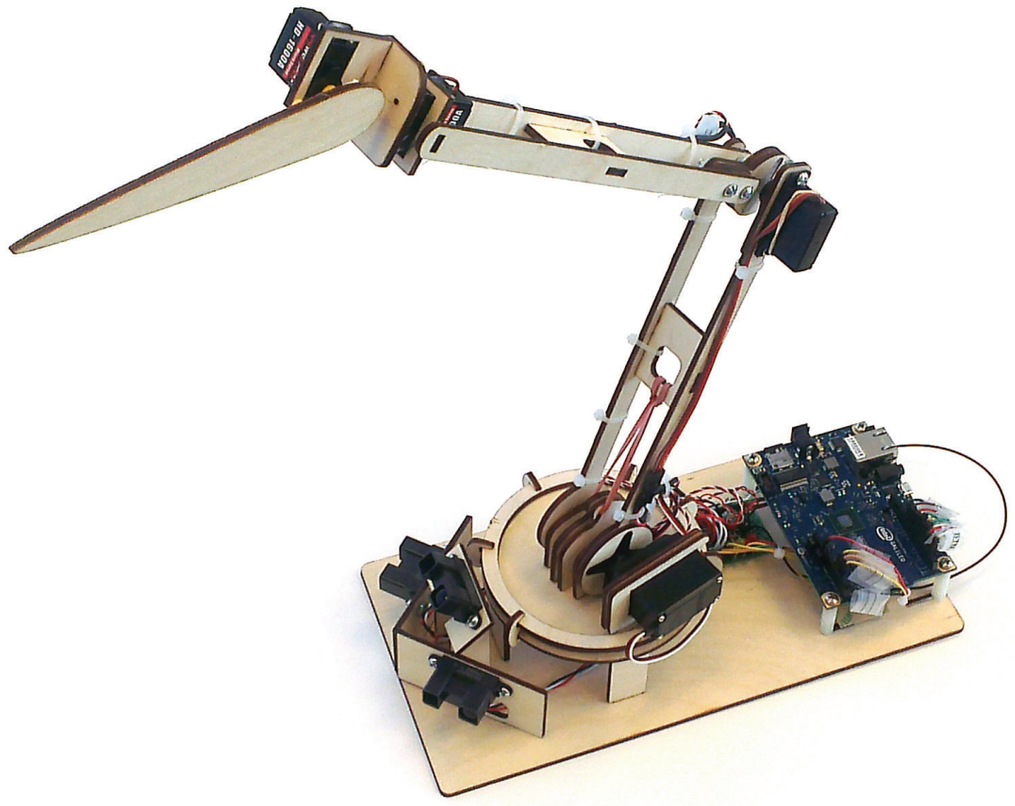
DataMonster



What is a datamonster?
Datamonsters are physical structures with the ability to:

1) use sensors to respond to people and things nearby.

2) connect to data-streams to determine moods or methods of behavior.

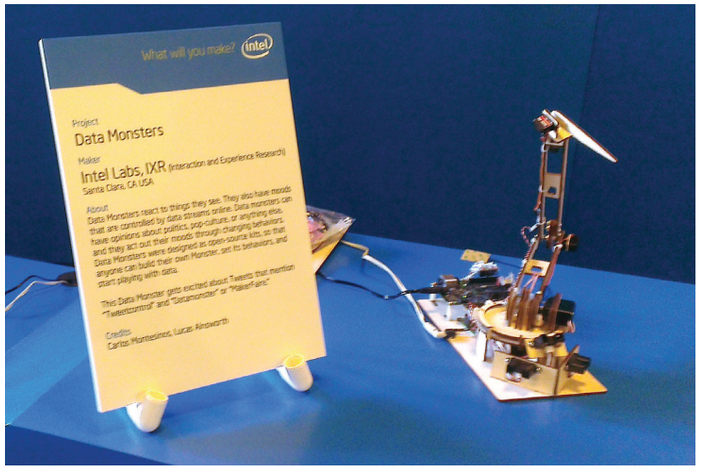
Datamonsters are creatures that respond to you. They can see you and respond to your presence and movement. In addition to responding to immediate interactions, they can also be influenced by events happening in the world outside. Just as a person's moods can be influenced by traffic jams, political climate, local events, the season and weather, Datamonsters can have their own opinions about anything you want them to listen too.

Why?
The first datamonster was built as an experimentation platform for expressive movement. A datamonster can take any form, but this original model is similar to a desk-lamp in structure, and can express dominance by standing upright and alert, and passivity by cowering or shying-away from things. There is a wide range of emotions and behaviors that can be explored with this physical structure. By listening to data online, Datamonsters can express more nuanced behavior than a robot that responds to physical presence alone. At this point, the project is very basic, but we hope the concept can extend into sophisticated behaviors and data visualization!

Datamonsters requires 3 main things:
1) physical structure-
The physical structure uses commonly available materials and a relatively easy-to build wooden kit pattern, so that the physical form "gets out of the way" as much as possible. If you cut this kit and put it together, you will have a robot with 5 joints: waist rotation, waist elevation, mid-body elevation, neck rotation, and head movement.

2) sensing.
For this version, we're using 3 long range active IR sensors for simplicity and low cost. This sensor pack estimates object location in 3D space. Next gen could possibly use a webcam and OpenCV to include face-detection and motion in addition to presence.

3) software.
This is where the fun is and where the most work remains to be done. We have code for the Arduino IDE (written for the Intel Galileo board) that you can use to calibrate and control your monster. If you use our code unchanged, you'll have some basic reactions to objects, and a connection over WiFi to Thingspeak. Thingspeak is an easy-to-use repository for data collected from the internet or any data sources you create.



Parts List:

The wooden parts of this kit are designed to be cut on 1/8" 12x24" plywood using a laser-cutter. Acrylic would probably also work fine. If you don't have access to a lasercutter at your local school or hackerspace, www.ponoko.com or www.pololu.com are good online lasercutting resources.

