What the H$!! is an Arduino, and why should I care ?

Input / Process / Output Systems

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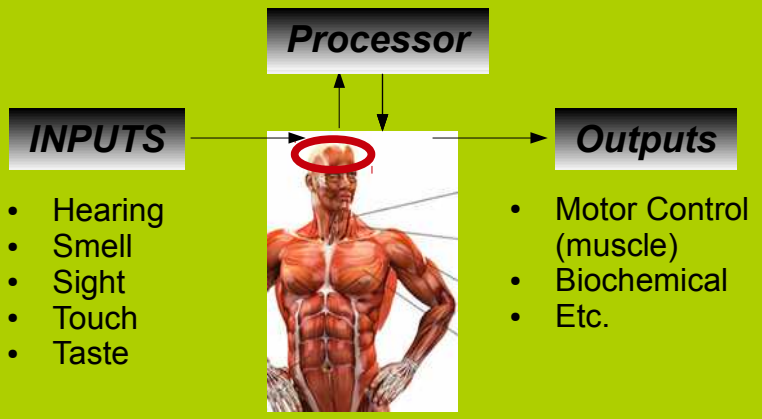


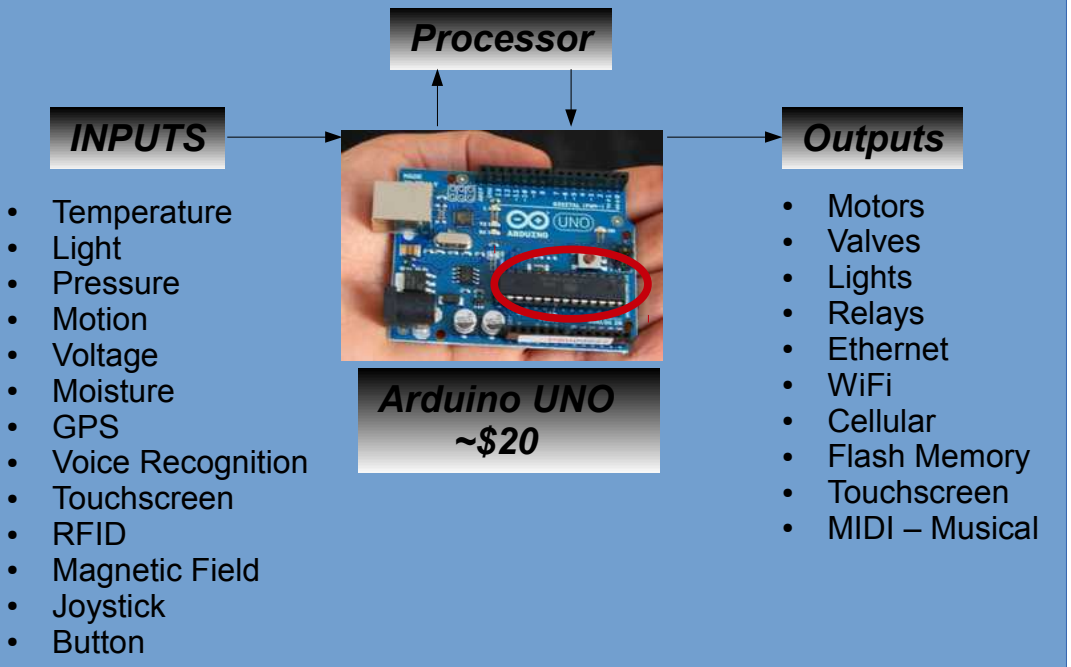
The human body is perhaps the most elegant, elaborate and certainly recognizable Input / Process / Output system. Our bodies are actually a collection of many such systems.

In our sensory system; hearing, vision, touch, taste and smell serve as inputs. Our brain is the processor of information flowing from these input sensors. When our brain receives sensory inputs, it processes this information, formulates responses, then initiate outputs.

For example, let's assume we want to pick up a pencil. Inputs from our eyes are processed by the brain to recognize a pencil on the desk in front of us. Our brain initiates outputs to begin muscular movements of our arm toward the pencil. As we approach the pencil, our eyes provide ongoing inputs which helps our brain in guiding our fingers to the pencil. As we reach and begin to grasp the pencil our visual and touch sensation inputs allows the brain to process and formulate outputs to exercise ever finer control of our fingers.

The Arduino is also an Input / Process / Output system. The Arduino uses multiple pins to connect to any of a vast range of input and output devices. The Arduino has a very simple yet robust microprocessor (brain) which is controlled by a simple coding language. Under instructions from the coding language, the Arduino brain can sense inputs from connected sensors, process that information, then formulate and send outputs to control connected devices.

