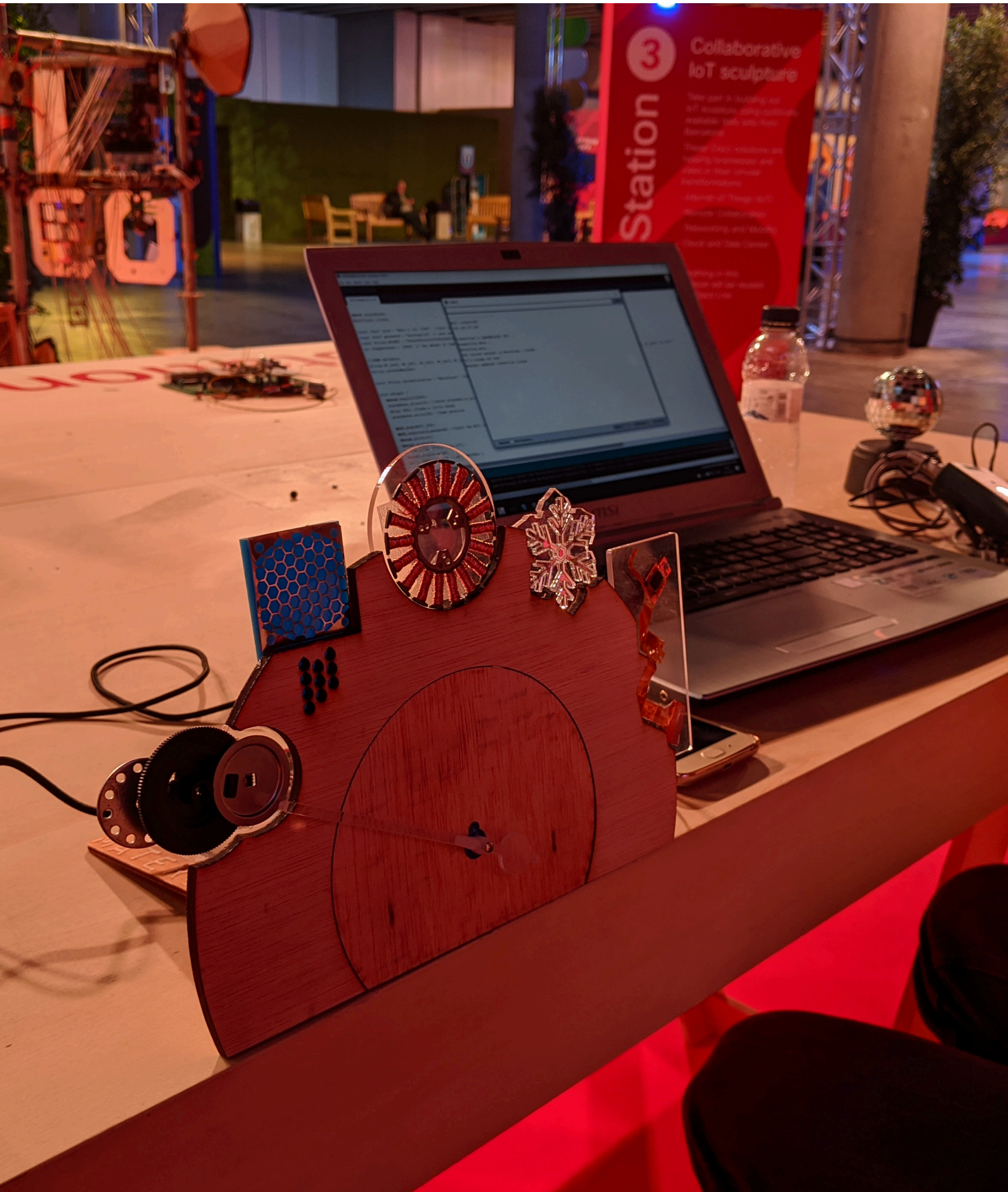

Tools: Software, Hardware and Tutorials

Resources for Educational Making



Makerspaces4Inclusion project over a period of two years we will produce one set of open educational resources which are based around the maker field and digital fabrication.

Who made this compilation of resources?

This compilation of resources has been made by the consortium of the European Project, Makerspace for Inclusion N° 2018-I-BE0S-KA205-002425, with the participation of the following associations: Digijeunes (France), Timelab (Belgium), Horizonlab (Italy), Nod Makerspace (Romania), MakerConvent-Trànsit Projectes (Spain).

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European Project N° 2018-I-BE0S-KA205-002425

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Digital Edition

Disclaimer

Most of the short introductory texts for each of the machines and software have been collected from wikipedia. Those not taken from wikipedia have been created by the consortium. The icons are from TheNounProject and belong to their designers.