You'll need 5 servos. We use
2x Parallax standard servo (180 degrees)
1x Power HD Mini Servo HD-1711MG
2x Power HD Micro Servo HD-1600A

For the sensor module, we use active IR sensors. Sonar sensors would probably also work fine (and in the future, a webcam.)
3x Sharp GP2Y0A02YK0F Analog Distance Sensor 20-150cm
3x 3-Pin Female JST PH-Style Cable for Sharp Distance Sensors (30cm)

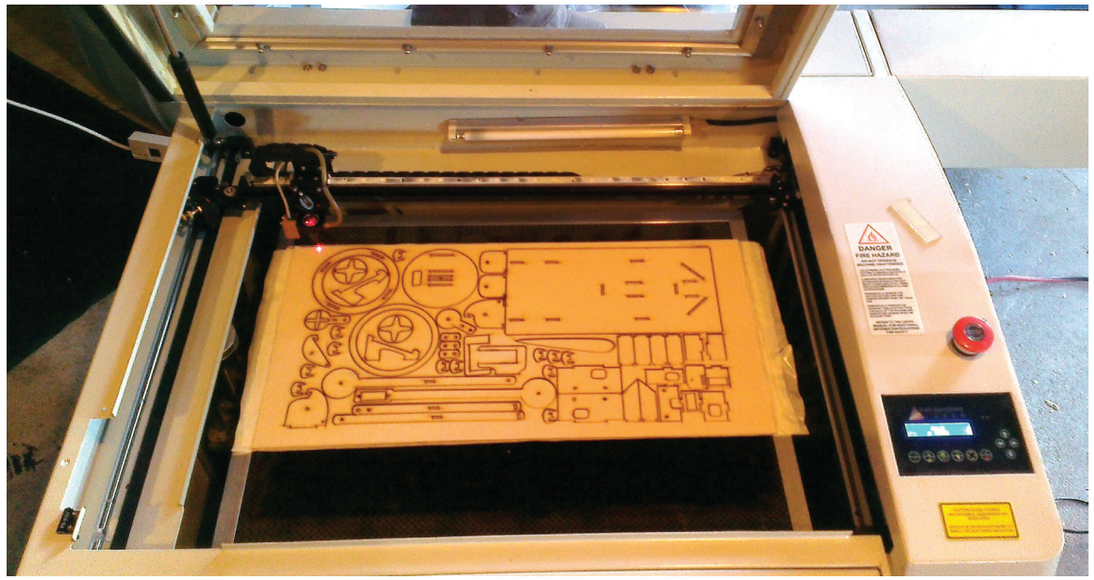
-a few pull-down resistors
-a button
-one capacitor ~10uf
-three LEDs as status indicators
-breadboard

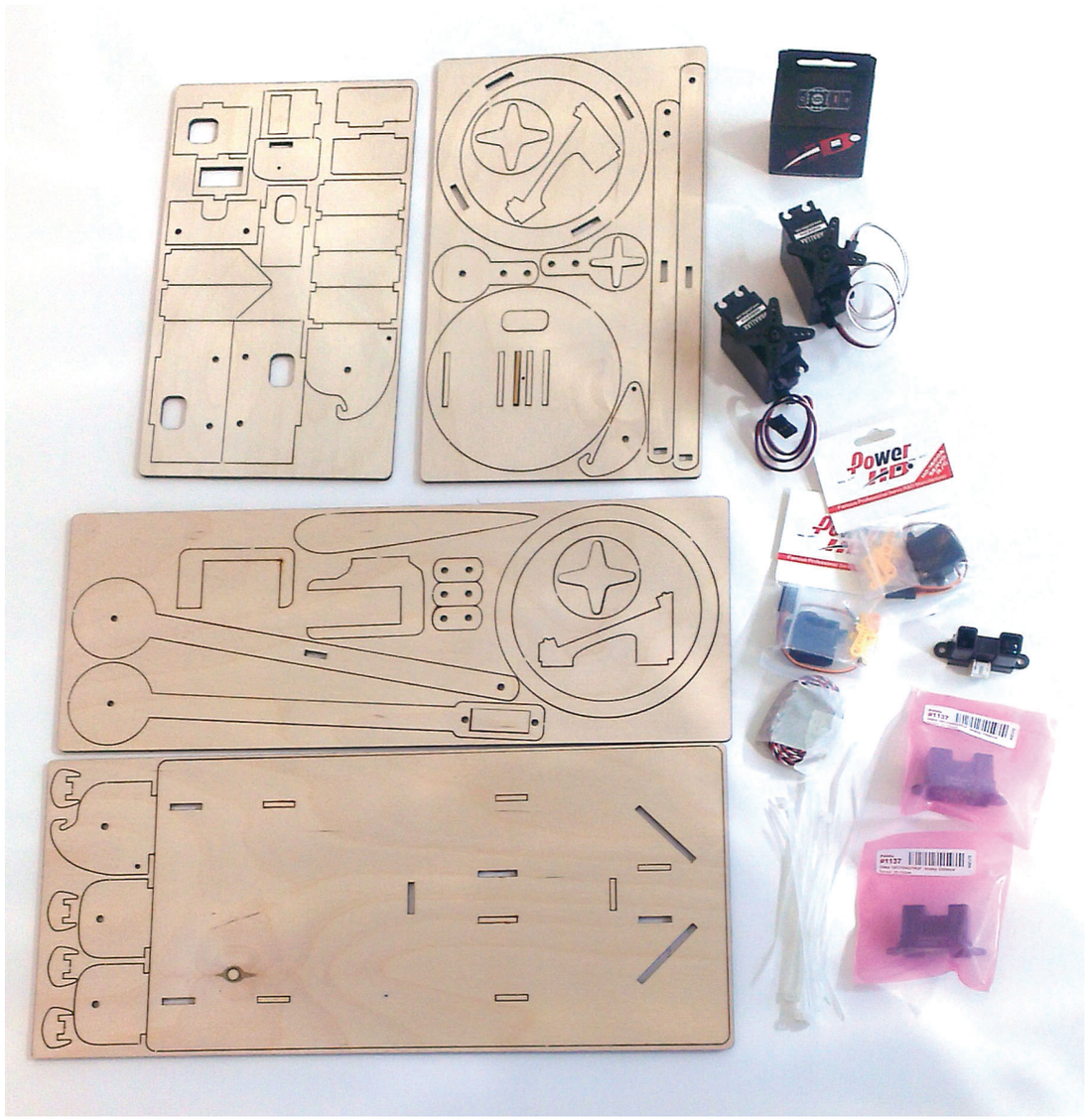
-Intel Galileo board
-Intel® Centrino® Wireless-N 135 WiFi card (to use wireless internet)
-Power supply for servos- anything that puts out 4.2v or 5v DC.

