

When Java™ meets Lego™



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Agenda

- Lego Mindstorm Overview
- LeJOS Java Based Firmware for Lego
- Demo

Put a Java™ Brain into
your Mindstorms Lego™ Robot
(and show some cool demos)

What is Lego Mindstorms ?



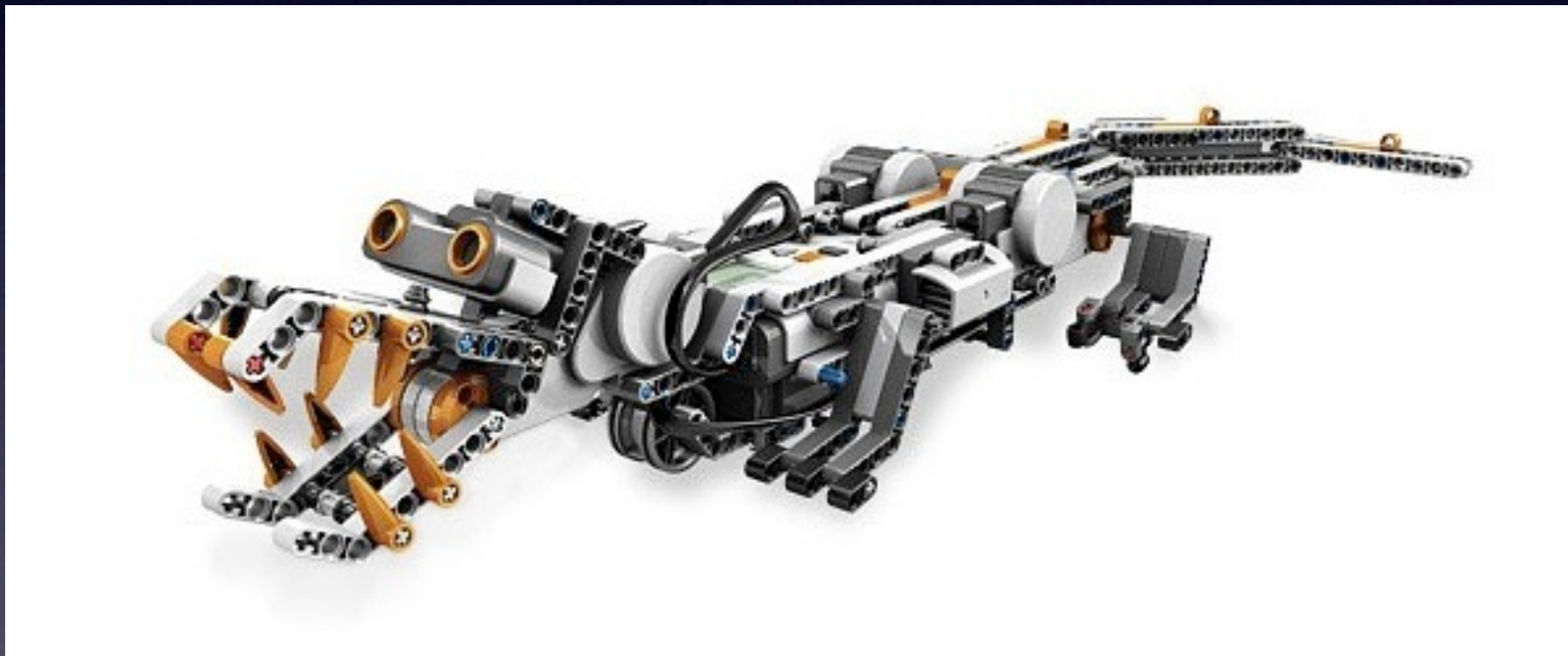
Lego Mindstorms



Many others

- Compass
- Accelerometer
- RFID
- Anything (provided you can solder)

