robotics and LeJOS were the ideal platforms for this endeavor. The Learning Management System (LMS) aided in creating a structured curriculum.

Background

Lego Mindstorms Robotics is an easy to use and popular educational robotics platform, but uses a drag and drop style GUI for programming. LeJOS is a Java programming software developed by Jose Solorzano, the initial developer of LeJOS, specifically for Lego Mindstorms Robotics. Java programming language is perfect for beginners, and has wide applications. An easily deliverable course that showed kids how to program a robot using Java code was put together on a LMS platform.

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Methodology

The effectiveness of the course was tested on a group of middle school students who participated in a workshop. A survey was given before and after the students took the course to determine if prior programming or robotics experience influenced the performance in the course and overall satisfaction with the workshop. The course was modified for subsequent workshops based on feedback from participants.

Results

The results showed an overall satisfaction rate of >90%. There was an increased interest in pursuing programming and STEM courses from participants with and without prior programming experience. Similarly, there was also an increased general interest in STEM, programming, and robotics after taking the course. Participants responded that the course gave them a better understanding of Java programming and robotics.

Future Work

For future work, the course material can be modified and applied to other programming languages. Also, implementation in a larger school setting would help evaluate the scalability of this course. In a larger setting, we can test if this is an effective way to give middle school students a head start on programming and STEM careers.

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