

Finch Manual

Introduction

This document provides a quick overview of the Finch, a new robot for use in computer science education. Finch is fully programmable in Java, and allows students to use a host of sensors and output devices not available to them if using just a computer. It is also very cute.

USB

The Finch uses an FTDI FT232R USB to serial converter chip to communicate with a computer. As with all USB devices, the Finch requires a driver to be installed on the computer before it is plugged in for the first time. Drivers are available here:

<http://www.ftdichip.com/Drivers/VCP.htm>

The Finch draws all power from USB, and is technically classified as a high-current USB device. It communicates at a baud rate of 57600, and when plugged in will show up as a serial or 'COM' port.

Sensors

The Finch is capable of sensing ambient light levels, temperature, obstacles placed in front of it, and acceleration. Refer to the annotated images of the Finch on the next page to see where sensors are placed on the Finch.

Light. The Finch uses two photoresistors to detect ambient light levels. The sensors are placed in the front of the robot on either side of the hump. They are placed to allow the robot to easily sense the direction of a bright light source, so as to turn towards or away from it.

Temperature. The Finch has a single thermistor sensor that detects the ambient temperature. The sensor can also determine the temperature of an object if the object is placed in contact with the sensor. The temperature sensor is accurate to within 2 degrees Fahrenheit.

Obstacles. The Finch can detect if obstacles are placed in front of it. The sensors face forward, and are on the left and right side of the Finch so as to detect obstacles placed on both sides of the Finch. The sensors can detect obstacles up to 1 foot away.

Due to the limitations of this type of sensor, some objects, primarily those made of black plastic, will not be sensed.

Accelerometers. The Finch uses a 3-axis MEMS accelerometer to detect acceleration in all three spatial dimensions. The sensor can detect accelerations of +/- 1.5 gees. The primary use of the accelerometer is to detect the direction of gravity, so as to know how the Finch is oriented (flat on the ground, upright, etc). It is also possible to detect spikes in acceleration caused by tapping the Finch, or quickly moving it by hand.

Motors

The Finch has two motors and uses its tail as a slide caster. It can turn in place around the axis of its two wheels. The wheels are pushed against the motor shafts, eliminating the need for a gearing system. Black and white encoder stickers are stuck to the inside of each wheel to allow the Finch to track and control its position and velocity. The encoders have a resolution of 0.75 cm or 0.3 inches per tick.

Light & Sound

The Finch has a full-color LED embedded in its 'beak'. This LED contains red, green, and blue elements. By setting the intensity of each element the LED can be controlled to make any color. There are 256 settings for intensity for each color element, ranging from 0 (off) to 255 (full on).

The Finch has an on-board buzzer which is capable of playing sounds with frequencies between 100 Hz and 10 KHz. Software that comes with the Finch also allows the programmer to control computer speakers so as to play synthesized speech, wav files, or musical notes.