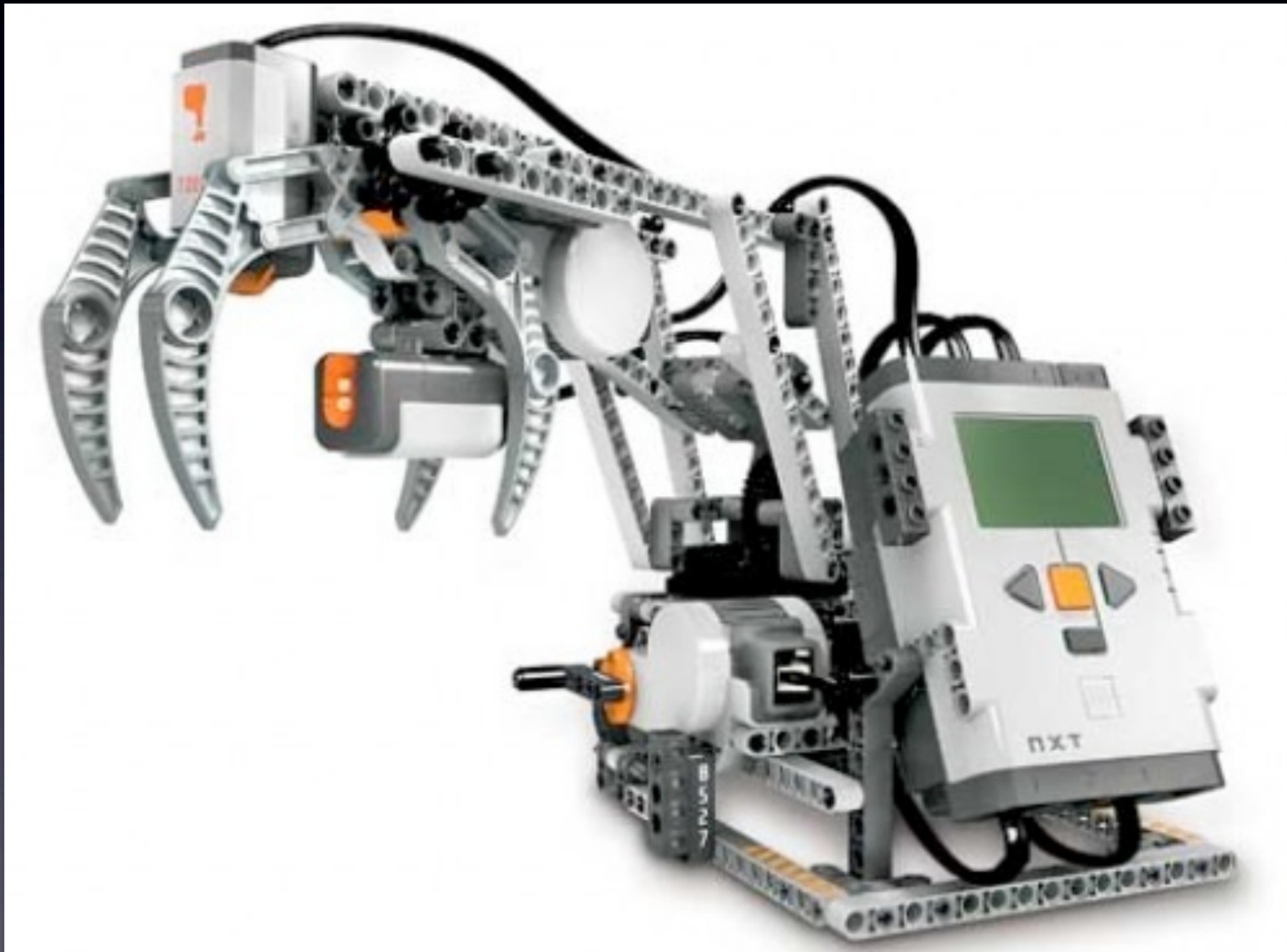
Simple Robots



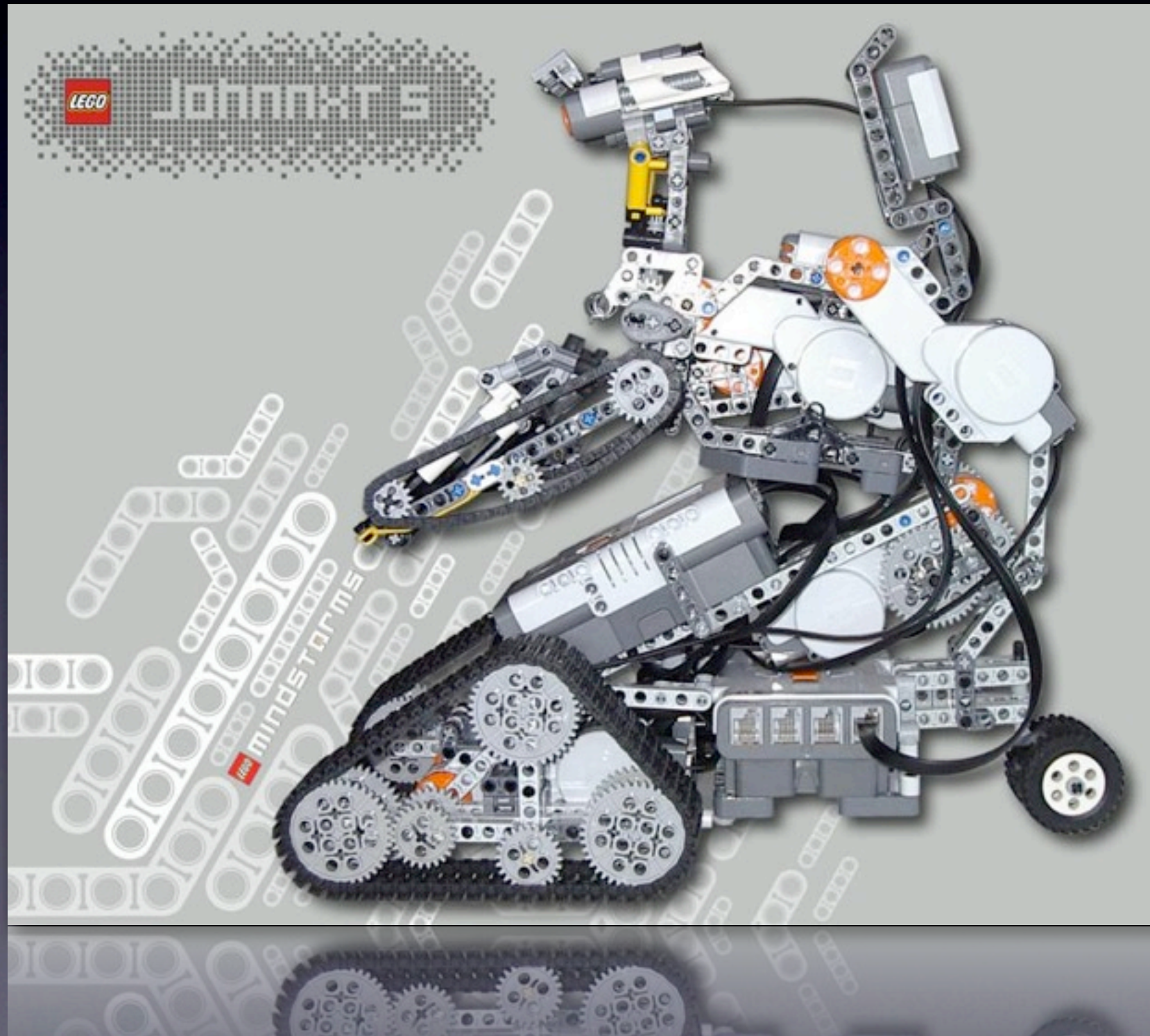
Simple Robots



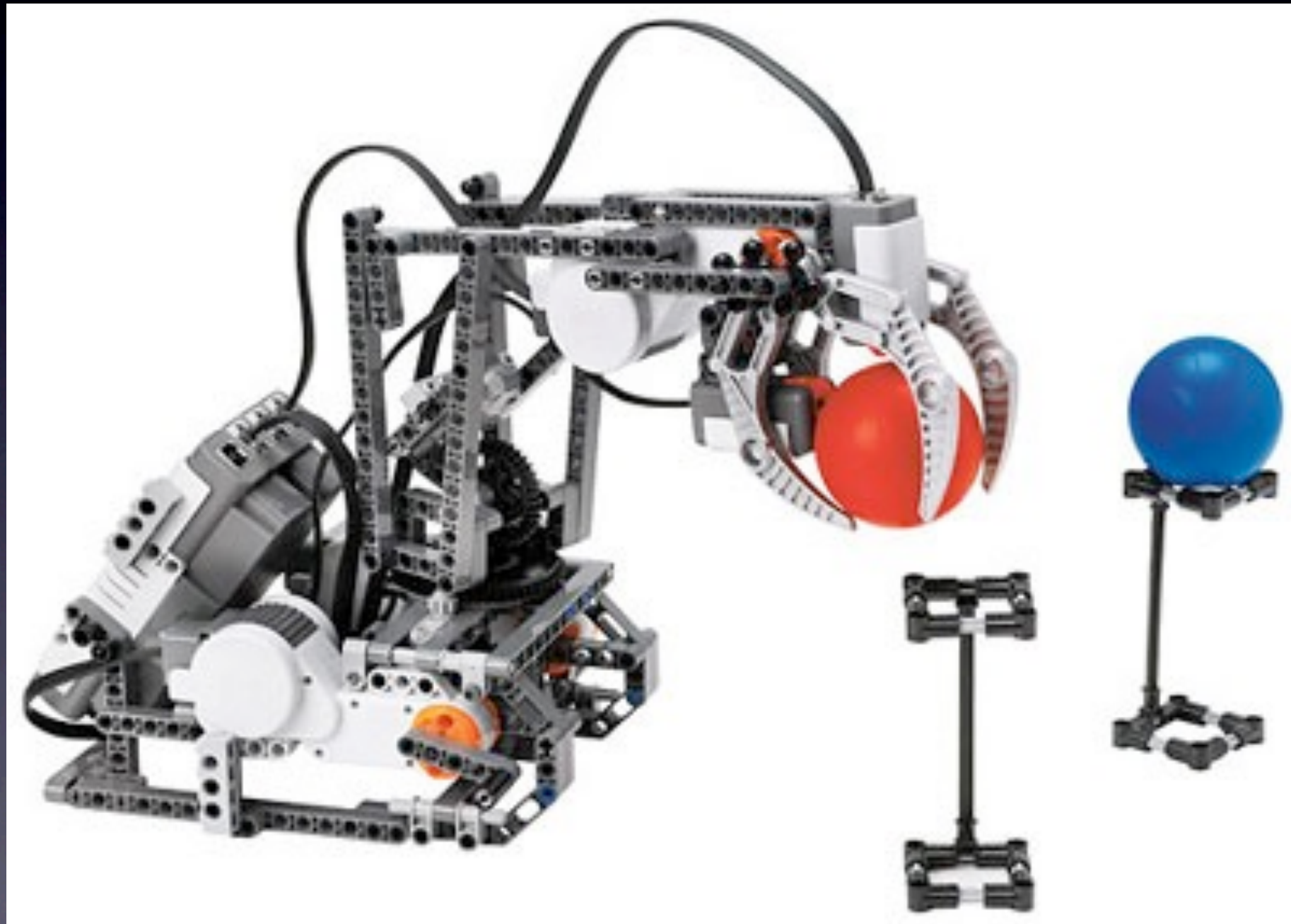
Simple Robots



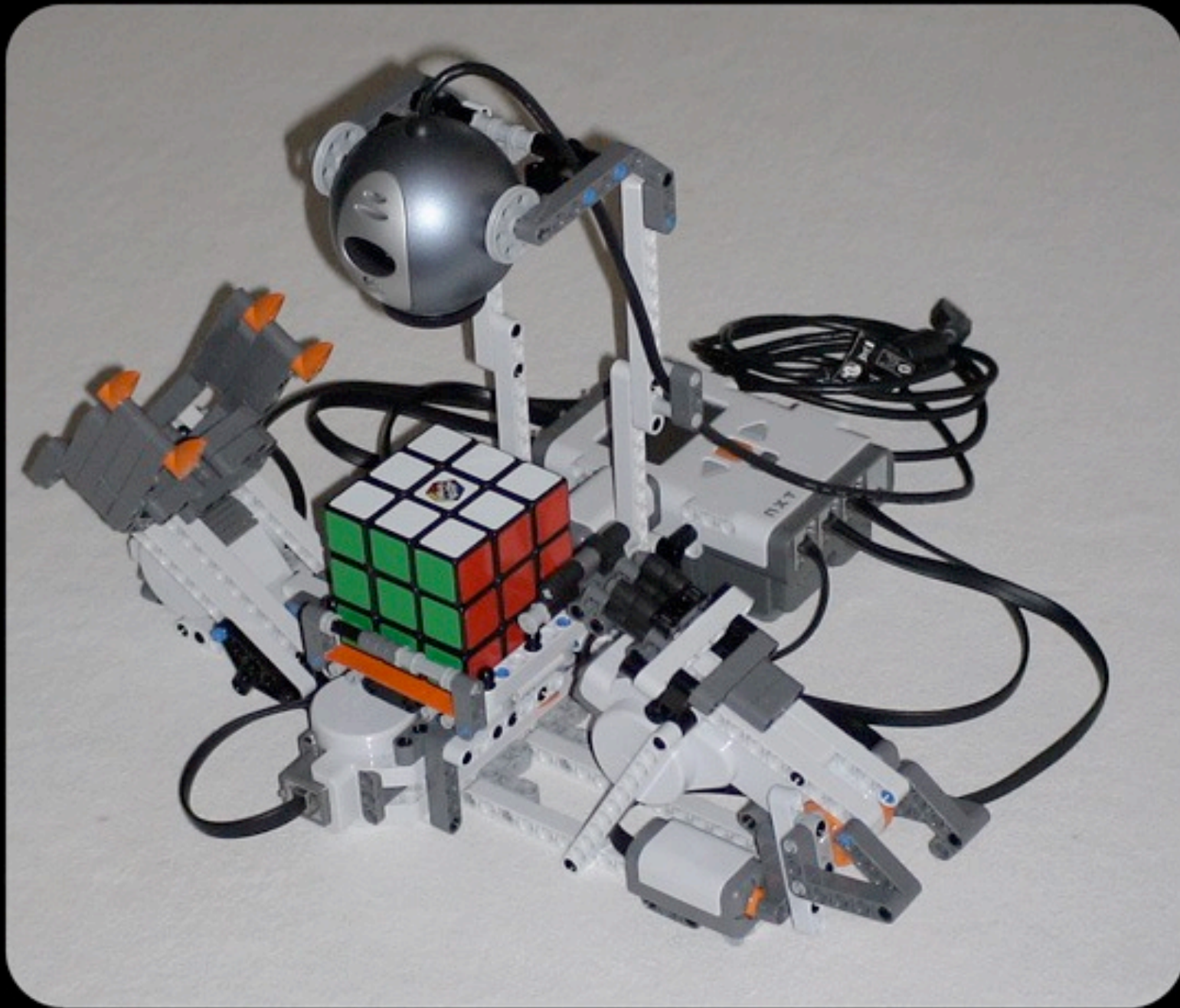