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- Kiln
- Pottery wheel
- Infrared Oven
- Welding Machine
- Soldering Station
- Vacuum Forming
- Foam cutter
- Acrylic bending Machine
- Woodworking bench

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Equipment and Tools : Techniques

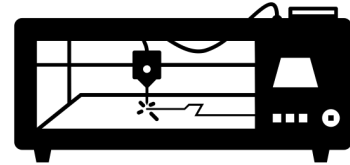
- Drone building
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- Squishy circuits
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- Smartphone Apps creation
- Programming for visual arts
- Making electronic devices
- Bare conductive
- AR app's

Equipment and Tools

Educational making activities

Laser Cutter

Tools: Software, Hardware and Tutorials



Laser cutting is a technology that uses a laser to slice materials. While typically used for industrial manufacturing applications, it is also starting to be used by schools, small businesses, and hobbyists. Laser cutting works by directing the output of a high-power laser most commonly through optics. The laser optics and CNC (computer numerical control) are used to direct the material or the laser beam generated. A commercial laser for cutting materials uses a motion control system to follow a CNC or G-code of the pattern to be cut onto the material. The focused laser beam is directed at the material, which then either melts, burns, vaporizes away, or is blown away by a jet of gas, leaving an edge with a high-quality surface finish.

Software

Adobe Illustrator
Inkscape
Software from the brand of the machine

Tutorials

<https://www.youtube.com/watch?v=sdACSB8GH3Y>

<https://www.youtube.com/watch?v=FFK3VI7i6Eg>

<https://www.youtube.com/watch?v=mVPKIOCCMQc>

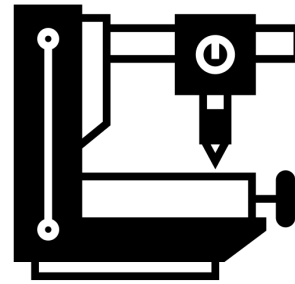
<https://www.youtube.com/watch?v=A1FII5Eq4PQ>

Observations

- Requires a filter and well ventilated space
- Recommended for spaces larger than 40square metters
- Can be used in classrooms if they have a filter included and are not used for long periods of time
- Requires protective eyewear

CNC Milling Machine

Tools: Software, Hardware and Tutorials



Translates programs consisting of specific numbers and letters to move the spindle (or workpiece) to various locations and depths. Many use G-code. Functions include: face milling, shoulder milling, tapping, drilling and some even offer turning. Today, CNC mills can have 3 to 6 axes. Most CNC mills require placing the workpiece on or in them and must be at least as big as the workpiece, but new 3-axis machines are being produced that are much smaller.

Software

Adobe Illustrator
Inkscape
Carbide Motion
Carbide Create
easily (online via [web inventables.com](http://webinventables.com))
MakerCam (online via makercam.com)
Software from the brand of the machine

Tutorials

https://www.youtube.com/watch?v=mnCrIM_jDX8

<https://www.youtube.com/watch?v=ibZcQLlbets>

<https://www.youtube.com/watch?v=qPVDsh93Zi8>

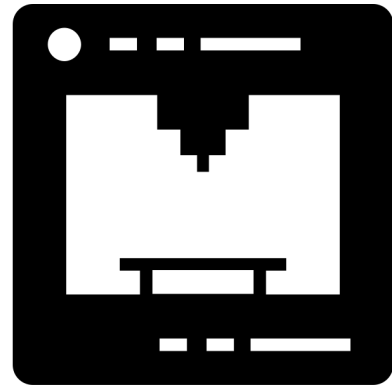
<https://www.youtube.com/watch?v=ibZcQLlbets>

Observations

- Creates debris
- Can be loud
- Might require a vacuum or some kind of suction
- CNC (table use) - can be protected with a enclosure
- CNC (big) - have their protection system.

3D Printing

Tools: Software, Hardware and Tutorials



3D printing, or additive manufacturing, is the construction of a three-dimensional object from a CAD model or a digital 3D model. The term “3D printing” can refer to a variety of processes in which material is deposited, joined or solidified under computer control to create a three-dimensional object, with material being added together (such as liquid molecules or powder grains being fused together), typically layer by layer.

Software

Cura
Slicer
Simplify3D
Software from the brand of the machine

Tutorials

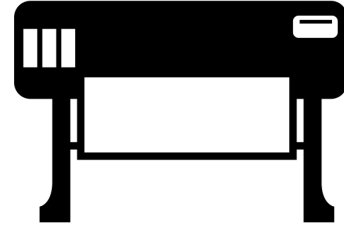
<https://www.youtube.com/watch?v=eUNT1b5pEWA>

Observations

- Some material may be toxic if used in nonventilated spaces (check technical specs before use).