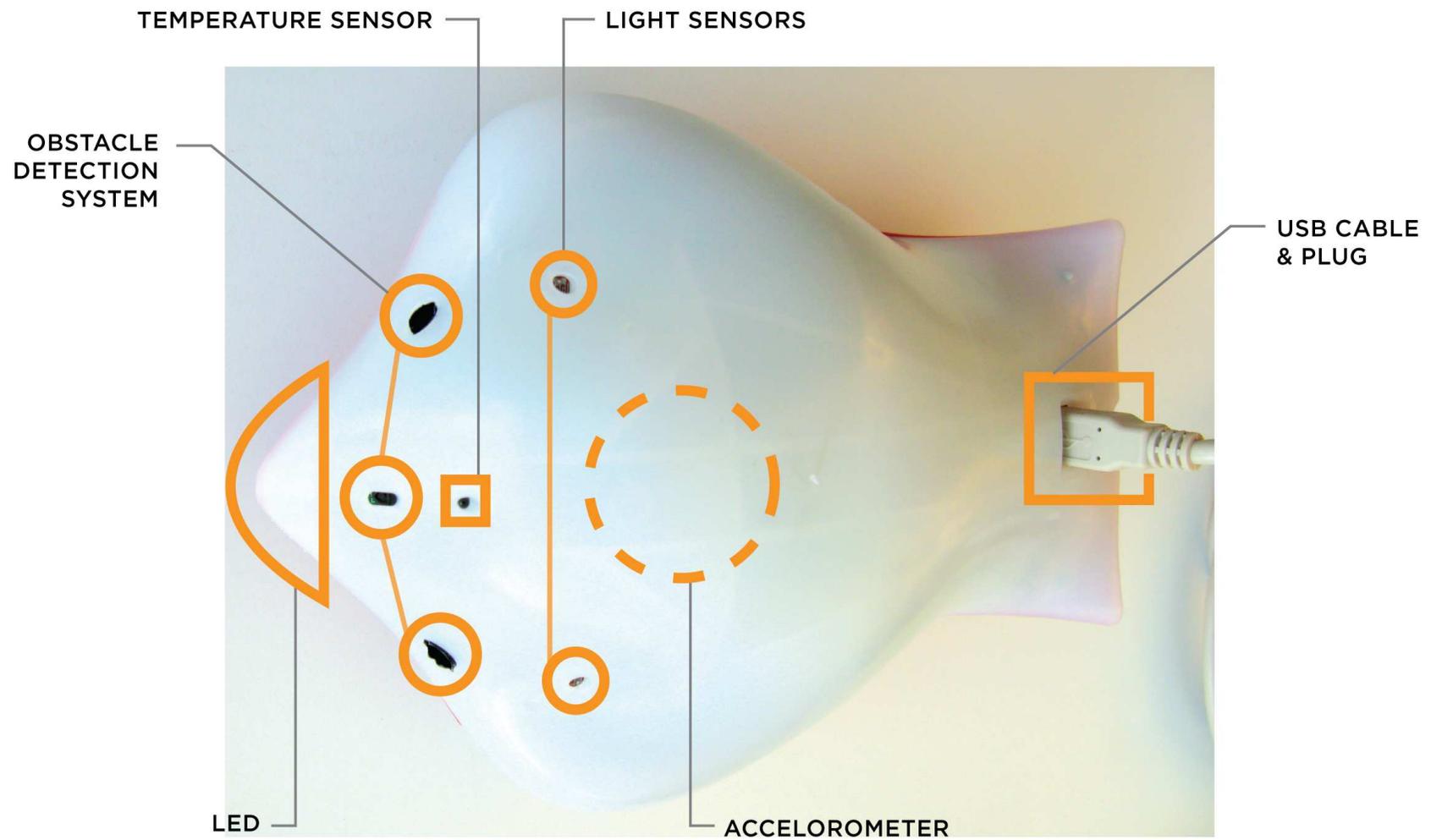


Image 1: Finch Sensor Placement

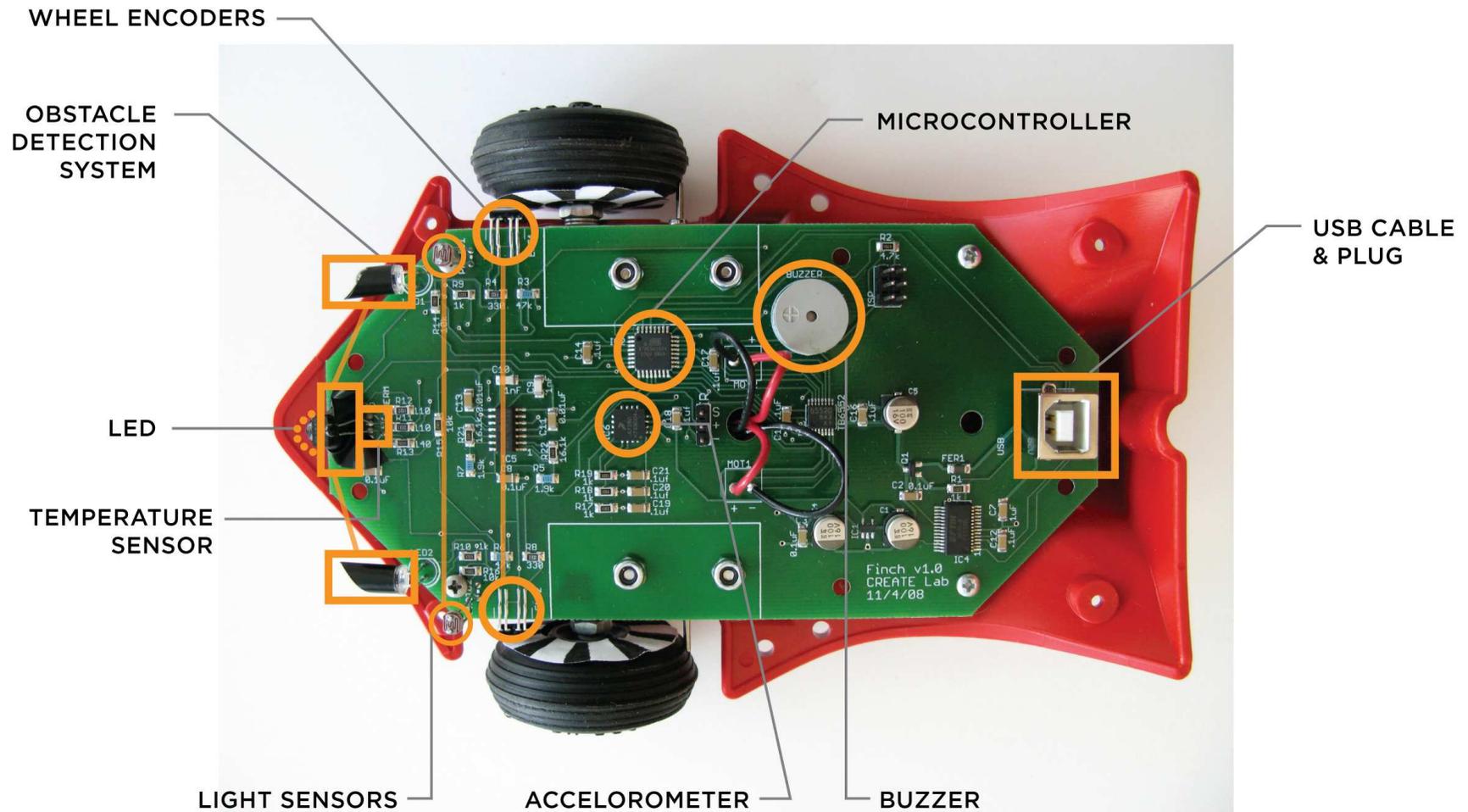


Image 2: Finch Interior