BombiniBot Teacher's Manual

by TALON 540, FRC Team 540, in collaboration with mindsensors.com

Table of Contents

To whom it may concern,

TALON 540 is the *FIRST* FRC robotics team of Mills E. Godwin High School. One of 540's main missions is to promote appreciation and enthusiasm for STEM (science, technology, engineering, mathematics) education within our communities.

Thus, we have collaborated with one of our sponsors, mindsensors.com, to create this program with the purpose of sharing the excitement of STEM with kids who otherwise may not have the opportunity. In this program, we teach youth the basic parts to a robot, principles of programming, and application of these principles in order to write a program that can control the robot's movements. Not only do we want to help cultivate their interest early on, but we also aim to provide them with a clear path that makes the pursuit of their interests more accessible, regardless of their backgrounds.

In this document, we will walk you through this program, which we have continually refined. We will also provide helpful insights learned over the years, detailing the robot, the curriculum, what we hope to accomplish, and what you can expect from this workshop. If you want an overview of the workshop, you can take a look at this video: www.youtube.com/watch?v=xlogrYq2phY.

We look forward to working with you!

— TALON 540

Introduction

The Bombinibot Curriculum is split into three overarching sections (Mechanical, Programming, and Application):

1. **Mechanical: Building the Robot**

   Teachers will guide the kids step-by-step through the building process, explaining what each part does and how it helps the robot to function. This will help kids to have a better understanding of the basic function of the robot and its parts when programming it in Scratch.
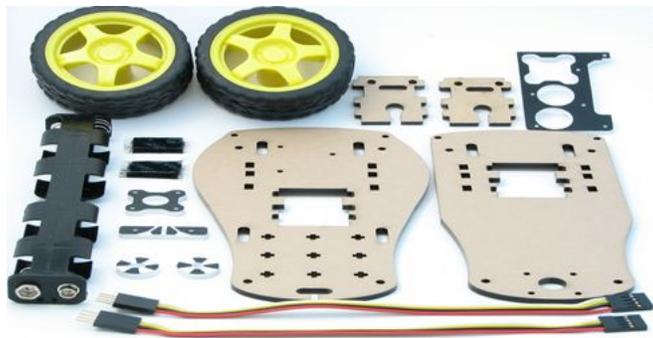
2. **Programming: Coding the Robot**

   Teachers will introduce Scratch to the kids and teach them how to write various programs that move and control the Robot. Based on the age of the kids, teachers will guide them through basic programming concepts such as infinite loops and "if" statements.
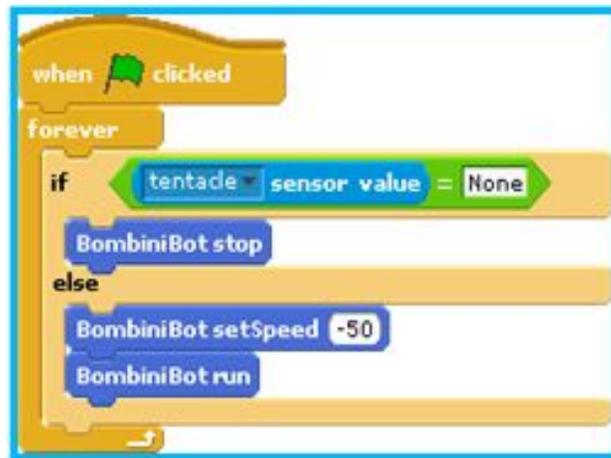
3. Application: Challenging the Kids

Teachers will then challenge the kids to apply everything they have learned during the session to write a program that allows them to remote-control the movements of the BombiniBot through the laptop keyboard. This provides a way for teachers to re-teach any concept that the kid has trouble with and for the kids to apply their knowledge to something new.

Mechanical: Building The Robot

We have created a powerpoint which details each step of the robot building process, along with what each part is and does.

