

Teacher's Guide to the MIYbot

Introduction

Running a class where your build and program a MIYbot (Make It Yourself robot) is an ambitious project indeed. As schools push for more and more STEM (Science, Technology, Engineering and Mathematics) a robotics project is often referenced. Most of the time robotics classes utilize Lego NXT robots or VEX robots. These are good robot systems but they are expensive and cannot be taken home at the end of the year. MIYbot solves these problems because a MIYbot can be built for about \$35 and students are encouraged to truly make the robot their own. They design and build their own robot chassis and program their robot to have its own personality. Plus (and perhaps most importantly) the MIYbot should be taken home at the end of the class to encourage the student to continue tinkering, playing with and building their robot.

Documentation and Files

All of these files, and perhaps more, are stored on <https://github.com/bpwagner/MIYbot>

The following documentation was written to help run a successful MIYbot class:

- ChassisDesigns.pdf - this document discusses the design of the robot body. It gives ideas on how to build the body plate, the wheels, the castor and how to mount the sensors.
- ElectronicsBuild.pdf - this document gives step by step instructions on how to solder the circuit board that controls the MIYbot
- MIYbotElectronics.pdf - this document describes in detail how the electronics work for the MIYbot.
- MIYbotSoftware.pdf - this document describes how to install and program the Arduino IDE and the MIYbot software on the robot. It also describes the functions of the robot.
- MIYbot Circuit Board BOM - Sheet1.pdf, MIYbotCircuitBoardBOM.xlsx - this spreadsheet includes all the parts and pieces needed to build a MIYbot in a classroom setting. It also includes several other useful tools needed, like soldering irons.
- TeachersGuide.pdf - This document. A guide to running a successful MIYbot robotics class.
- Catalog.pdf - List of documents and files
- MIYbot Paper.docx, MIYbot Paper.pdf - Academic paper describing MIYbot

The following files are also included

- MIYbot2.dip, MIYbot2.dch (in folder circuit board) - these files are Diptrace design files for the circuit board. If you need to make changes to the circuit board you can use Diptrace to make the changes. Diptrace also generates the Gerber and Drill files needed to manufacture the circuit board. Diptrace can be downloaded and purchased at www.diptrace.com.
- MIYbot2Gerbers.zip (in folder circuit board)- these are the gerber files needed to have the circuit board manufactured. You can view them with the free program GERBV if you want to take a look.
<http://gerbv.geda-project.org/>
- MIYbot.cpp, MIYbot.h, and MIYbot1.ino, (in MIYbot1 folder) - the actual code to run the MIYbot. See the documentation on MIYbot software for more information
- HC-SR04-bracket.svg (in MiscDesign folder)- Nice laser cut bracket design that can be useful for mounting the HC-SR04 ultrasonic sensors.
- castor.scad and castor*.stl files (in MiscDesign folder)- these are 3D designs for making a castor that uses a large marble. The stl files can be printed on a 3D printer. Use OpenScad to open castor.scad. There are many viewers on-line that can open stl files.

Timeline

To run a successful class building MIYbots, the following schedule is suggested. Times are based upon experience but your mileage might vary. Each class is 45 minutes meeting once per week.

Summertime

- Before school familiarize yourself with soldering by taking a class, being taught, practicing, watching youtube etc. Be sure you know how to clear holes in a circuit board and know how to remove components. There are many soldering 'experts' in the community, be sure to find one and have them help you.
- Purchase soldering supplies for the class. Don't forget safety glasses.
- Purchase the components for the robots. Many of the components can be cheaper if purchased through ebay.com. If the component is coming from China, be sure to leave plenty of time for shipping. You can also choose ebay supplies from USA in the search options on ebay. A list of all of the components needed (and suggested suppliers) is found in the MIYbot Circuit Board BOM document.
- Order the circuit boards. smart-prototyping.com is a good supplier out of Hong Kong. Just choose to make a circuit board and then upload the MIYbot2Gerbers.zip. When you place the order, choose 10cm X 10cm, e-test 100% and leave the other options at default. You can choose gold surface finish and a different solder mask (board) color if you want. Ship using DHL from China. It will take about 3 weeks.
- When the parts come in, it is highly recommended that you build and program a MIYbot robot yourself so you can see what is required!

First month (3-4 45 minute classes)

- Teach the students to solder using a simple soldering project. There are many simple soldering kits that would be appropriate. Velleman makes some inexpensive kits that are easy to solder: <http://www.vellemanusa.com/products/list/?id=342509> It is important to have the kids practice before building their MIYbot Board. Also, Have students collect materials that might be useful for building MIYbot bodies.

Second month (3-4 45 minute classes)

- Solder the MIYbot circuit board. Install the headers on the Pro Trinket and plug into the MIYbot board. Follow the instructions in the Electronics Build Document. Continue to have students collect materials that might be useful for building MIYbots.

Third and Fourth month (5-8 45 minute classes)

- Use the Chassis designs and MIYbot software document directions to build a chassis for your robot and program it to run. These months are where the real engineering happens. Encourage your students to design, test, build and redesign their robots to continually make them better. Encourage them to program their robot to play songs, dance, follow lines and fight SumoBot (Google it!) style. For the chassis design, it is useful to have many recycled materials from which to choose. Have students bring in useful robot parts during the first months of the class. If you have 3D printers and/or a laser cutter, it is useful to have castors and sensor mounts made so the students can use them. You can also use a laser cutter to make wheels for the robots.
- Have your students name their robot. Robots are sad without names.

Fifth month

- Have a robot show to celebrate student accomplishments! Awards could be given to students with Best Soldering Job, Most Creative MIYbot, Most Unique New Software Feature, Best Overall, Best SumoBot, etc. Create contests and celebrate!

HELP!

Please contact me if you have questions and you would like to run a MIYbot class. My email is brian@tegrasys.com. I look forward to hearing from you.