-wood or Elmers' glue

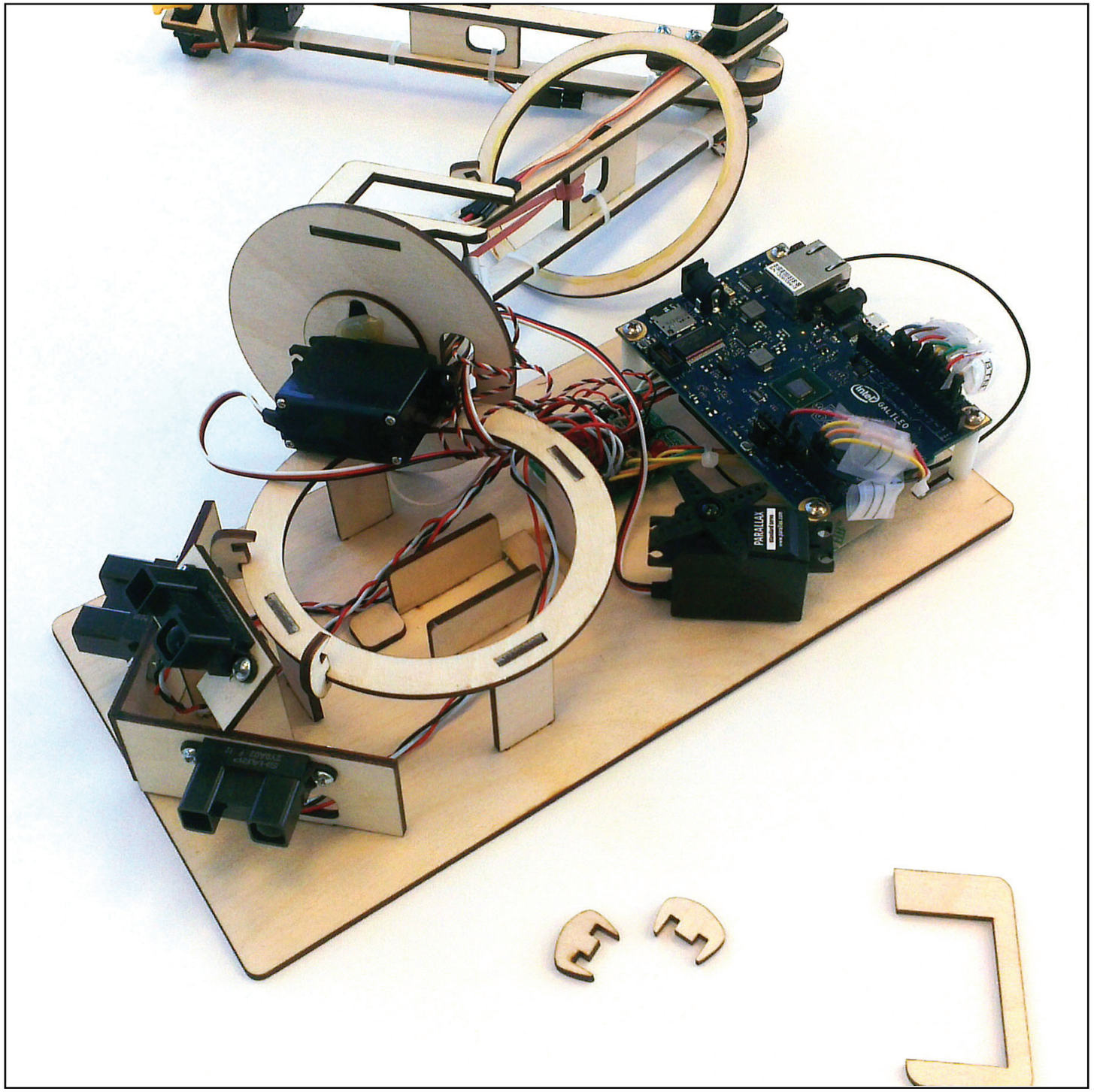
-some machine screws and nuts- all 1/8"
1x 1.5" long
1x 1" long
2x 3/4" long
6x 1/2" long
12x matching 1/8" hex nuts

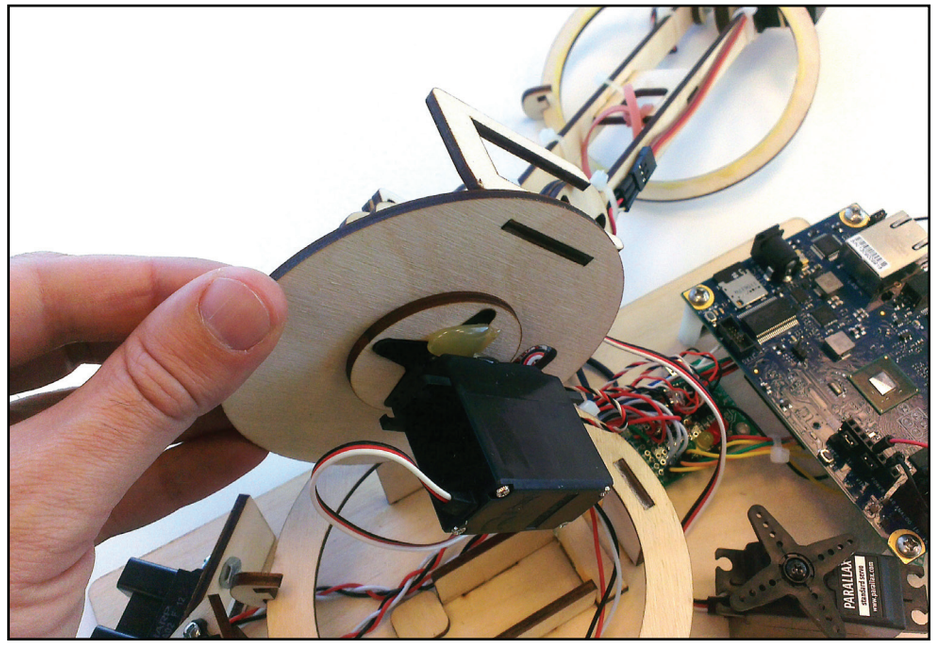
-some tiny zip-ties
-some thin stranded servo wire and jumper wires.

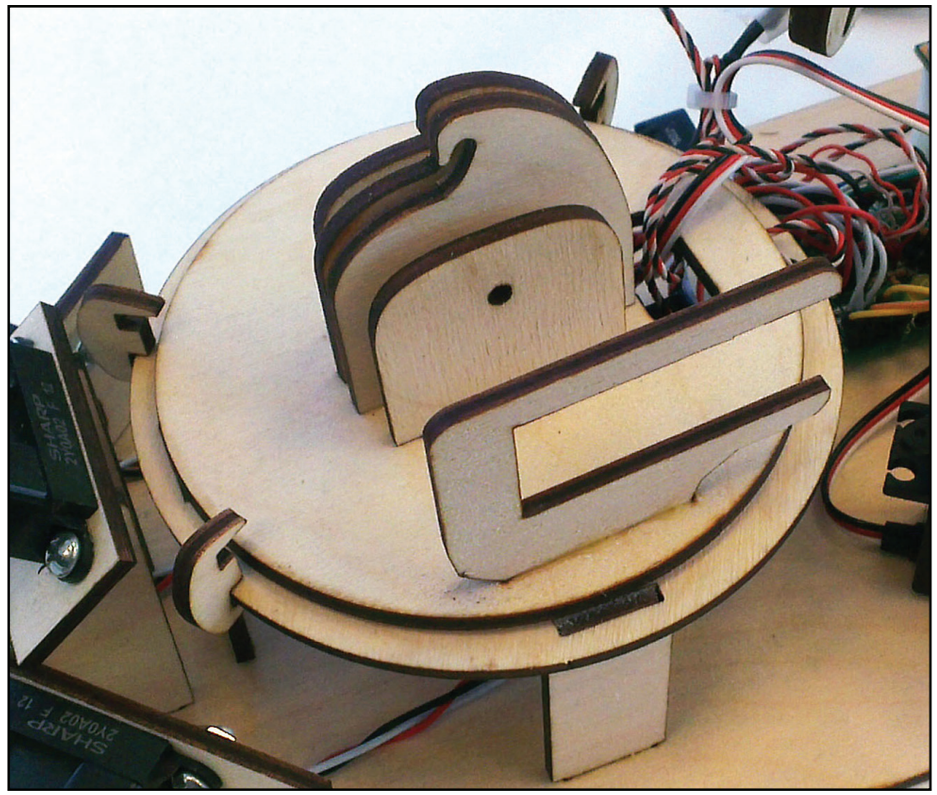




Frame:







