

**May 23, 2002**  
**USING LEGOS AND ROBOLAB TO TEACH ENGINEERING  
AND TECHNOLOGY**

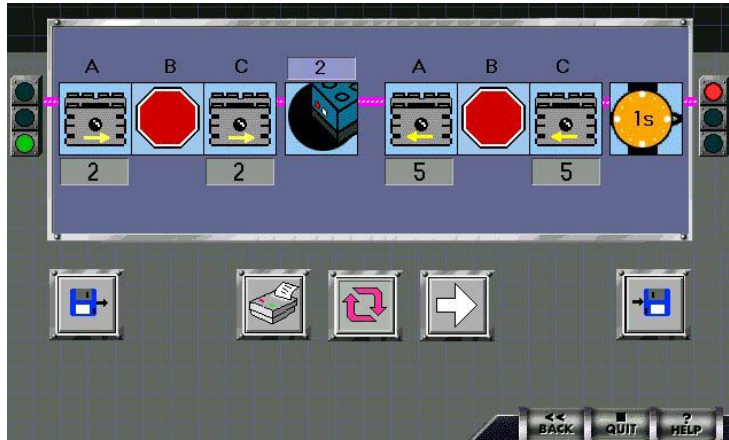
**“What is RoboLAB and how is it used with LEGOs?”**

LEGOs can be used in combination with the RCX brick and RoboLAB, programming software, to build and program robots or acquire data. The RCX helps to overcome the logistical nightmare of too few computers and too many students by making it possible for several groups of students to embed “smarts” into their designs at one time. After downloading a RoboLAB program into the RCX, the desktop computer is not needed to run the LEGO design.

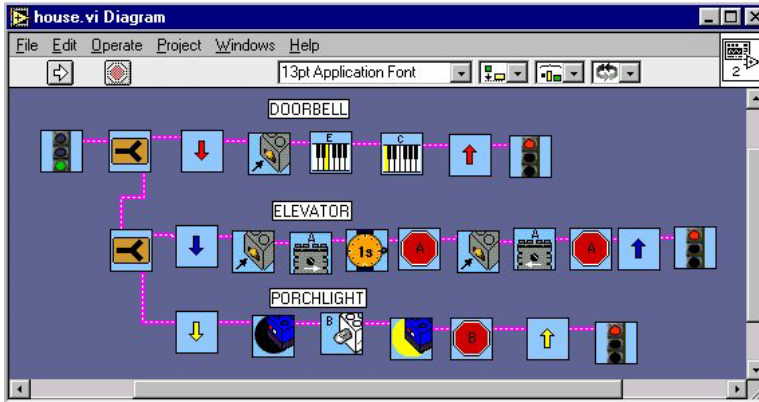
The RCX is a programmable brick equipped with a microprocessor capable of controlling motors and lights, reacting to sensors, and acquiring data. The RCX can simultaneously control three outputs for lights and motors that have been incorporated into the robotic constructions. Changes detected by the sensors can control the outputs; for instance, an increase in light can trigger the motors to stop. The RCX can be incorporated into LEGO structures to make robots. The complexity of robots can range from a simple car that is programmed to drive forward for a second to fax machine. Building possibilities are endless.

**RCX with motors and sensors at [www.lego.com/dacta/robolab](http://www.lego.com/dacta/robolab)**

The programming language RoboLAB consists of graphical icons. After you write a program, an infrared transmitter via a serial port on a Mac or PC sends the information to the RCX. Once the program has been downloaded to the RCX, the RCX can function autonomously from the computer and transmitter. RoboLAB has eight levels of difficulty: starting with a simple interface and with limited capability and ending with a full programming language. As with building, the difficulty of programming is dependent on the skill of the user, again challenging all academic levels. **Computer, tower, rcx**



Pilot Program: The components are pre-arranged. Students can alter the program slightly and not the effects.



Inventor Program: The icons are combined to create new programs.

### **“What is engineering and how does it help?”**

Engineering is the application of science and math to real world issues and objects. Engineers are involved with nearly every object your come in contact with on a daily basis - pots, pans, radios, stereos, cars, trucks, roads, computers, power lines, and even shampoo and lipstick. Their jobs require them to not only be able to perform calculations and understand theories but to gather information, synthesize data, and generate coherent reports and communications. Adding engineering and its elements to education offers students a new way to learn that encourages inter-disciplinary work. LEGOs and RoboLAB can be used as a tool to help make engineering more accessible to children and adults.

### **“How can I teach this to small kids?”**

Tufts University's Center for Engineering Education Outreach (CEEEO) brings together teachers, engineers, and college professors to develop curriculum and lesson plans that

will create a dynamic, inter-disciplinary learning environment in K-12 classrooms. The skills and projects presented by this facility allow students of all ages to learn technology and engineering skills. This curriculum web site ([www.ceeo.tufts.edu/curriculum](http://www.ceeo.tufts.edu/curriculum)) presents useful tools for classroom use, including example and startup challenges to get a classroom going, and background information to enable teachers to feel comfortable with more technical concepts.

### **"How do I start?"**

Exploring this web site will give you an idea of the capabilities of LEGOs and RoboLAB. This web site lists LEGO-related activities. Also available are glossaries of technology and engineering terms and individual part's uses. Classroom hints such as gender differences and computer shortages are also discussed. **Playing around with LEGOs and the RCX is really the best way to get started.**

### **"Where can I go for help?"**

There are several places to go for help. Programming manuals are offered by LEGO that are available through the pitsco site ([www.pldstore.com](http://www.pldstore.com)). The manuals give in-depth explanations of programming steps. Programming help is also available at another of the CEEO's sites ([www.ceeo.tufts.edu/Robolab/default.asp](http://www.ceeo.tufts.edu/Robolab/default.asp)). You can download a robolab guide that gives sample of programs and how to use advanced features of RoboLAB. There is even a link called "Learning to Use" RoboLAB.

LUGNET ( [www.lugnet.com](http://www.lugnet.com)) is a site devoted to LEGOs. It offers LEGO reference materials and web pages from LEGO enthusiasts. It's a great place to get ideas for projects to do at home.

You can find further information on [Bringing LEGOs into your School](#) and [Using LEGOs at Home](#).