TECHBASH 2016

ROBOT ROYAL RUMBLE

@joshgretz

github/jgretz

JOSH GRETZ

truefit

Husband

Father

Tinkerer

CTO

WHO IS THIS TALK FOR?

INTERESTED BEGINNER

Maybe you've seen some videos or other talks on robotics, but aren't quite sure how to get started

HOME HACKER

The number of "connected" devices today is astounding, with more coming every day. Maybe you are someone who wants to hook up their home to their phone.

EXPERIENCED CODER

Every day you spend crafting solutions for your company and you have mastered one or more languages along the way. What if you could use that knowledge to control robots?

WHAT ARE WE TALKING ABOUT?

HOW TO GET STARTED

You've decided to get started, now what do you do?

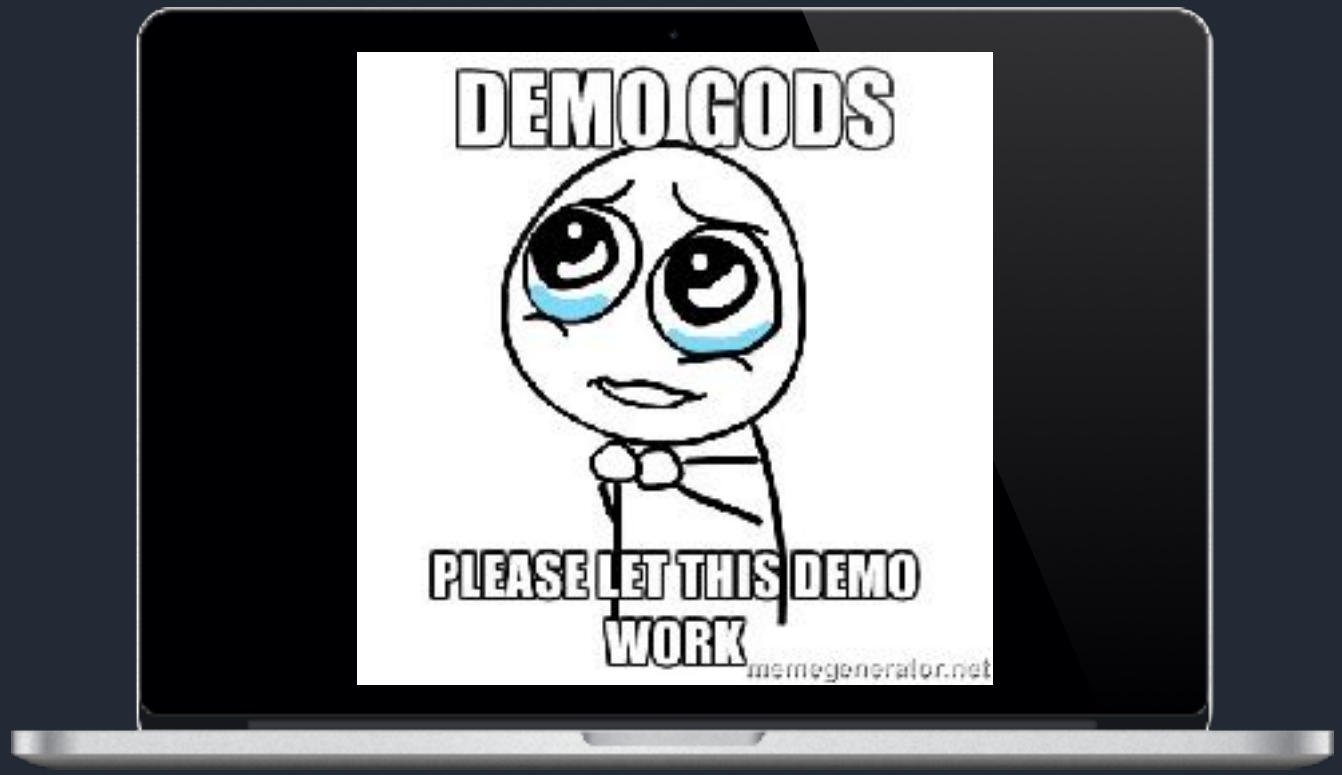
PROS / CONS

Each language naturally has it's own pros and cons. We will look at those with a lens filtered by their robotic ecosystem

WIDE, NOT DEEP

We have a lot of ground to cover today, as such we will just be skimming the surface with each of the languages, touching on the basics.