For example, let's assume we want to make a door lock which can be unlocked by specific Radio Frequency ID (RFID) tags. We would attach an RFID reader as the input to the Arduino. We would write a simple code sketch which tells the Arduino to watch for the presence of an RFID tag near the reader. When an RFID tag is sensed, the code tells the Arduino to check against a roster of known tags. If the tag is recognized, the code tells the Arduino to unlock the door lock. Finally the code tells the Arduino to write a log entry to an attached memory card logging the identity of the RFID tag and time of day the door was unlocked.



Why is the Arduino a big deal?

Embedded electronics will be integral to many emerging disruptive technologies. McKinsey Global Institute projects by 2025 there will be

1 Trillion Objects

with embedded electronics and capable of being connected to the internet.

	Illustrative rates of technology improvement and diffusion	Illustrative pools of economic value that could be impacted[1]
 **3D printing**	**90%** Lower price for a home 3D printer vs. 4 years ago **4x** Increase in additive manufacturing revenue in past 10 years	**$11 trillion** Global manufacturing GDP **$85 billion** Revenue from global toy sales
 **Automation of knowledge work**	**100x** Increase in computing power from IBM's Deep Blue (chess champion in 1997) to Watson (Jeopardy winner in 2011) **400+ million** Increase in number of users of intelligent digital assistants like Siri and Google Now in past 5 years	**$9+ trillion** Knowledge worker employment costs, 27% of global employment costs
 **The Internet of Things**	**300%** Increase in connected machine-to-machine devices over past 5 years **80–90%** Price decline in MEMS (microelectromechanical systems) sensors in past 5 years	**$36 trillion** Operating costs of key affected industries (manufacturing, health care, and mining)
 **Advanced robotics**	**75–85%** Lower price for Baxter[3] than a typical industrial robot **170%** Growth in sales of industrial robots, 2009–11	**$6 trillion** Manufacturing worker employment costs, 19% of global employment costs **$2–3 trillion** Cost of major surgeries
 **Autonomous and near-autonomous vehicles**	**7** Miles driven by top-performing driverless car in 2004 DARPA Grand Challenge along a 150-mile route **1,540** Miles cumulatively driven by cars competing in 2005 Grand Challenge **300,000+** Miles driven by Google's autonomous cars with only 1 accident (which was human-caused)	**$4 trillion** Automobile industry revenue **$155 billion** Revenue from sales of civilian, military, and general aviation aircraft

- Arduinos allow users to prototype physical devices, sometimes as whimsical hobby projects, sometimes as projects with huge commercial potential, often for way less than $50.
- Arduinos are controlled by a free, open source coding language with millions of free, open source pre-written functions which speed development.
- Arduinos have a massive worldwide community of developers who share knowledge and expertise.
- Arduinos connect to an incredibly diverse range of low cost input and output devices.
- Arduino developers have a clear, low cost, path to participate in a broad swath of opportunities in the coming decade.

What can I do with an Arduino?

Some examples...but don't stop here!

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Biped Robot

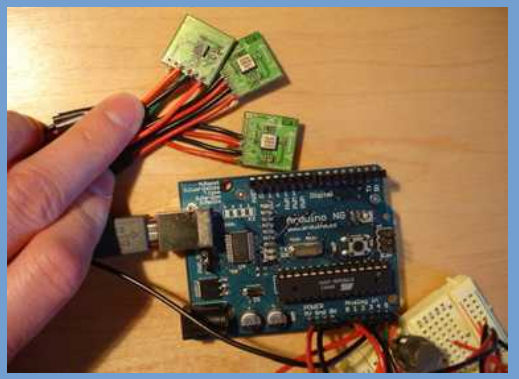
Quad-copter Drone

Flame throwing Jack-o-lantern

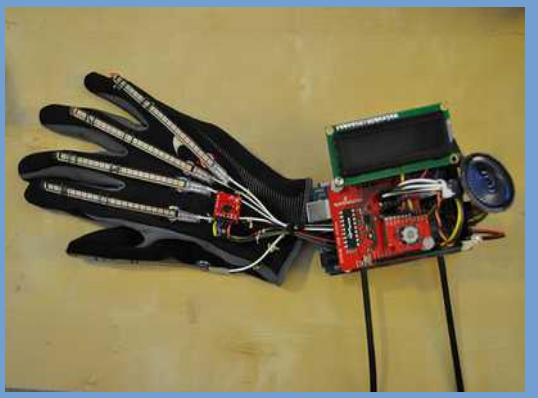
Romance Pants, as the zipper goes down the lights dim and and stereo comes on.

Audiovisual feedback for CPR on newborn infants

Arduino controlled Desktop CNC Mill



Sleep Tracker



Glove which translates sign language into English

Arduino controlled Handwriting Machine

Tweeting plant moisture meter

Sonar feedback device for the blind

Arduino based E.E.G.

Original MakerBot Replicator 3D Printers