Modular Construction for Playful Robots

Man-Chi Liu (MS, Mechanical Engineering, MIT 2014)
Andrew Gauthier (MS, Mechanical Engineering, Cornell 2013)
David Nguyen, Nick Zink, Daniel Broun (intern developers)

Build-It-Yourself, 269 Pearl Street, Cambridge, MA 02139
Contact: John Galinato, john@build-it-yourself.com

Description

Let's build a robot to save the world!

Premium Quality Junk Modules LEGO Modules

(Figure 1 – Build-It-Blocks)

The Build-It-Blocks online database of modules is used to construct creative, personalized, robots quickly and easily. Build-It-Blocks include application examples and instructions to build structural, sensor, motion and control modules.

Workshop Agenda

1. Demonstrate how Build-It-Blocks modules can be integrated into a project solution.
2. Present the online database of instructions for building modules.
3. Build a creative robot using Build-It-Blocks modules that solves a real-world problem.
4. Present participants' solutions on video.
5. Discuss Build-It-Blocks benefits and how it can be incorporated in curriculums.

About Build-It-Yourself

The Build-It-Blocks online database of modules was developed at Build-It-Yourself in collaboration with the MIT Media Lab. The program is driven by technology-in-education research at the MIT Media Lab, especially: Beyond Black Boxes, Scratch and the LEGO® Mindstorms™ platform. www.build-it-yourself.com

Keywords:

robotics; project-based learning; construction systems; modular construction; building blocks

1. Introduction

It's difficult to guide students to build engaging, technology-based projects. For example, let's build a robot that entertains! Okay … Where do I start? Break your solution into simple functional building blocks or modules.

2. A Tool That Teaches Modular Construction

Typically in the grown-up world, engineers will make a block diagram or flow chart of a design. Then they will select functional building-blocks from a library of structures, mechanical mechanisms, subroutines and integrated circuits to build a prototype. Attributes of this prototype are that it can be built quickly and that it is easy to edit. To enable students to build like engineers, Build-It-Yourself has developed Build-It-Blocks, an online database of instructions to build functional components or modules. Modular construction involves breaking down a complex solution into simple, reliable, reusable and functional building blocks. These individual blocks can be combined in many different ways to create a solution that is scalable, reliable, and customizable. Build-It-Blocks include hardware and software modules classified into five categories:

(Figure 2 – Build-It-Blocks Categories)

3. Results and Conclusions

Build-It-Blocks enable students to build creative, complex projects in less than 8 hours. Over 300,000 modules from the Build-It-Blocks online database were built in less than 3 years by students and teachers around the world. Build-It-Yourself has served over 3,500 students. Over 70% of revenue is repeat business. Over 30% of Build-It-Yourself students continue their workshop projects at home on their own initiative.

4. Discussion Questions

a. What is the most difficult part of engaging students in project-based learning?
b. How can Build-It-Yourself [1] collaborate with you to make Build-It-Blocks a valuable part of your technology curriculum?