LOTS OF DEMOS



- WE WILL LOOK AT CODE FOR EACH LANGUAGE
- ALTHOUGH WE WONT LIVE CODE, WE WILL RUN IT AGAINST A LIVE ROBOT
- SO BE KIND

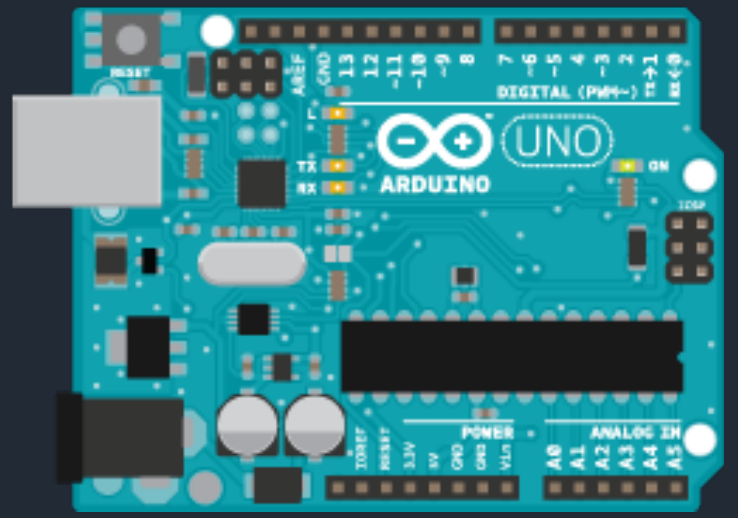
THE BODY

We will be using the

Zumo Robot for Arduino

THE BRAIN

We will be using the Arduino UNO as the basis for our discussion today. Its versatile, easy to work with, and affordable



GETTING STARTED

Buy a board

You can buy a board for around $25 and can find it almost any where Amazon, Newegg, or the Arduino site itself.

Decide on a project

I've always found it better to learn in the context of the a project, it gives you something to target.

Download the IDE

Download the IDE from the Arduino site. You will need it even if you are going to use another language and IDE.

Grab a longer cable

The Arduino boards typically comes with a 3" cable, I've always found that to be too short, so grab at least a 6" A-B USB cable while you are ordering.

NOW THAT WE HAVE THE HARDWARE LETS GET STARTED

WHO ARE THE CONTESTANTS

1. **C**
   Low-level, functional - the incumbent default

2. **C#**
   Microsoft's flagship language - well known, but an underdog in robotics

3. **Go**
   Google's newest entry into the fray, Simple, yet elegant.

4. **Ruby**
   Easy to learn, older than you might think, often forgotten outside Rails

5. **Javascript**
   Currently eating the world and robotics is no different

C

LET'S LOOK AT

VERSATILE
WELL KNOWN
& BUILT IN

Despite its low-level capabilities, the language was designed to encourage cross-platform programming.

The language has become available on a very wide range of platforms, from embedded microcontrollers to supercomputers.

PROS / CONS

PROS

Built In

Lots of Examples

Runs On Device

CONS

Low Level

Manual Memory

No Debugging

GETTING STARTED

- We've already covered it - install the Arduino SDK and that's it!

DEMO


QUICK SIDETRACK - FIRMATA

FIRMATA

Firmata is a protocol for communicating with microcontrollers from software on a host computer.

You load the firmata onto your arduino, then in the language of choice, you interact with an SDK that is implemented against the same protocol.

Arduino has had a list of firmatas developed for it from python to elixir. We will be using these firmatas for the remainder of the talk.

Github

DEMO

C#

LET'S LOOK AT

MODERN
MANAGED CODE
& POWERFUL

A general-purpose, object-oriented programming language.

It is intended to be a simple, modern, general-purpose, object-oriented programming language.

PROS / CONS

PROS

C#

Visual Studio

CONS

Fringe

Specialized Hardware

Manual Code

GETTING STARTED

- Windows
- .Net 3.5 - 4.5
    - Key is you need System.IO.SerialPort

- There are attempts at C# Firmata libraries, but they haven't kept up with the times
    - Firmata.NET
    - SolidSoils

WHAT ABOUT .NET CORE?

Unfortunately, they chose to not implement Serial.IO.Ports in .NET Core yet.

Depending on who you ask, it may or may not be on the roadmap, but they have at least acknowledged that it been requested

ASIDE - A DIFFERENT APPROACH

Microsoft has taken a mixed approach to IOT. Rather than integrating with arduino there are two alternative approaches:

- Windows 10 IOT
- Netduino

DEMO

GO

JOE

LET'S LOOK AT

CONCISE
SIMPLE
& SAFE

In the tradition of C, but built to answer many of it's shortcomings.

Built-in concurrency.