Complex Machinery



Complex Machinery

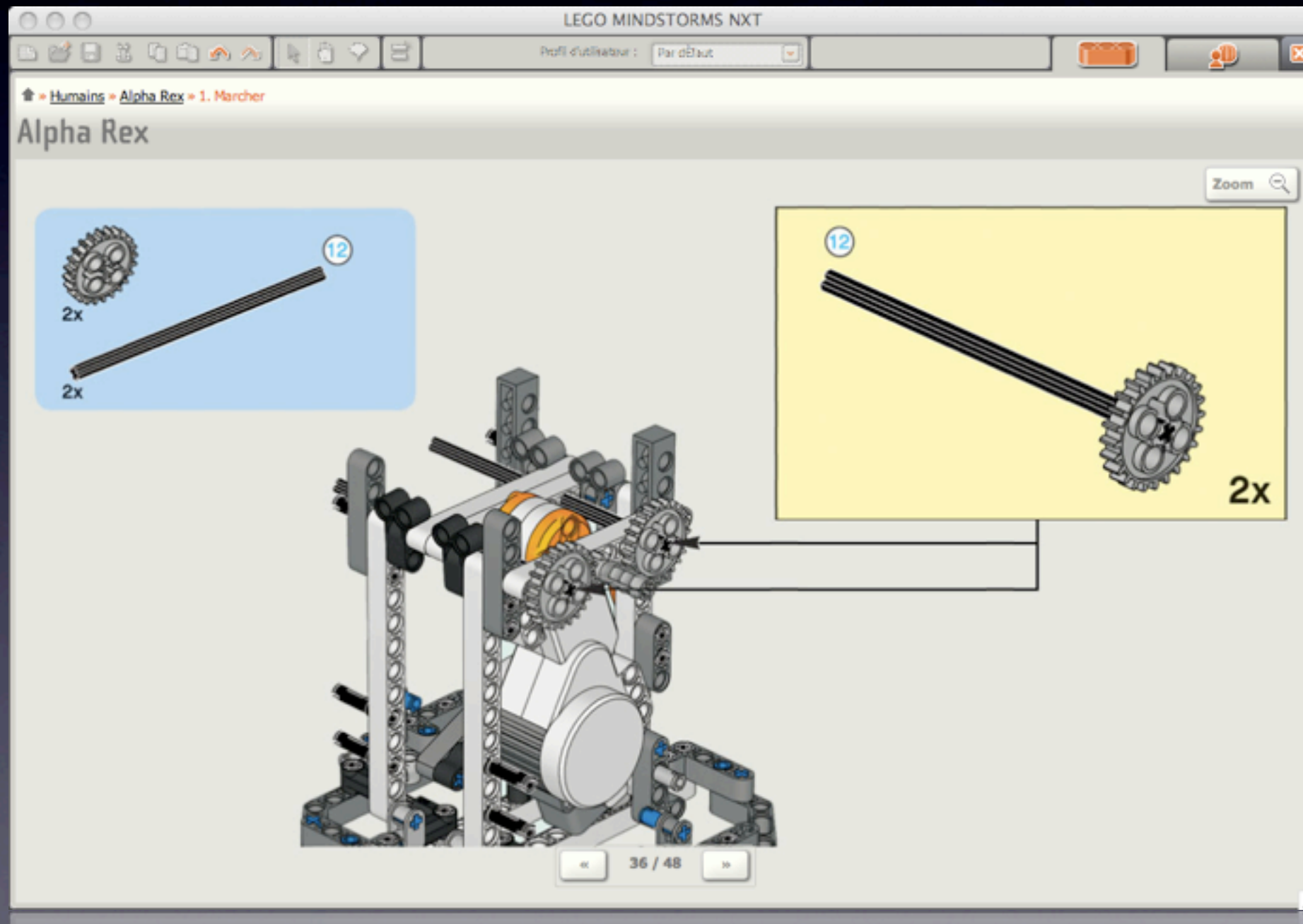


Complex Machinery

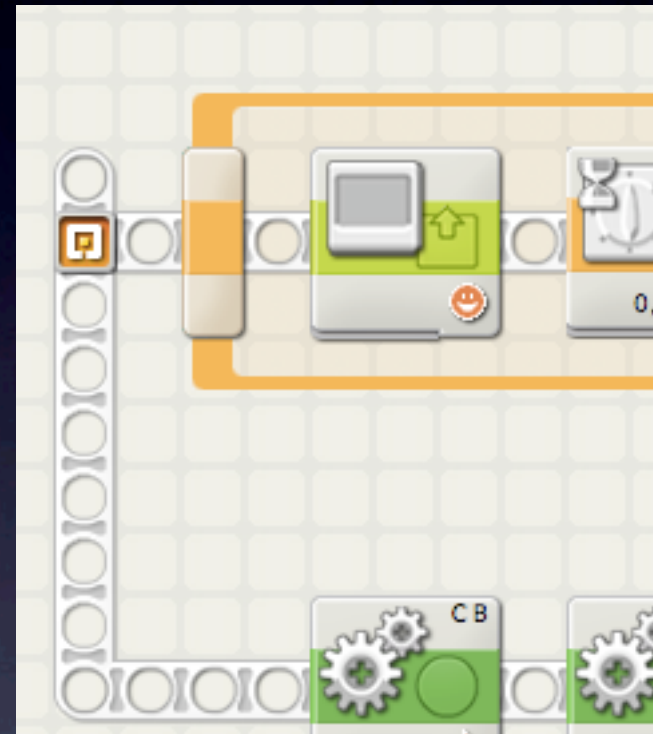
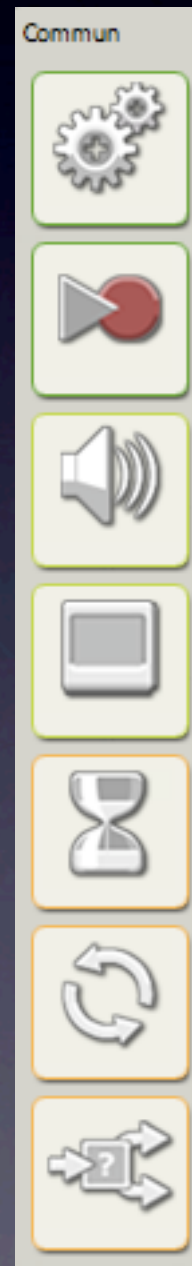




