ROBOTICS

Technology | Ethics | Community

Did you know?

- A robot in the form of a human being is called an "Android"
- Robots are used a lot to do heavy dangerous work, like building cars, and disarming bombs
- Robots are a big part of space travel and have driven around on Mars

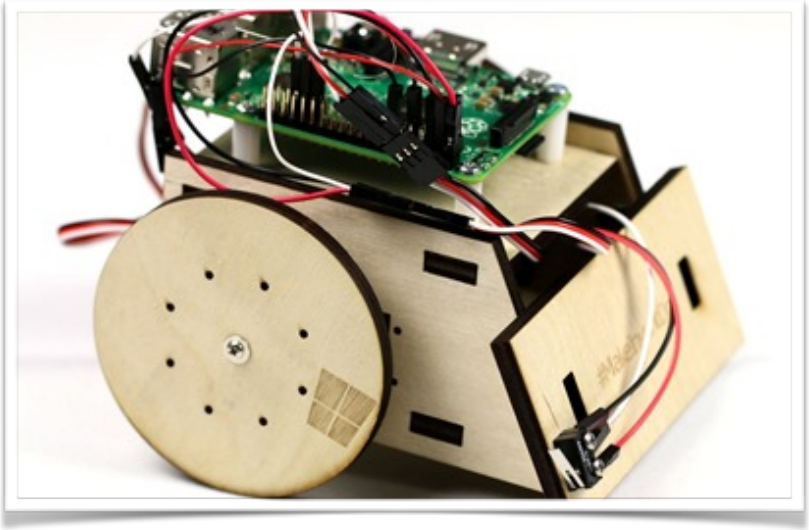
MicroControllers

Are tiny computers that control the electronic devices all around us

Coding

Software is used to control robot behavior

Simple code blocks used to control motors or detect light are combined to create advanced behaviors that seem almost alive



Welcome to the Amazing World of Tech!

Your world is full of exciting technologies which are powered by the magic of electronics and software... Things like computers and televisions, mobile phones and video games... These are things that have changed everything about the way we live.

The Starter Technology Lab Philosophy

You are the future generation of Technology leaders... Coders, engineers, entrepreneurs and enthusiasts. With the pace of change in technology and in our world, you will witness and shape

Safety First!

Robots and technology are a lot of fun, but like most fun things, there are some risks.

We have a number of important rules we follow to make sure nobody gets hurt.

- Electricity
- Batteries
- Always unplug power before touching wires
- No lead solder
- Eye protection
- Gloves
- Ventilation

Most electronics operate at low voltages of 3.3V or 5V volts so these are not dangerous amounts of power.

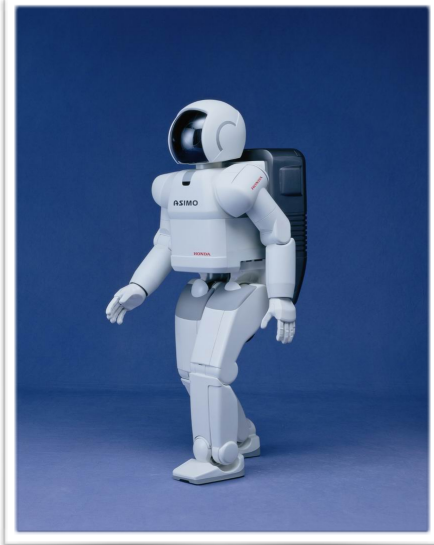
But sometimes power can be stored up and provide a nasty shock, so there are some things we never touch:

- ***AC (wall socket) power or wires***
- ***Capacitor leads***
- ***Hot or fast moving parts***

a future of incredible things, so get ready to open your minds to the exciting world of electronics, and the superpowers they represent.

"With great power comes great responsibility."

--Voltaire



It is especially critical as we transition to a future world where robots have intelligence and where choices that we make as builders about what we build, how we build it and how it will be used can impact the world in a major way.

So it is important before starting any project to consider the benefits, the risks, and the challenges we may create. For this reason we have developed a set of pledges that we take before we get to work.

Safety

Technology can improve and save lives, but it can also be dangerous.

I pledge to put safety first, to protect myself and others from harm, and to use proper precautions at all times.

Ethics

Technology can be used for good and it can be used to do harm. We pledge to do no harm. When in doubt, we discuss and come to consensus.

Cooperation

Everybody learns at their own pace, so be patient with each other. Try to explain things in new ways and teach each other. We all learn from each other and through cooperation we help the team and our community to succeed.

Always remember that the Workshop Leaders are in charge.

Connection

The internet has expanded humanity's personal and communal connectedness -- yet Technology can also disconnect us from Nature and from our selves. I pledge to seek out and understand the connections between systems and components, and to use this insight to drive innovation without creating adverse side effects.

Diversity

Science and technology thrive on ideas, the more the better! I pledge to be eager to learn from everyone, to appreciate all different types of projects and ideas, and to be open to other ways of doing things, as well as sharing my best practices with others.

Getting Started

- what is electricity
- what is a circuit
- what is positive vs negative (ground)
- what is a microcontroller / arduino
- wire color meanings
- motors
- batteries
- the parts of a bot
- breadboards and splicing/connecting wires
- what is programming?

Electricity and Electronics

A great way to understand electricity and electronic circuits is by comparing to water plumbing and pipes.

Electricity is composed of electrons (microscopic bits of atomic matter) that flow through wires and electronic components just like water flows through pipes, valves, and fittings.

The analogy for all electrical behavior, including volts (water pressure) and amps (volume)

volts * amps = watts

so a 110 watt lightbulb powered by 110 volt AC is running about 1 amps

switches then are exactly like a faucet valve on or off

a potentiometer or variable resistor is like a faucet valve turning more open and more close.

the “drag on the water” or “blocking” of the water by valves is measured as resistance or “ohms"

Introducing: the Arduino Microcontroller

Microcontrollers are tiny computers that allow us to control electronic devices in our every day lives.