Powerpoint Available at: http://tinyurl.com/buildbombini

Pro Tip: When teaching students, display the PowerPoint on the projector for students to reference so you don't have to walk and the show the robot around the entire class.
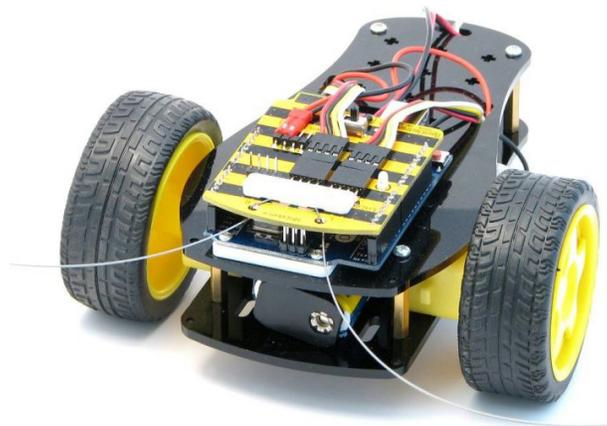
The Robot

BombiniBot Anatomy

BombiniBot has two motors and two antennas.

You can control the speed and direction of motors and read the tentacle values through the Scratch programming software.

The robot also has an LED on top, and the blinking of this LED can be controlled from your Scratch program. (You can turn it ON, blink it at different speeds, or turn it OFF).

Antenna

Each antenna senses touch when it bends and touches the outer conductive edge of the hole through which it passes.

Programming: Coding The Robot

We have created a manual which details each step of the robot coding process, from making the robot move forward to remote-controlling the robot.
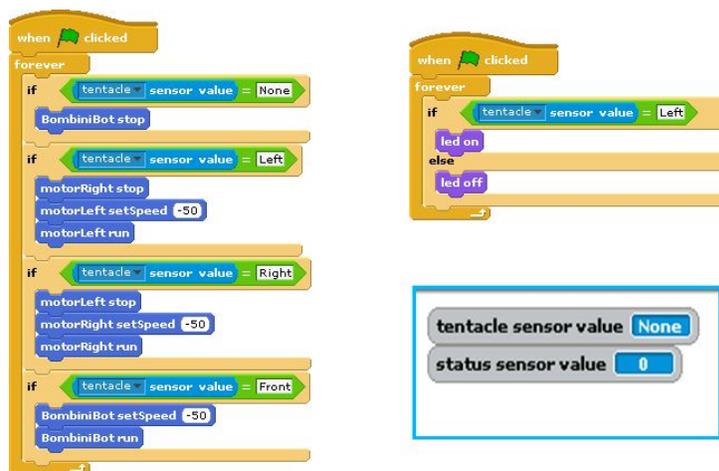
Pro Tip: When teaching students, project your own laptop screen for students to reference. As you code, your students will be able to follow along on their own computers.

Installing the Software

The BombiniBots are equipped with Bluetooth to communicate with your computer wirelessly. If your school or center has computers with Bluetooth capabilities, please download and unzip the following files:

Windows: http://www.mindsensors.com/largefiles/BombiniBotWin.zip

Mac: http://www.mindsensors.com/largefiles/BombiniBotMac.zip

The Software

Programming Environment: BYOB (a version of Scratch)

BombiniBot uses BYOB, a version of Scratch Visual Programming Language, for programming.

BYOB provides an intuitive, drag-and-drop graphical user interface intended make coding easier to learn for novice programmers.

Application: Challenging The Students *(and having some fun)*

This part of the curriculum offers an opportunity for students to apply the skills they have learned. Instead of guiding students, teachers should challenge the students to write a program for the given task and provide example functions that could be used. There are three challenges of progressing difficulties, all of which are found in the programming manual.

Challenges

1. **Autonomous movement through obstacle course**
   a. **Write a program that allows the robot to navigate an obstacle course by itself.**
2. **Remote-control movement through obstacle course**
   a. **Write a program that allows student to remote-control the robot through same obstacle course.**
3. **Robot Freeze Tag**
   a. **Goal: With existing remote-control program, write an additional program so that whenever BombiniBot's antenna is hit, the robot stops moving.**

Contact Information

TALON 540	**Mills E. Godwin High School** 2101 Pump Rd. Glen Allen, VA 23238 team540@gmail.com
E. Henry Hurlburt, II	**Lead Mentor** ehhurlburt@henrico.k12.va.us
Deepak Patil	**COO at mindsensors.com** deepak@mindsensors.com
David Lu	**Outreach Lead** hcps-ludm@henricostudents.org