Vinyl Cutter

Tools: Software, Hardware and Tutorials



A vinyl cutter is a type of computer-controlled machine. Small vinyl cutters look like a desktop printer. Like a printer controls a nozzle, the computer controls the movement of a sharp blade over the surface of the material. This blade is used to cut out shapes and letters from sheets of thin self-adhesive plastic (vinyl). The vinyl can then be stuck to a variety of surfaces depending on the adhesive and type of material.

To cut out a design, a vector-based image must be created using vector drawing software. Some vinyl cutters are marketed to small in-home businesses and require download and use of a proprietary editing software. The design is then sent to the cutter where it cuts along the vector paths laid out in the design. The cutter is capable of moving the blade on an X and Y axis over the material, cutting it into any shape imaginable. Since the vinyl material comes in long rolls, projects with significant length like banners or billboards can be easily cut as well.

The one major limitation with vinyl cutters is that they can only cut shapes from solid colours of vinyl. A design with multiple colours must have each colour cut separately and then layered on top of each other as it is applied to the substrate. Also, since the shapes are cut out of solid colours, photographs and gradients cannot be reproduced with a stand alone cutter.

Software

Software of the cutter (roland, Silhouette...)

Tutorials

<https://www.youtube.com/watch?v=FDPibyX6dZc>

<https://www.youtube.com/watch?v=e-yoX9UIGD8>

<https://www.youtube.com/watch?v=10-DYGvMFPC>

Precision Milling

Tools: Software, Hardware and Tutorials



Rotary tools are handheld power tools used for grinding, sanding, honing, polishing, or machining material (typically metal, but also plastic or wood). All such tools are conceptually similar, with no bright dividing line between die grinders and rotary tools, although the die grinder name tends to be used for pneumatically driven heavy-duty versions whereas the rotary tool name tends to be used for electric lighter-duty versions. Flexible shaft drive versions also exist.

Tutorials

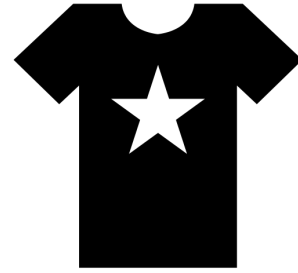
<https://www.youtube.com/watch?v=zenwKTMC1R0>

Observations

- Creates debris
- Can be loud
- Might require a vacuum or some kind of suction
- Can be used in classrooms
- Requires protective eyewear and hand gloves

Transfer Press

Tools: Software, Hardware and Tutorials



Transfer is used in textiles and arts and crafts projects. Transfer is a thin piece of paper coated with wax and pigment. Often, an ink-jet or other printer is used to print the image on the transfer paper. A heat press can transfer the image onto clothing, canvas, or other surface. Transfer is used in creating iron-ons (Iron-on transfers are images that can be imprinted on fabric. They are frequently used to print onto T-shirts.).

Software

Any design software.

Tutorials

<https://www.youtube.com/watch?v=clgQpkEkhXA>

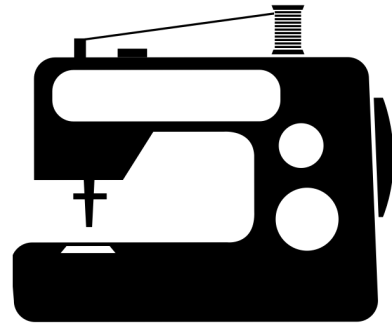
<https://www.youtube.com/watch?v=aHnWkyiwL84>

<https://www.youtube.com/watch?v=e-xaKTliTUg>

<https://www.youtube.com/watch?v=y8D9HWzg1II>

Sewing Machine

Tools: Software, Hardware and Tutorials



A sewing machine is a machine used to sew fabric and materials together with thread. Sewing machines were invented during the first Industrial Revolution to decrease the amount of manual sewing work performed in clothing companies.

Now we can find sewing digital machines for embroidery.

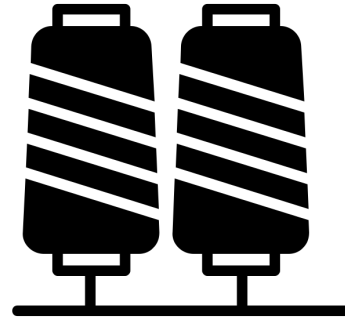
Tutorials

<https://www.youtube.com/watch?v=xdHnrlrQ6RE>

<https://www.youtube.com/watch?v=rXmnb4AALXg>

Knitting Machine

Tools: Software, Hardware and Tutorials



A knitting machine is a device used to create knitted fabrics in a semi or fully automated fashion.