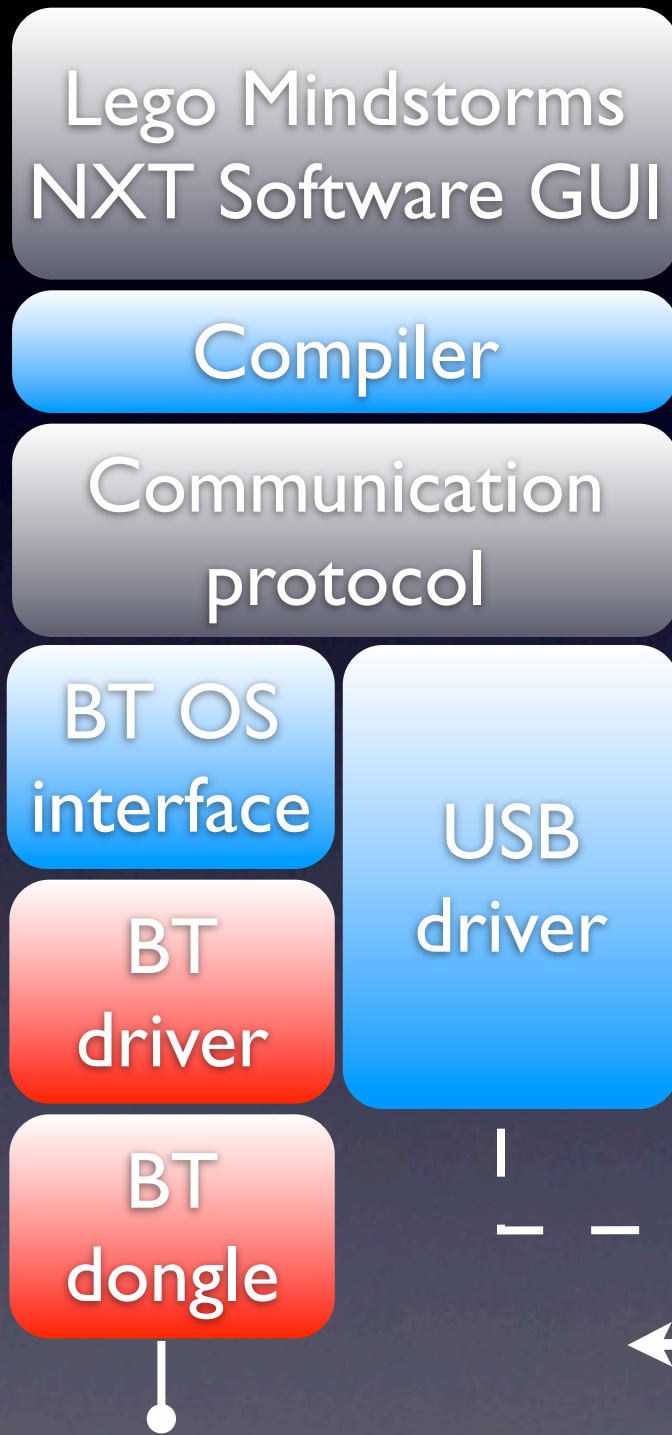
Step #1 : Assemble



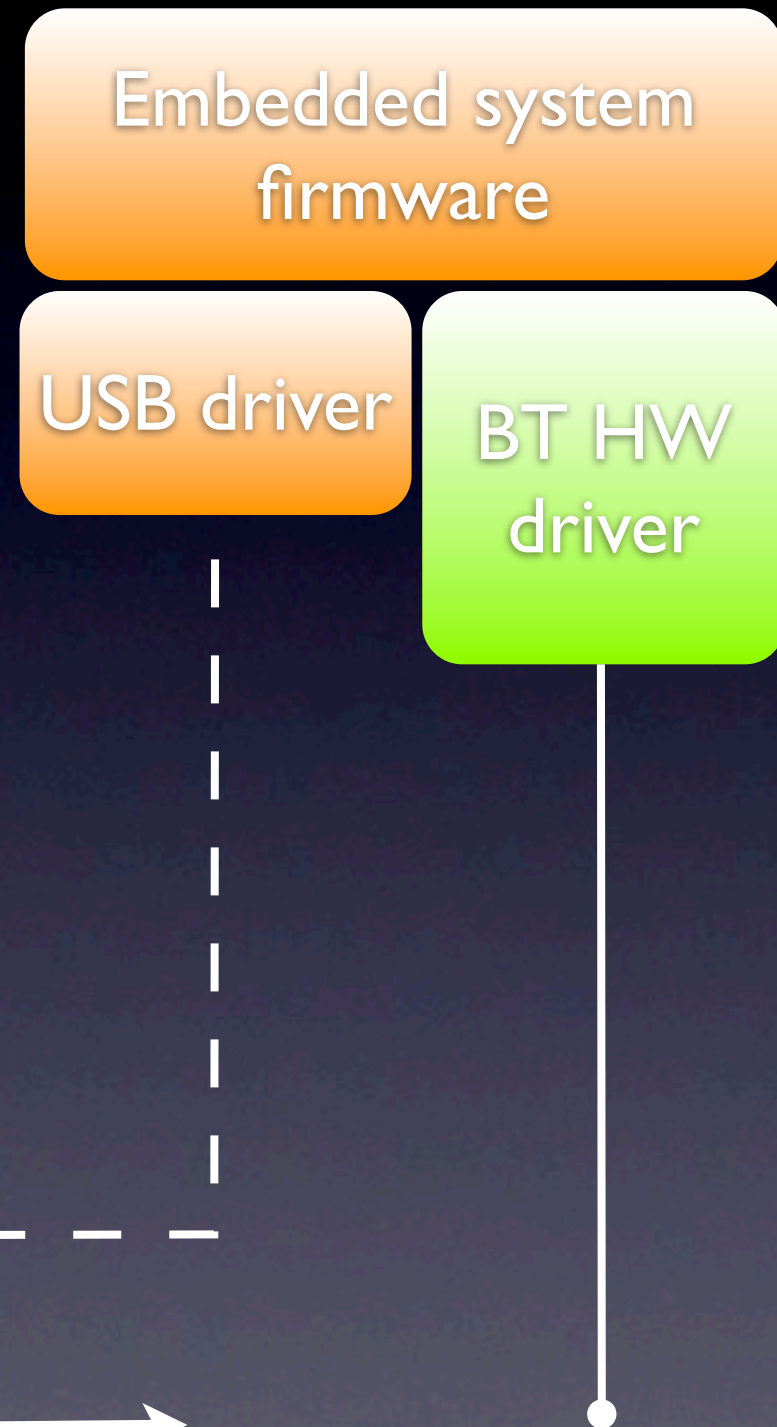
Step #2 : Program



PC/MAC

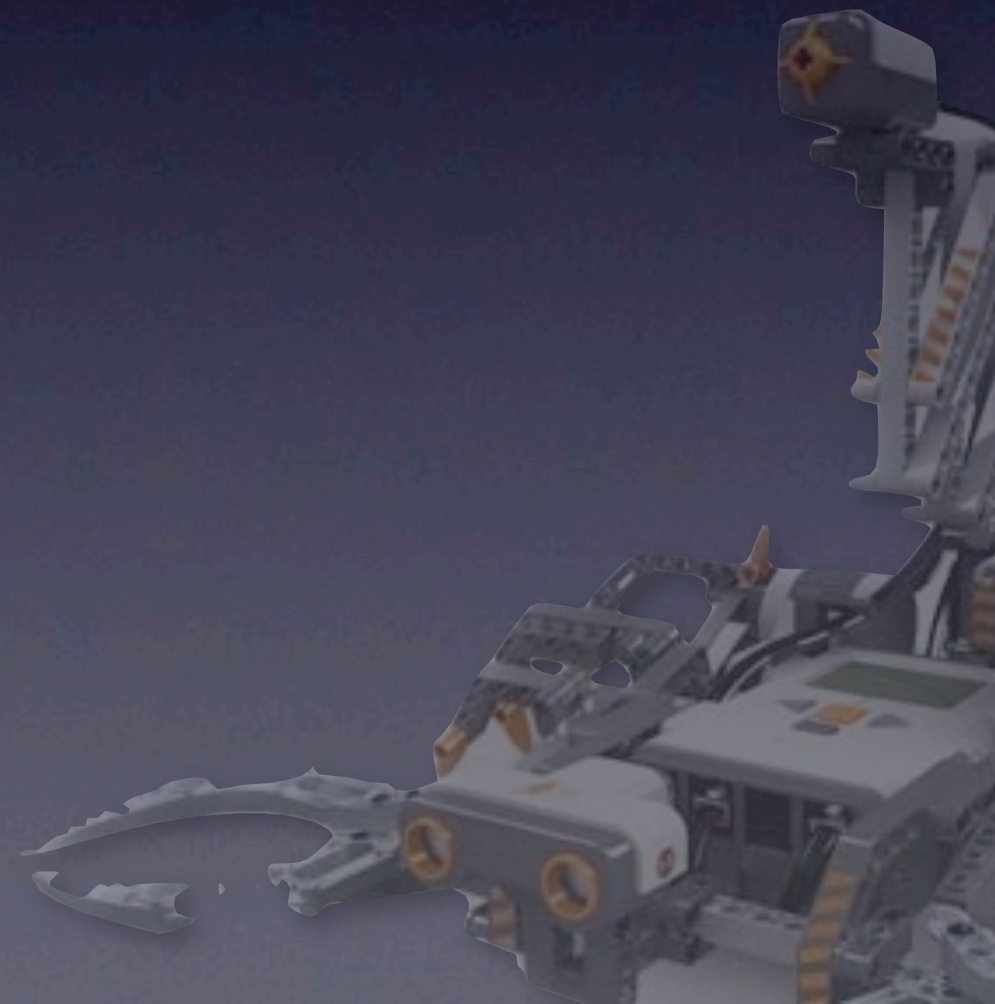


NXT



Open Platform

- Lego Communication Protocol
- RobotC
- NXC
- LeJOS



LeJOS



LeJOS



LeJOS Tour

Dans les slides qui suivent, je fais le choix de faire un focus sur 3-4 aspects important de LeJOS, pas toute la feature list

