USING LEGOS AND ROBOLAB (LABVIEW) WITH ELEMENTARY SCHOOL CHILDREN

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Abstract — This work-in-progress presentation describes the use of a Lego robotics kit and RoboLab software to meet the science, math, and technology standards of local elementary school curricula. The presentation includes a demonstration by a kindergartener. The instructional materials used include a standard Lego Mindstorms kit and the Robolab. Robolab is based on LabVIEW and retains the iconic programming interface. Assessment of student learning includes both formal, pre- and post multiple choice testing and demonstration of ability to “read” programs, and informal, project outcomes.

Index Terms — elementary school, labview, lego, robolab

INTRODUCTION

The objective of this ongoing project is to determine how Robolab can be used to satisfy the science, math, and technology standards for local elementary schools.

Robolab is a programming environment used to program the Lego RCX. Being based on LabVIEW, it retains the graphical interface and does not require reading or writing skills – an important issue in teaching elementary school students. The software has two basic programming modes: Pilot and Inventor. Pilot mode uses fixed program structures such that every program will compile and run. The Inventor mode uses graphical programming much like LabVIEW, which permits programming mistakes.

METHODS

Since the main focus of this project is on programming rather than construction, the first author constructed a Lego vehicle that includes two touch, a light, and a rotation sensor (inputs) and two motors and a lamp (outputs). The vehicle is shown in Figure 1. This eliminated the need for the students to build a vehicle, which saved time and also provided a common platform for evaluating the programs.

A pair of kindergarteners (5 and 6 years old) were separately given several hours of one-on-one instruction on using the Robolab software over several weeks. All instruction took place at private residences. Complete transcripts of every instructional session has been kept.

With aid from the first author, each student first completed the Pilot mode tutorials included in the instruction manuals. Then Inventor mode was introduced via a series of six tasks. The tasks were devised ranged in difficulty from driving straight for 10 seconds to sensing the edge of table to prevent it from falling off.

RESULTS

A sample program from the Inventor mode is shown in Figure 2. This program was written after approximately 3 hours of instruction, including the Pilot mode tutorials.

Assessment of student learning was primarily in the form of informal assessment of project outcomes (i.e. how well the robot performed the stated task). However, both pre- and post-tests were administered. The best indication of learning appeared to be the ability of the students to “read” the program and describe what the vehicle should do.

CONCLUSIONS

While not conclusive, the results are very promising. Increasing the sample size is our main priority. The next planned step is to raise funding to bring the materials into an actual classroom.

The enthusiasm of the students towards this mode of instruction can best be summed up with a quote: “Wow it works! Mommy watch this! It has two touch sensors.”

FIGURE 1.
LEGOCLOBOBOT USED IN THIS PROJECT.

FIGURE 2.
ROBOLAB PROGRAM WRITTEN AFTER 3 HOURS OF INSTRUCTION

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