Intentionally kept small to fulfill the goal of having the entire language be simple enough to be held in a single programmers head

PROS / CONS

PROS

- Fast
- Simple Language
- Concurrent
- Lots OOB Support

CONS

- Smaller Community
- Simple Language
- Young Language

GETTING STARTED

- Install Go
- Install Gobot
- Flash Arduino with the Standard Firmata

- Install gort
- Copy the port your arduino is connected to

DRIVERS OUT OF THE BOX

- Ardrone
- Arduino
- BeagleBone
- Bebop
- C.H.I.P.
- Digispark
- Intel Edison
- Joystick
- Keyboard
- Leap Motion
- Mavlink
- MQTT
- Neurosky Mindwave
- OpenCV
- Pebble
- Raspberry Pi
- Spark
- Sphero
- Analog Sensor
- Button
- Direct Pin
- Grove Touch
- Grove Sound Sensor
- Grove Button
- Grove Buzzer
- Grove Rotary
- Grove Relay
- Grove Temperature Sensor
- LED
- Makes Button
- Moto
- Servo
- BlinkM
- Grove LCD
- Grove Accelerometer
- HMC6352 Compass
- LIDAR-Lite
- MPU6050
- MPL115A2
- Wiimote with Nunchuck

DEMO

RUBY

LET'S LOOK AT

DYNAMIC
REFLECTIVE
& FRIENDLY

Designed for programmer productivity and fun following the principles of good interface design

Object Oriented (by default), it's intent is behave in way that minimizes confusion for experienced programmers

PROS / CONS

PROS	CONS
Unicorns	Small Community
Stable	Rails
Gems	Speed

GETTING STARTED

- Install Ruby
- Install Artoo
- Flash Arduino with the Standard Firmata

- Install gort
- Copy the port your arduino is connected to

DRIVERS OUT OF THE BOX

- Ardrone
- Arduino
- BeagleBone
- Crazyflie
- Digispark
- Joystick
- Keyboard
- Leap Motion
- Neurosky Mindwave
- OpenCV
- Pebble
- Raspberry Pi
- Roomba
- Spark
- Sphero
- Analog Sensor
- Button
- Continuous Servo
- LED
- Makes Button
- Maxbotix
- Moto
- Servo
- BlinkM
- HMC6352 Compass
- Wii Classic Controller
- Wiimote with Nunchuck

DEMO

JAVASCRIPT

LET'S LOOK AT

DYNAMIC
FLEXIBLE
& FAMILIAR

A high level, untyped interpreted programming language.

Commonly used as on of the three core Web technologies alongside HTML and CSS.

PROS / CONS

PROS

Large Community

NPM

Common

CONS

JS Bad Parts

Speed

GETTING STARTED

- Install Node
- Install XCode
- Install node-gyp
- Install Johnny-Five
- Flash Arduino with the Standard Firmata Plus

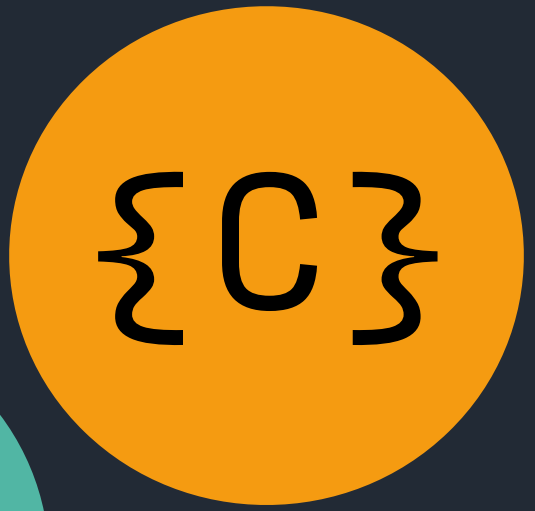
- Install gort
- Copy the port your arduino is connected to

DRIVERS OUT OF THE BOX

- Arduino
- SparkFun
- chipKit
- Spider Robot
- DFR Robot
- Teensy 3
- BeagleBone
- C.H.I.P
- Blend Micro
- Elector Imp
- Intel Galileo Gen 1 & 2
- Intel Edison
- LightBlue Bean
- Lining One
- pcDuino3 Dev Board
- Pinoccio Scout
- Raspberry Pi
- Particle Core
- Particle Photon
- Tessel 2
- LED
- Motor
- Stepper Mottor
- Servo Motor
- GRP
- Lego NXT
- Lego EV3
- Button / Switch
- Keyboard
- Keypad
- Relay
- Infrared
- Proximity
- Motion
- Joystick
- Magnetometer
- Sensors (Temp, Gyro, Noise, Accelerometer, etc ...)
- Grove
- **And More ....**

DEMO

WHO WINS?



WHERE DO I GO FROM HERE

- Grab an arduino
- Start a project!
    - Don’t be intimidated by hardware - there are plenty of kits out there that are pre-assembled
- Make Electronics
- Raspberry Pi

Thank You

Any Questions?

http://techbash.com/evals/sessions/robot-royal-rumble

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