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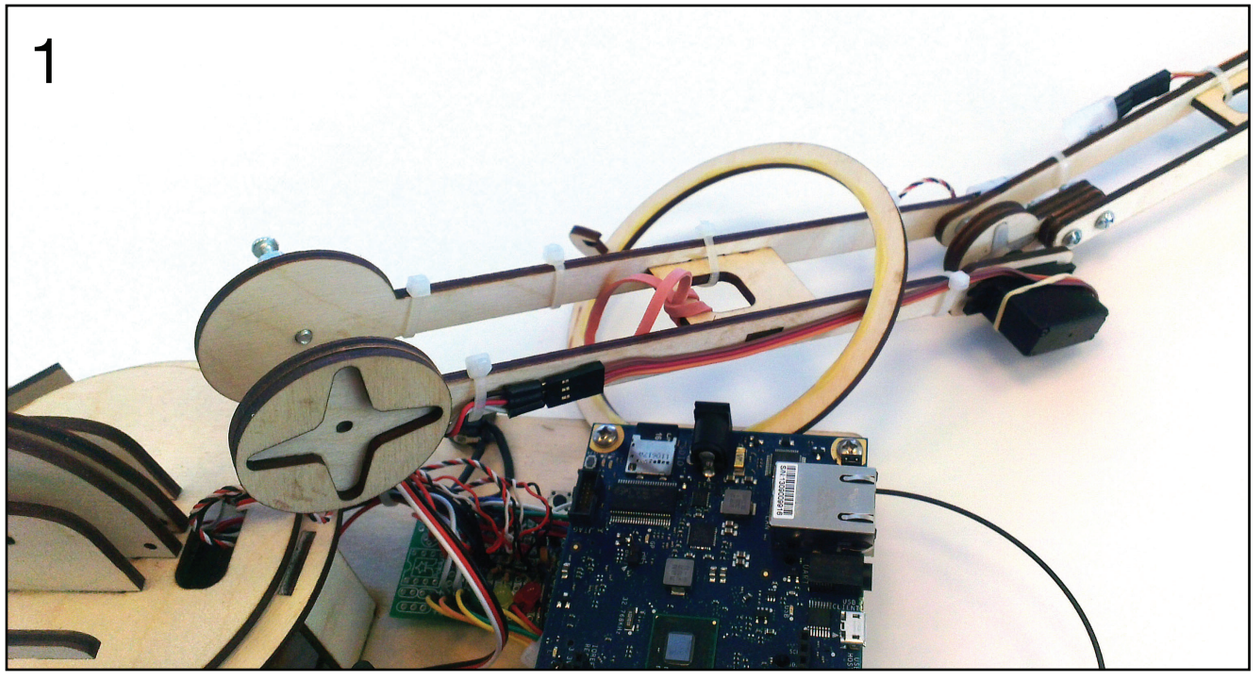

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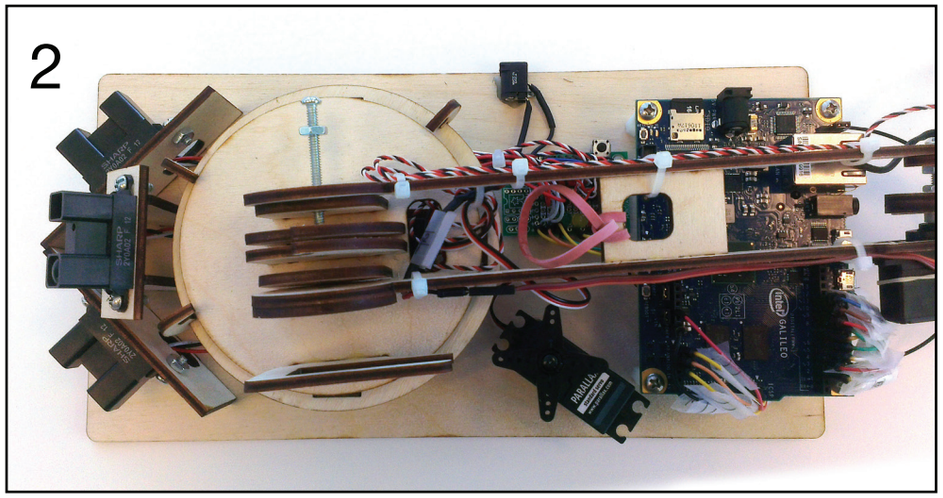

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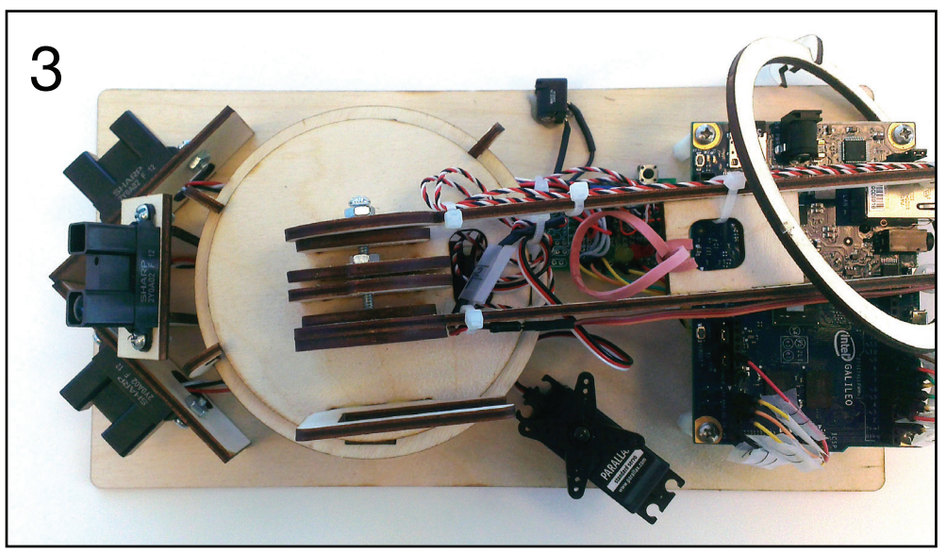