- A Virtual Machine
- A Java API
- A Linker to create Virtual Machine byte code
- PC Tools to flash, upload apps etc ...
- A PC Communication API

Develop on any platform

Develop on any platform



With any IDE

With any IDE



NetBeans

LeJOS Virtual Machine

- Based on TinyVM, but improved
- Around 50kb
- Fully preemptive, multi threaded
- Garbage Collection
- Bluetooth, USB, I2C & RS485 communication
- Most of `java.lang.*`, `java.util.*`, `java.io.*`

PC Comm API

Java programming from
the PC.
Working both with the
original firmware and
LeJOS

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USB
↔
BlueTooth



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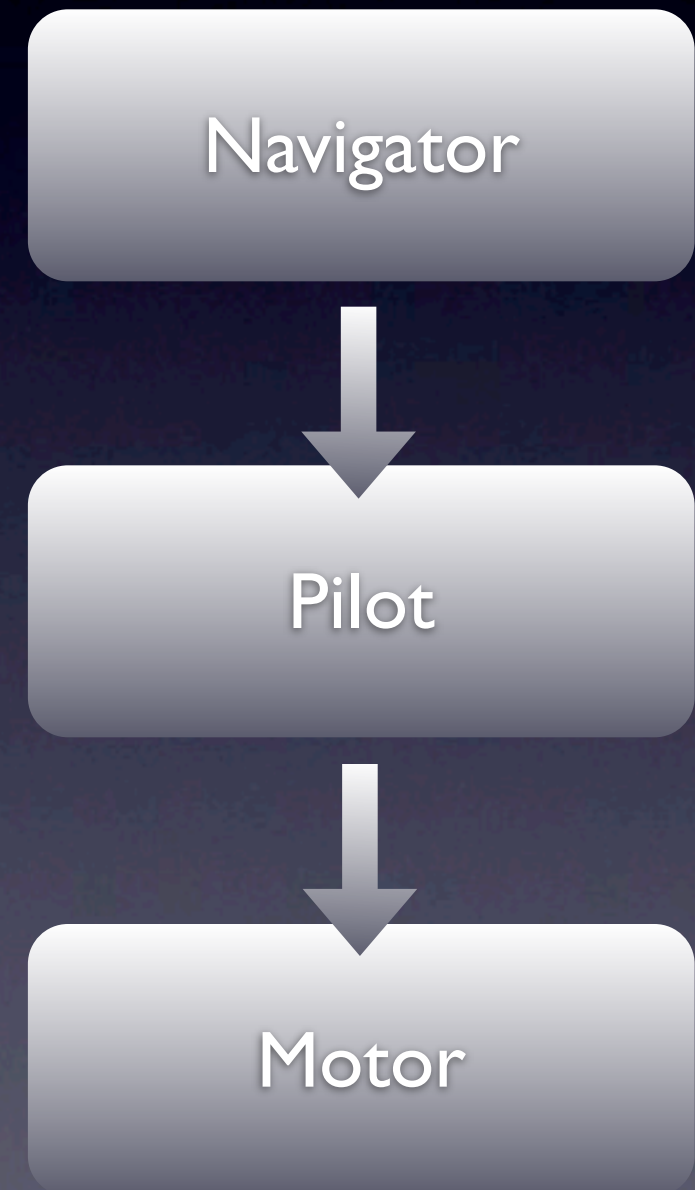
LCP - Lego Communication Protocol

Advanced Control

- Individual Motor Control
- Pilot Java Classes
- Navigator Java Classes

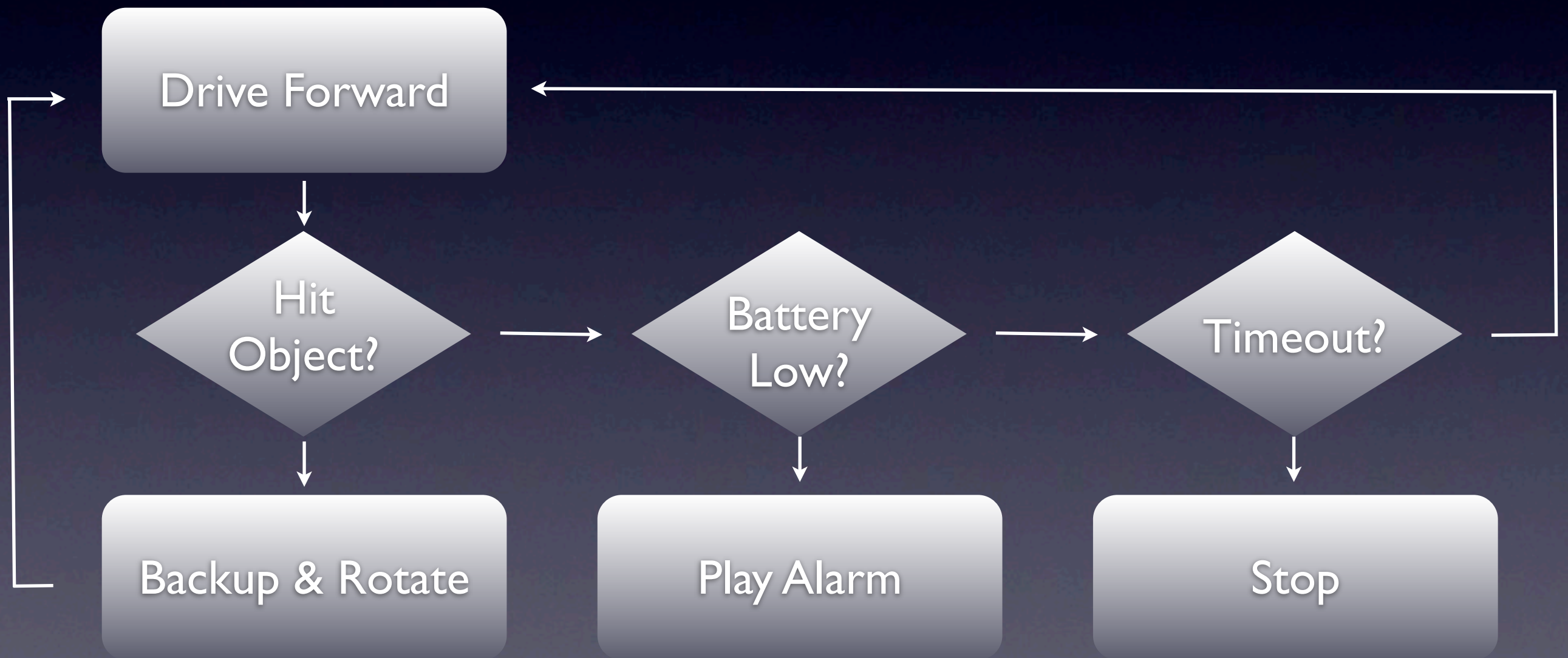
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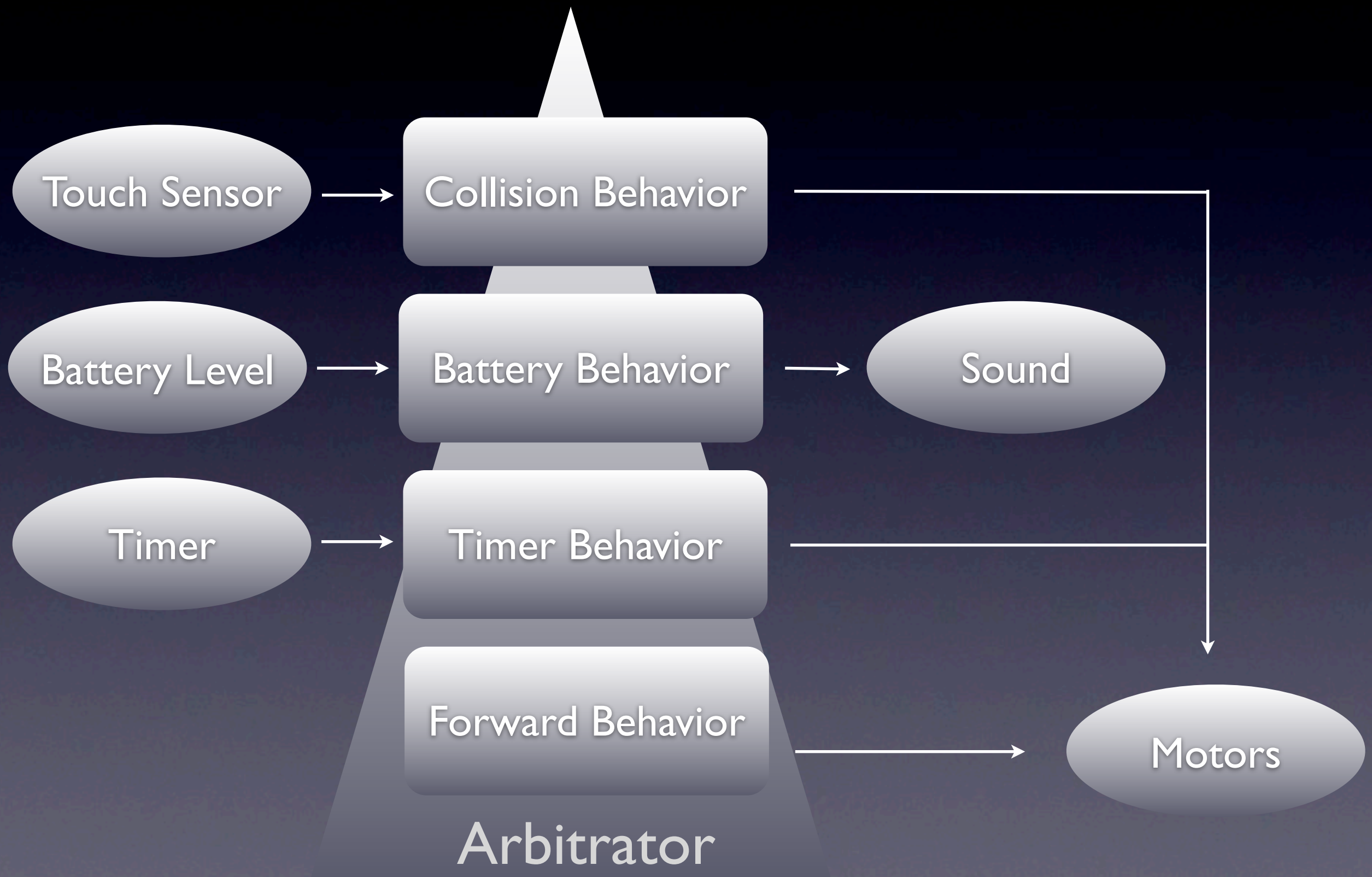
Advanced Behavior