Everyone has microcontrollers their homes and sometimes you don't even know they are there.

Televisions, thermostats microwaves and clock radios are good examples of modern conveniences powered by tiny room thermostats microwaves and clock radios are good examples of modern conveniences powered by tiny robot brains.

Microcontrollers are also commonly used in robots and many other electronic projects.

MicroControllers provide us with 2 useful things:

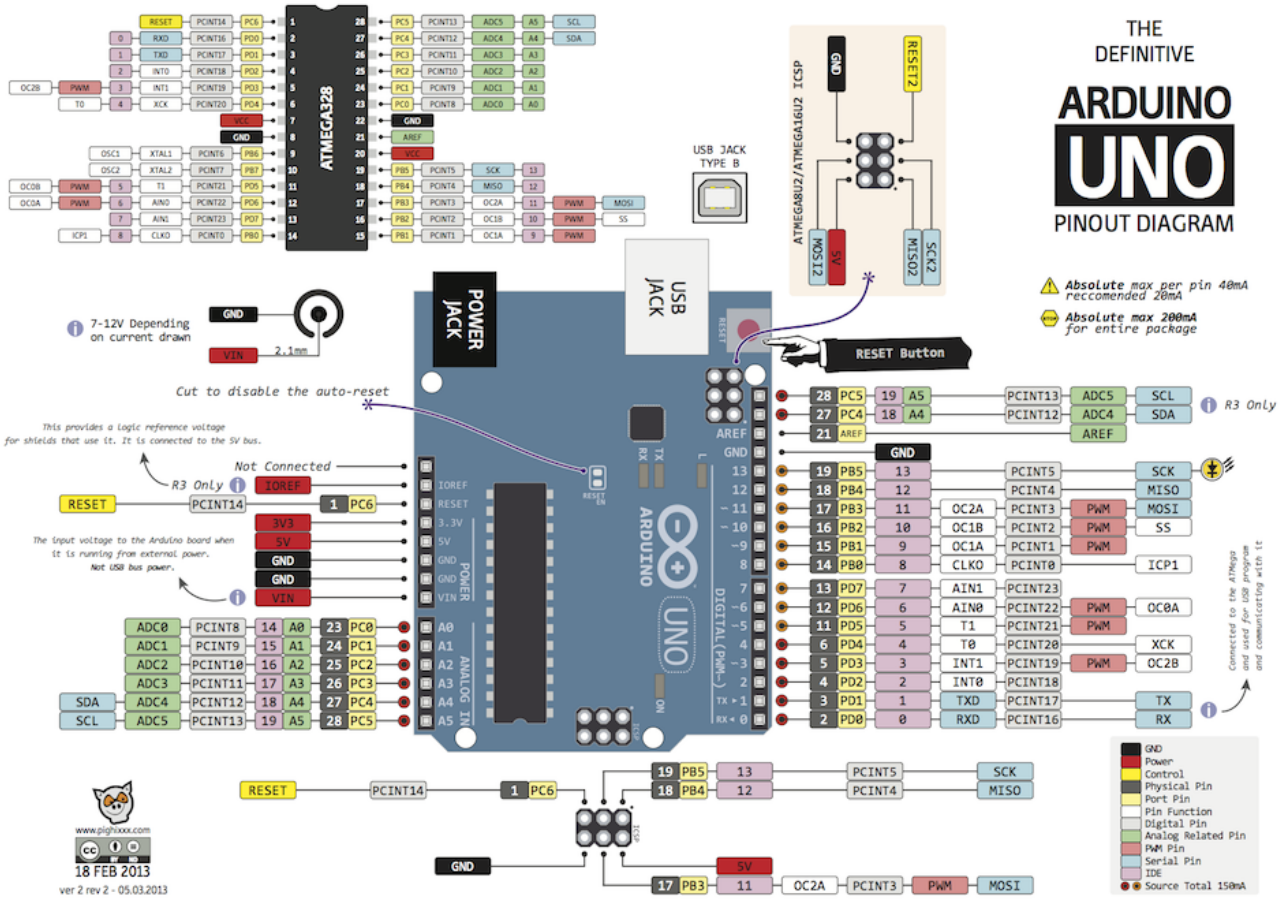
1. Electronic connectors or "pins" that we can wire to other components such as motors and sensors
2. A programmable processor that we can upload software code into that controls the pins

It is by programming the controller that we can do things like:

- turn a motor (servo) back and forth
- play a sound
- flash a light when something happens.

We are going to do all 3 of these things today, using a very popular Microcontroller (atmega328).

This chip (shown) is the brain of the robot, and controls the motor and reads and writes electricity through these pins (shown)


THE DEFINITIVE
ARDUINO
UNO
PINOUT DIAGRAM
ATMEGA328
ATMEGA8U2/ATMEGA16U2 ICSP
USB JACK TYPE B
POWER JACK
USB JACK
RESET Button
7-12V Depending on current drawn
Cut to disable the auto-reset
Absolute max per pin 40mA reccomended 20mA
Absolute max 200mA for entire package
R3 Only
Not Connected
This provides a logic reference voltage for shields that use it. It is connected to the 5V bus.
The input voltage to the Arduino board when it is running from external power. Not USB bus power.
Connected to the ATMega and used for USB program and communicating with it
GND
Power
Control
Physical Pin
Port Pin
Pin Function
Digital Pin
Analog Related Pin
PWM Pin
Serial Pin
IDE
Source Total 150mA
www.pighixxx.com
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