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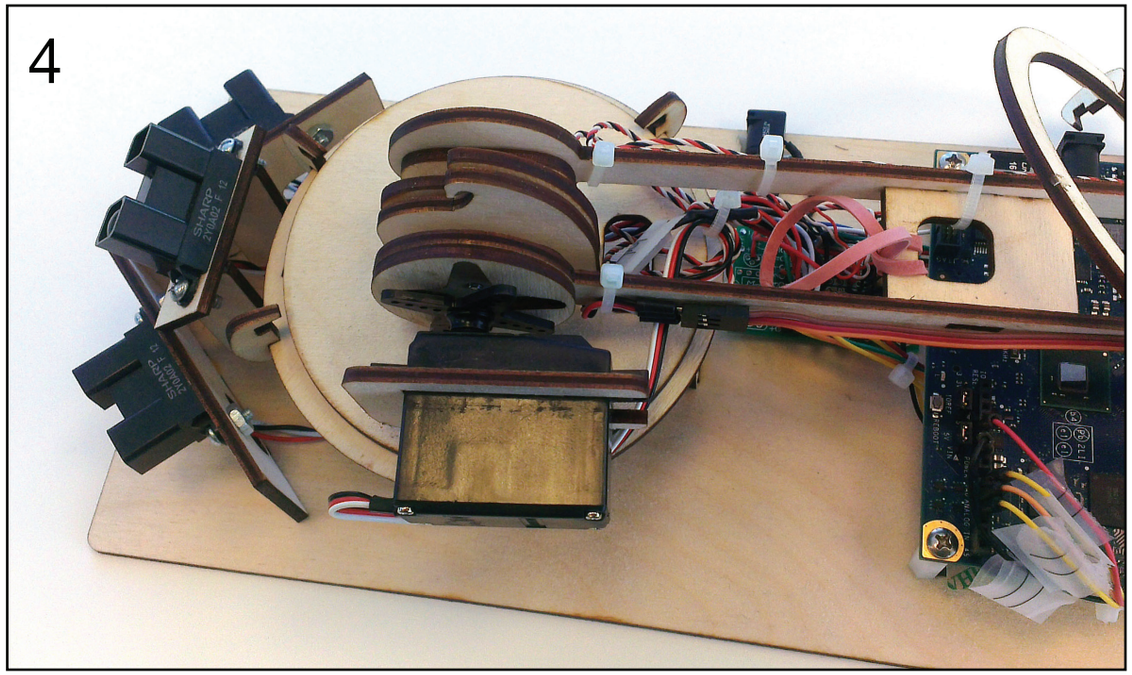