Advanced Behavior

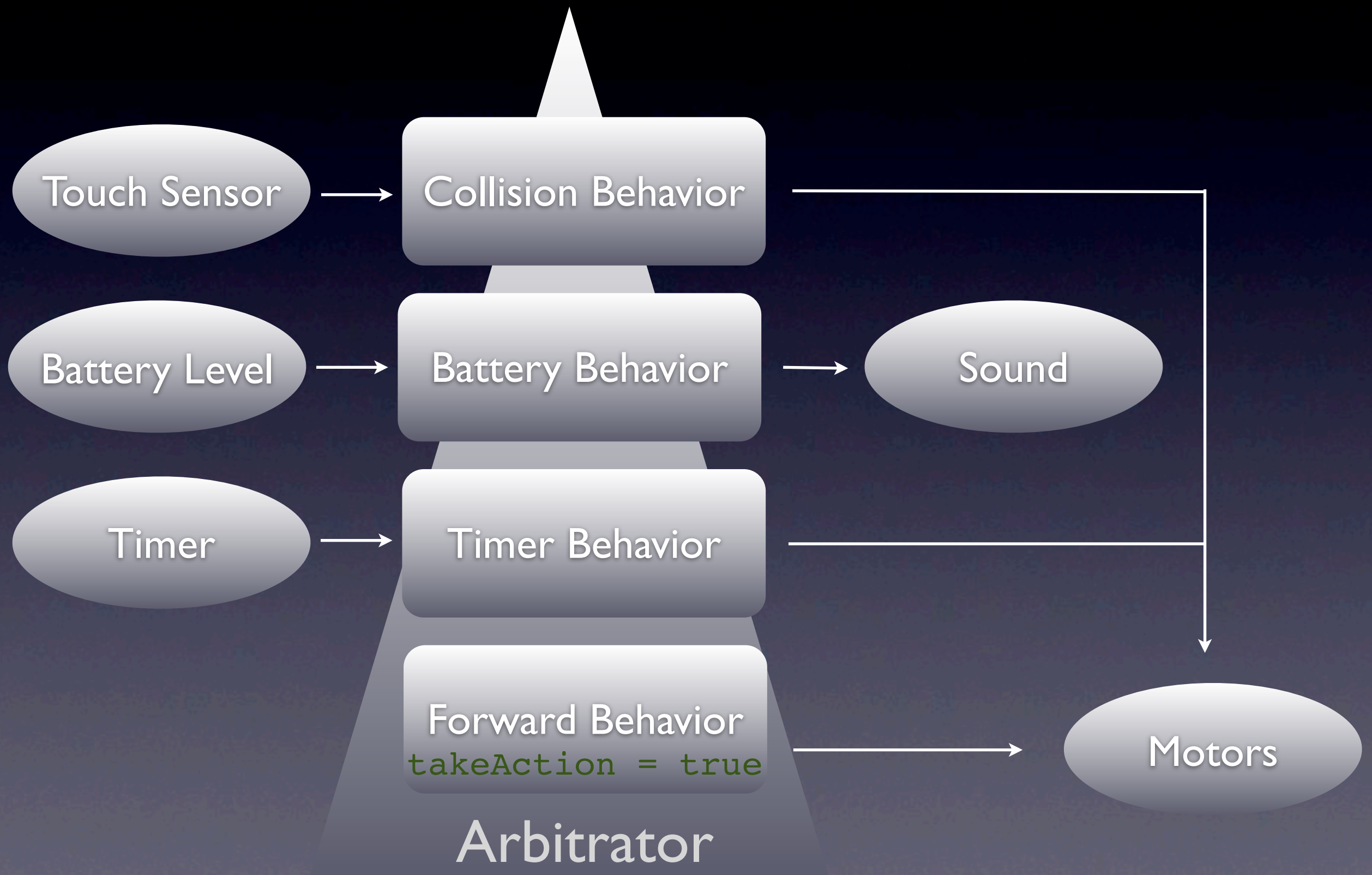


Advanced Behavior

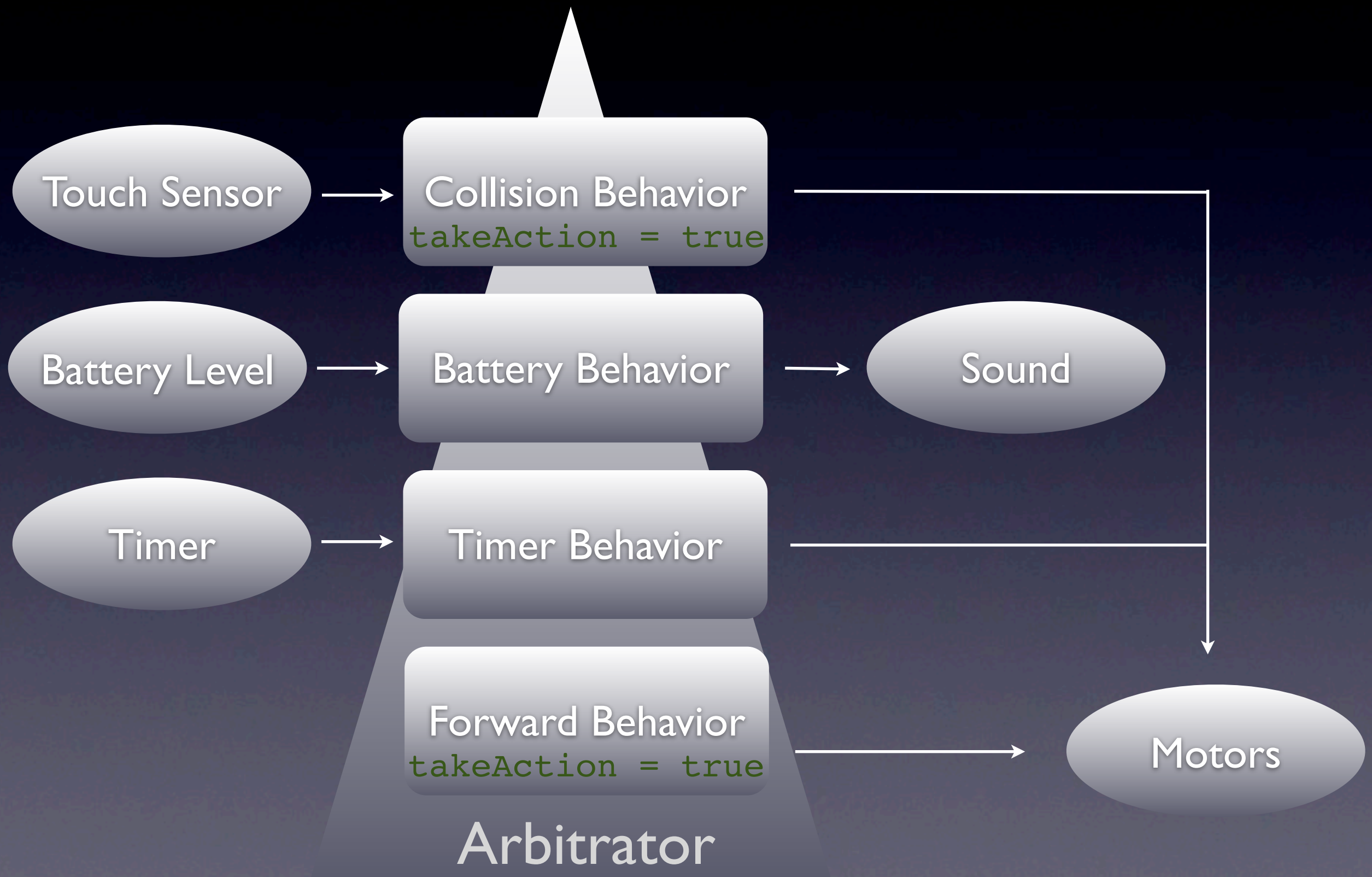
Advanced Behavior



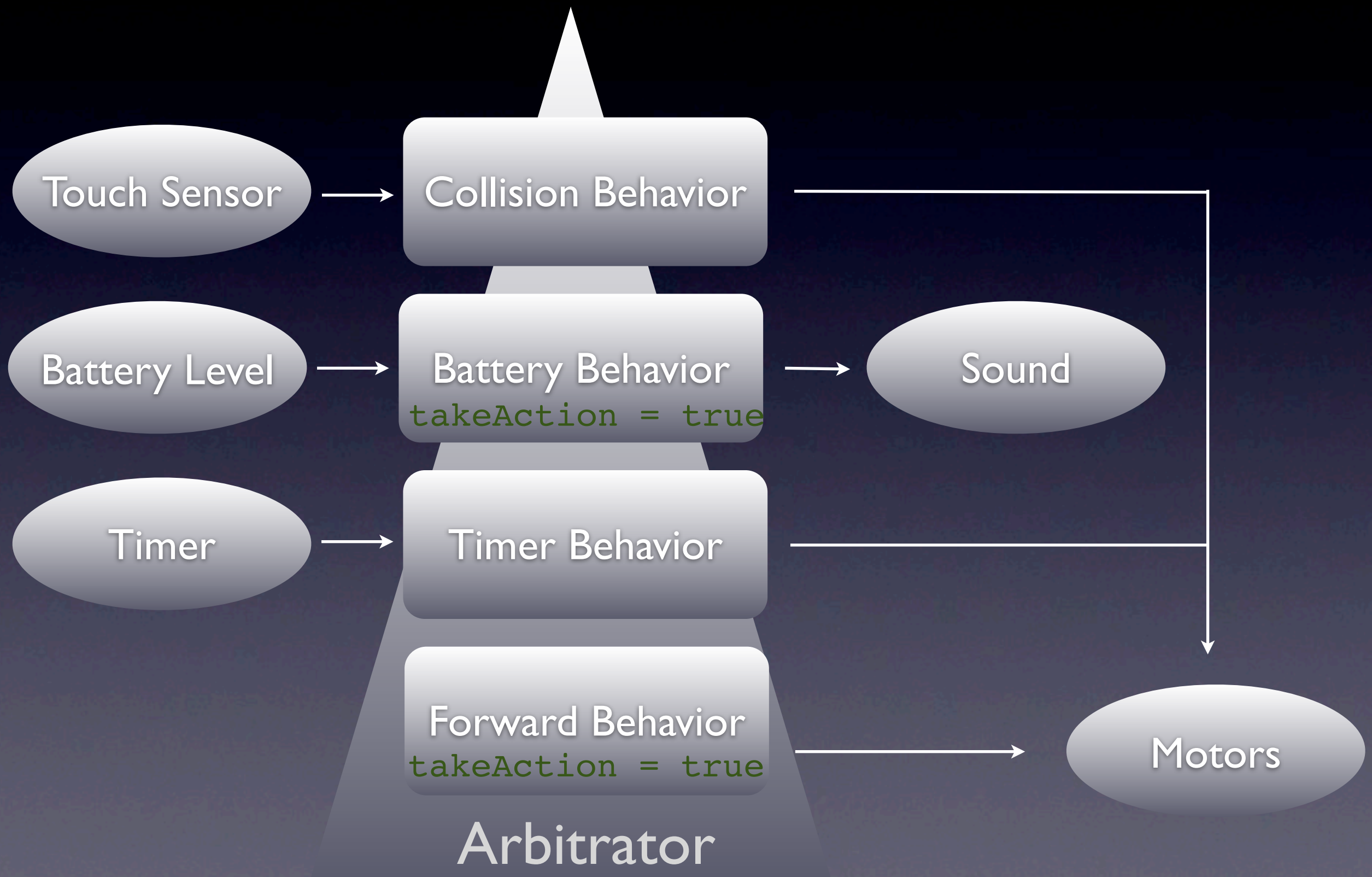
Advanced Behavior



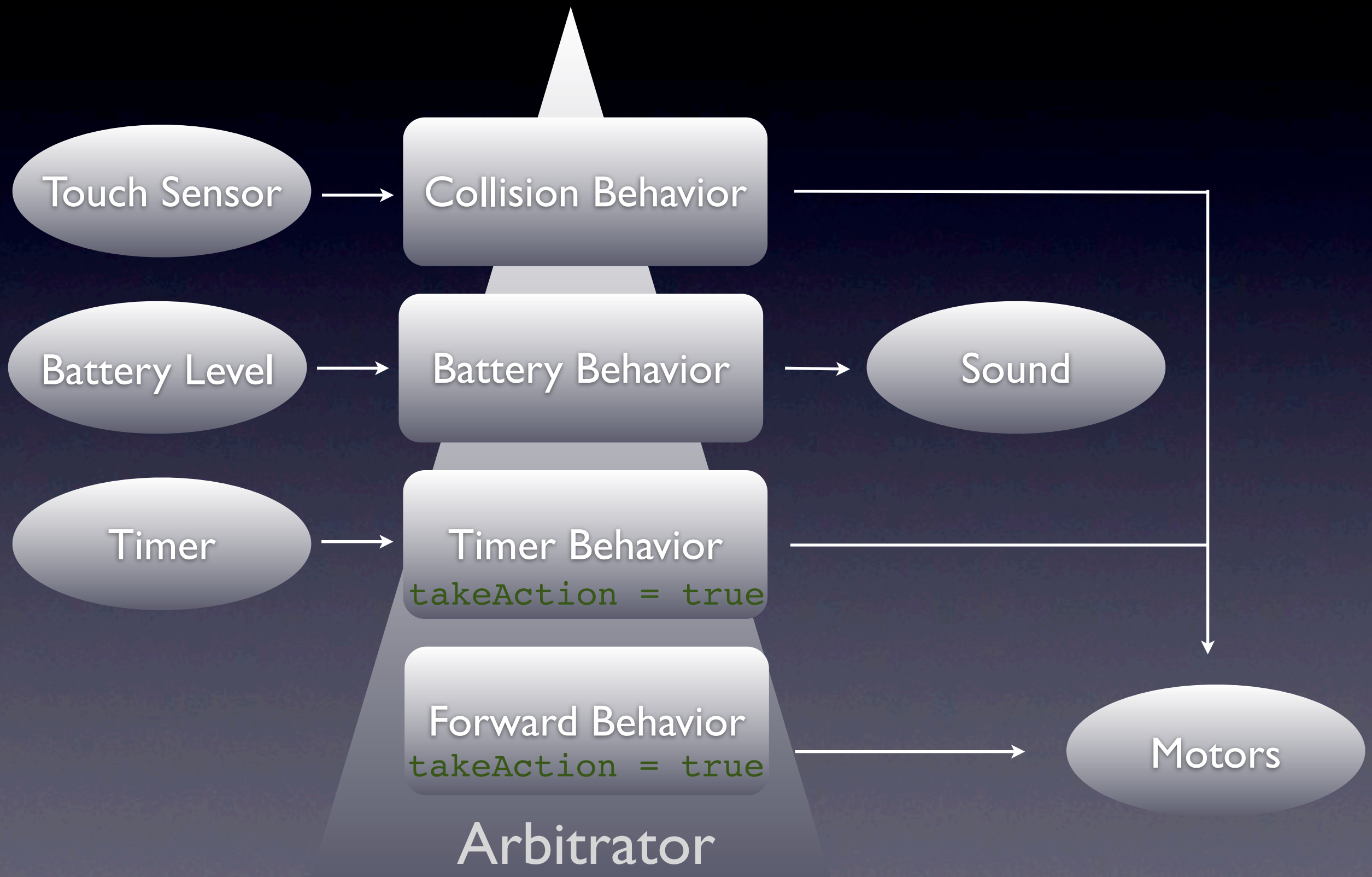
Advanced Behavior



Advanced Behavior



Advanced Behavior



Cool Demos

REST API in GlassFish

REST API in GlassFish



REST API in GlassFish



REST API in GlassFish



LCP - Lego Communication Protocol

REST API in GlassFish



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REST API in GlassFish