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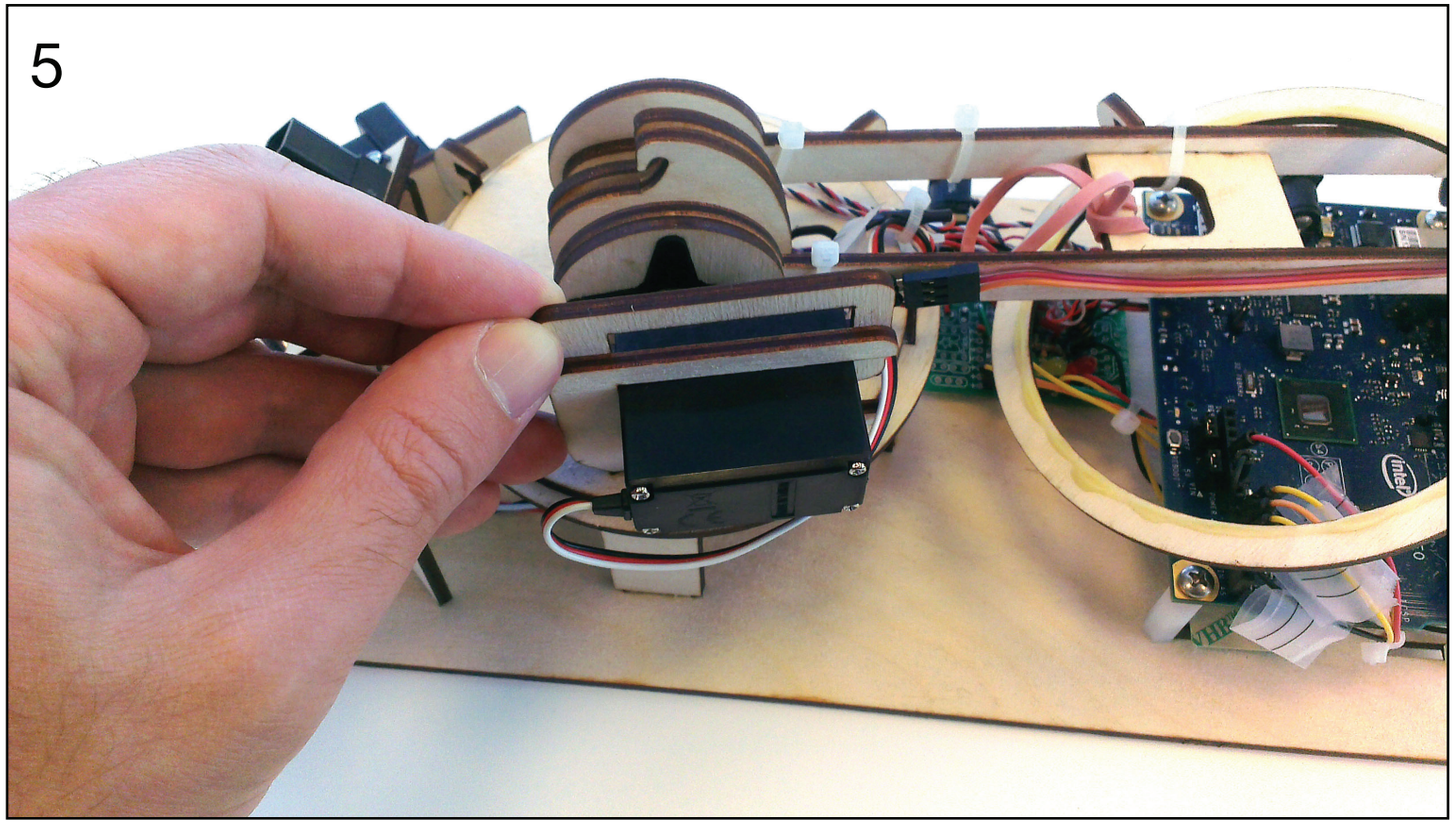
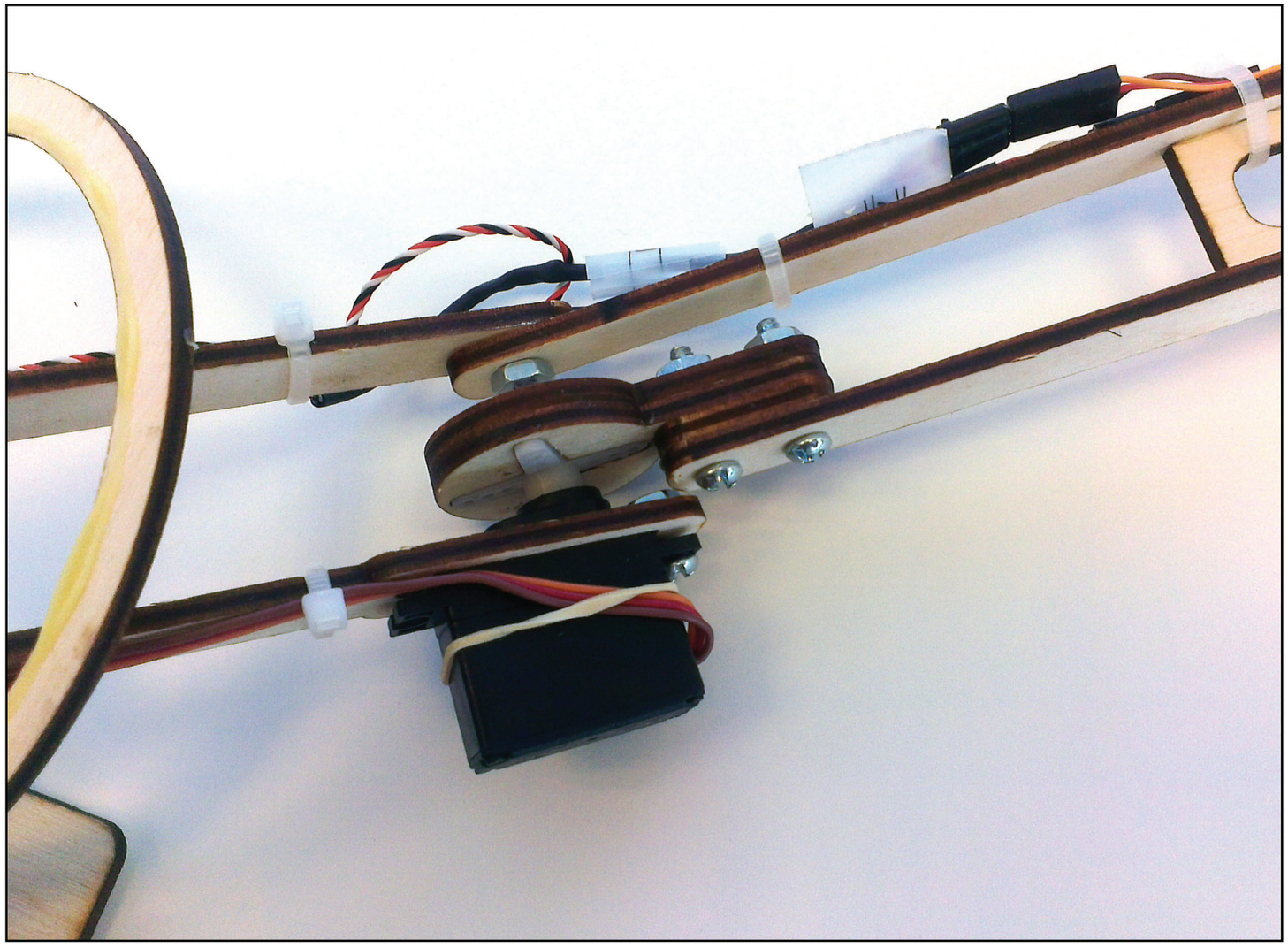
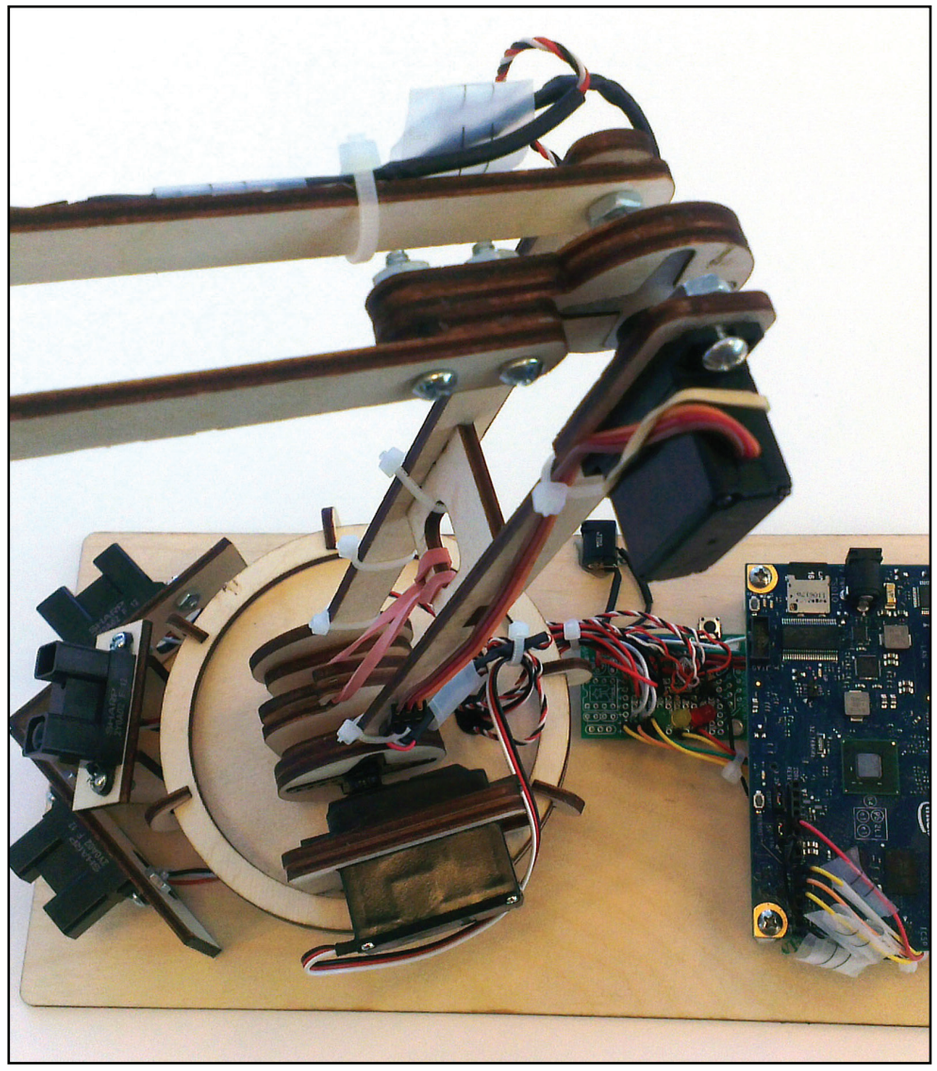
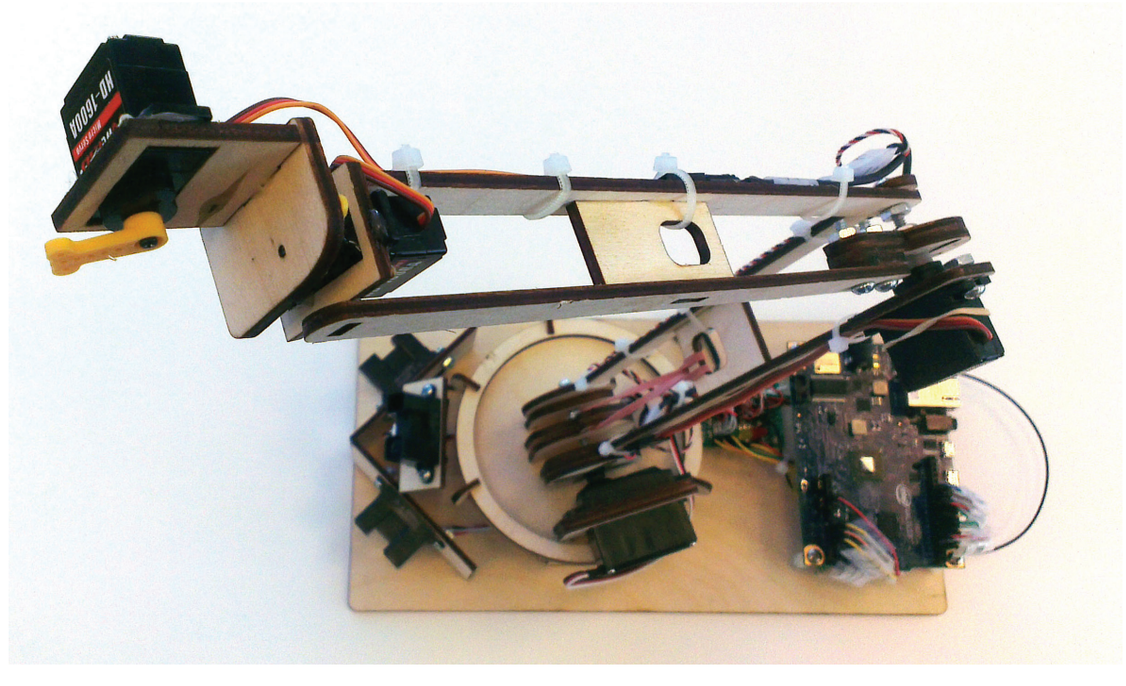
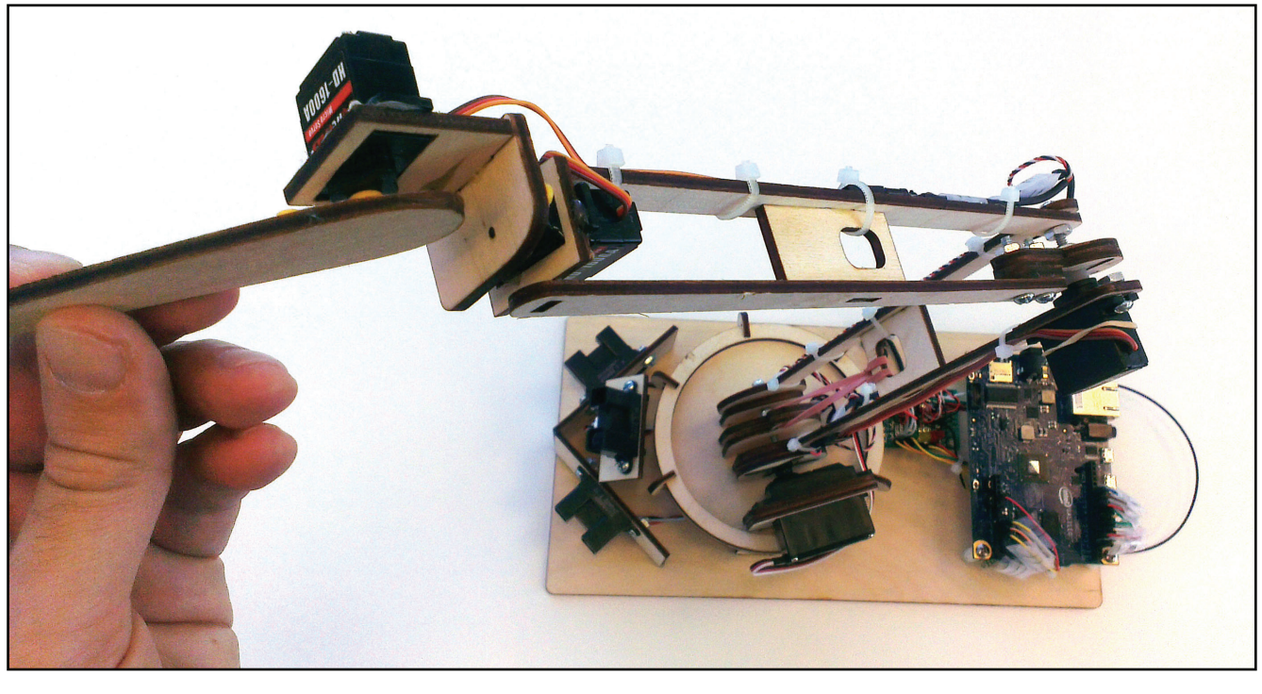