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REST API in GlassFish



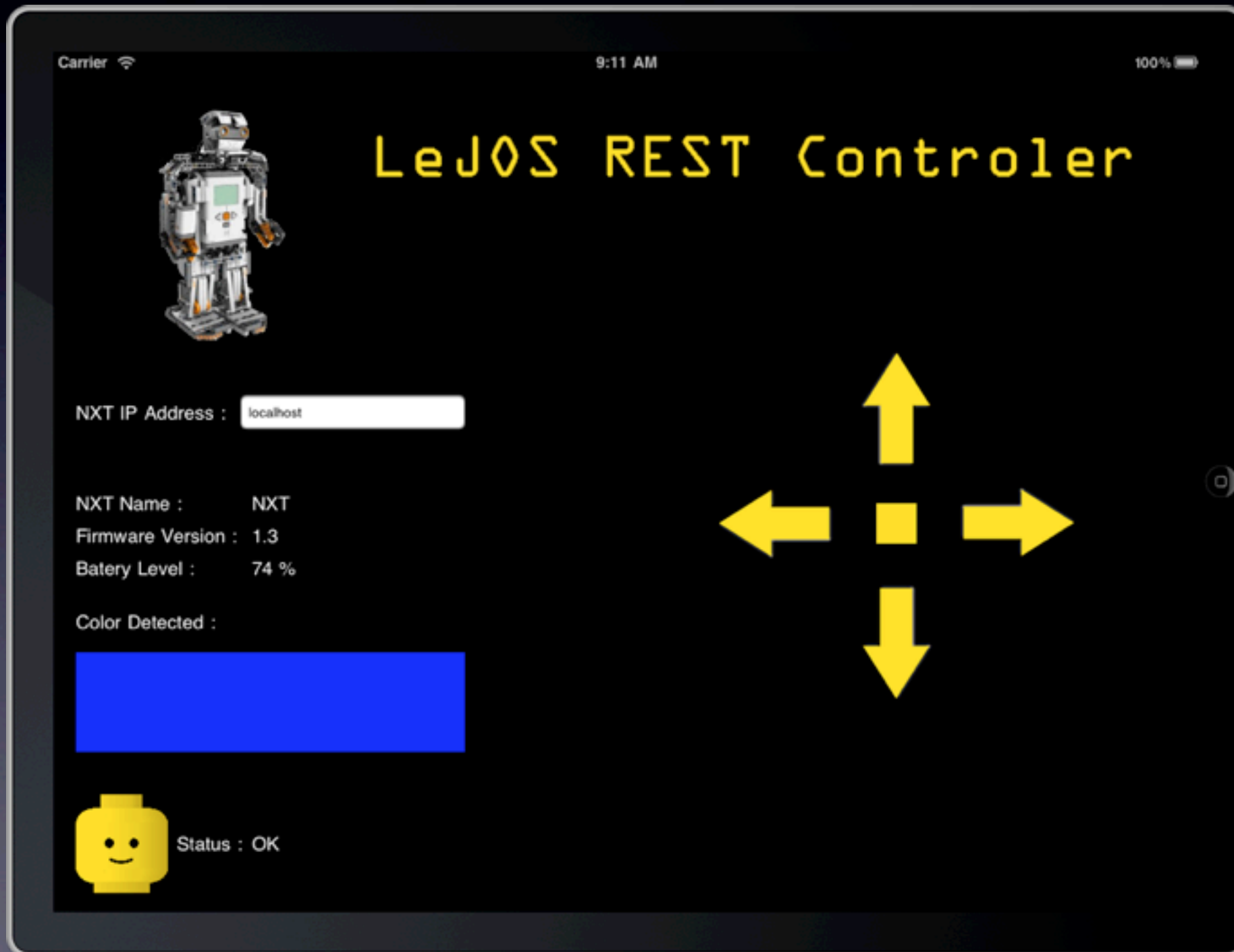
LCP - Lego Communication Protocol

REST API in GlassFish



LCP - Lego Communication Protocol

REST API in GlassFish



Extending Mindstorms

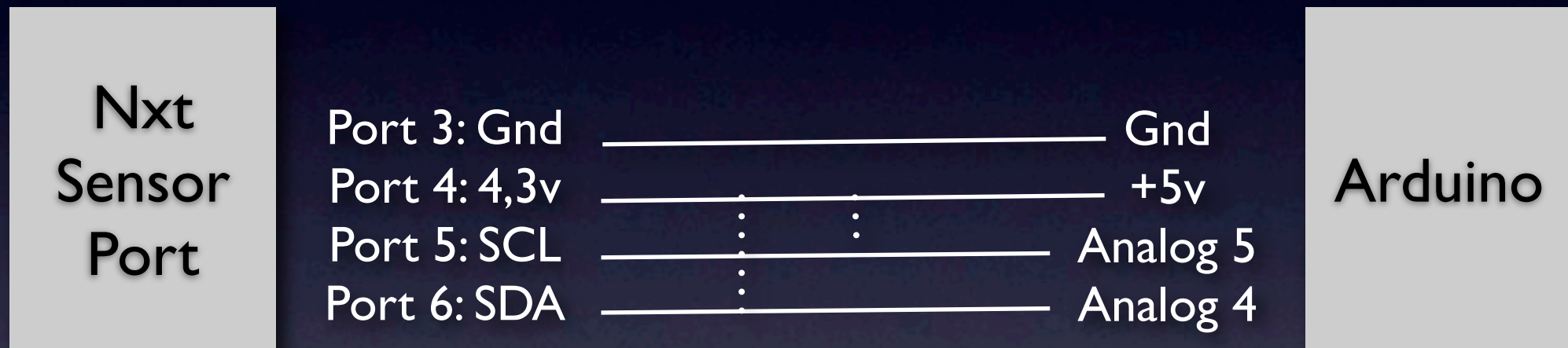
Lego Mindstorms



New sensors

- I²C
 - Inter-Integrated Circuit
 - Low speed master-slaves serial protocol
 - Lego Mindstorms Hardware Developer Guide
- Arduino
 - Hardware prototyping platform
 - Open source

“My sensor”



“My sensor”

```
import lejos.nxt.I2CPort;  
import lejos.nxt.I2CSensor;  
  
I2CSensor Arduino = new I2CSensor(SensorPort.S1);  
Arduino.setAddress(1); // set slave address  
  
...  
Arduino.sendData(0, bufOut, bufOut.length);  
  
...  
Arduino.getData(0, readData, readData.length);
```

“My sensor”

```
#include <Wire.h>

void setup() {
  Wire.begin(1); // Join I2C bus as slave 1
  Wire.onRequest(requestEvent); // define callbacks
  Wire.onReceive(receiveEvent);
}

void receiveEvent(int len) { // data in
  while( 0 < Wire.available() ) {
    char c = Wire.receive();
  }
}

void requestEvent() { // data out
  Wire.send("Arduino to Mindtsorms");
}
```


Demo