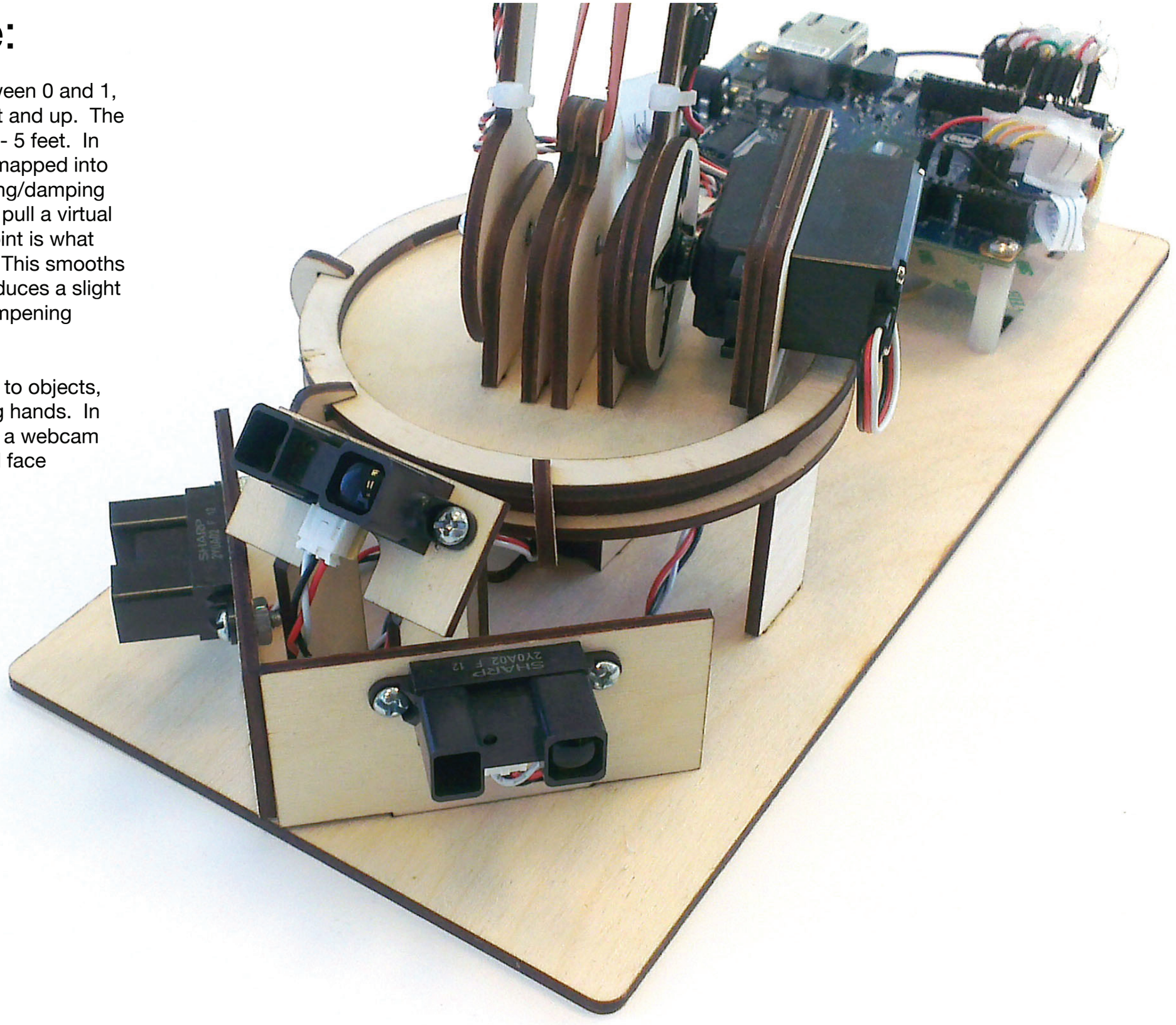


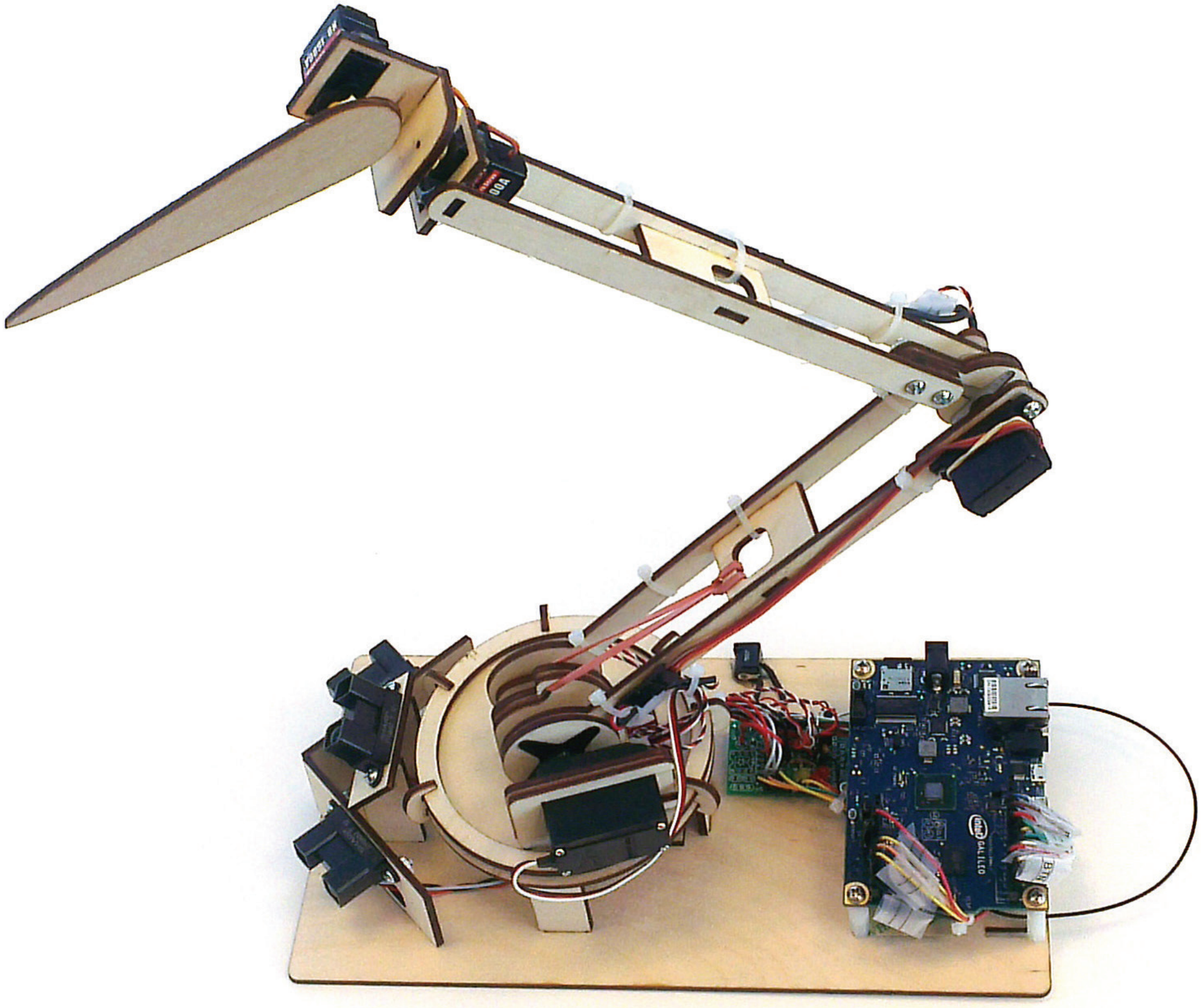


Sensor module:

These IR sensors read values between 0 and 1, and are set at 45 degrees left, right and up. The sensors have a range of about 8in - 5 feet. In the code, the distance values are mapped into x, y, z space. The code has a spring/damping system that uses these sensors to pull a virtual “attention point.” The attention point is what the monster actually responds to. This smooths out any sensor jitter, but also introduces a slight delay depending on the spring/dampening values used.

This system is good at responding to objects, but doesn’t respond well to waving hands. In the next rev, we plan to implement a webcam using OpenCV to track motion and face position.





Electronics:

The datamonster uses two 5v power supplies. The first is for the Galileo board. The 5v pin on Galileo supplies power to the 3 IR sensors, and the 3 status LEDs and button are powered directly by pins on the board. The second power supply only goes to the servos. In the photos, we've soldered our components to a prototyping board, but it's simple to wire this up using a solderless breadboard as well.