There are numerous types of knitting machines, ranging from simple spool or board templates with no moving parts to highly complex mechanisms controlled by electronics. All, however, produce various types of knitted fabrics, usually either flat or tubular, and of varying degrees of complexity. Pattern stitches can be selected by hand manipulation of the needles, or with push-buttons and dials, mechanical punch cards, or electronic pattern reading devices and computers.

Software

Software of the machine.

Tutorials

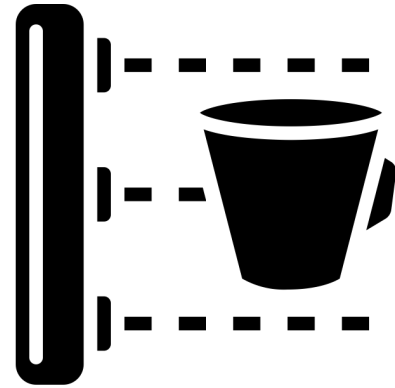
<https://www.youtube.com/watch?v=5EqQOgebCqw>

<https://www.youtube.com/watch?v=wjwDAP35bQo>

<https://www.youtube.com/watch?v=J6QUqWHw7o0>

3D Scanning

Tools: Software, Hardware and Tutorials



3D scanning is the process of analyzing a real-world object or environment to collect data on its shape and possibly its appearance (e.g. colour). The collected data can then be used to construct digital 3D models.

A 3D scanner can be based on many different technologies, each with its own limitations, advantages and costs. Many limitations in the kind of objects that can be digitised are still present. For example, optical technology may encounter many difficulties with shiny, reflective or transparent objects. For example, industrial computed tomography scanning and structured-light 3D scanners can be used to construct digital 3D models, without destructive testing.

Software

Top 3D Scan software

<https://www.sculpteo.com/blog/2019/10/01/top-20-3d-scanning-software-photogrammetry-laser-and-light-scanning-and-scanning-apps-for-your-phone/>

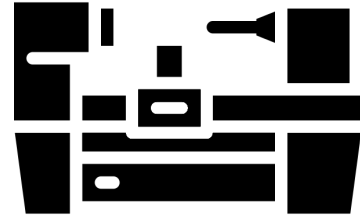
Qlone

Tutorials

https://www.youtube.com/watch?v=XkTaCOQ_OjI

Lathe

Tools: Software, Hardware and Tutorials



A lathe is a machine tool that rotates a workpiece about an axis of rotation to perform various operations such as cutting, sanding, knurling, drilling, deformation, facing, and turning, with tools that are applied to the workpiece to create an object with symmetry about that axis.

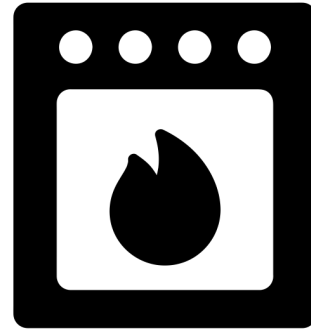
Tutorials

<https://www.youtube.com/watch?v=XXpOwsD0fWM>

<https://www.youtube.com/watch?v=h3FmORZVfm4>

Kiln

Tools: Software, Hardware and Tutorials



A kiln is a thermally insulated chamber, a type of oven, that produces temperatures sufficient to complete some process, such as hardening, drying, or chemical changes. Kilns have been used for millennia to turn objects made from clay into pottery, tiles and bricks. Various industries use rotary kilns for pyroprocessing—to calcinate ores, to calcinate limestone to lime for cement, and to transform many other materials.

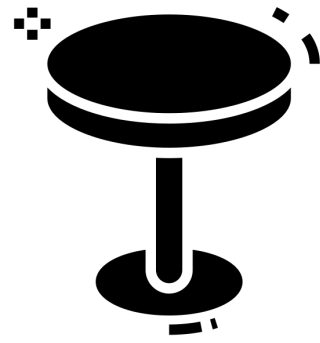
Tutorials

<https://www.youtube.com/watch?v=Aba62VOIOXc>

<https://www.youtube.com/watch?v=SgmDfvIHB6U>

Pottery Wheel

Tools: Software, Hardware and Tutorials



A potter's wheel is a machine used in the shaping (known as throwing) of round ceramic ware. The wheel may also be used during the process of trimming the excess body from dried ware, and for applying incised decoration or rings of colour. Use of the potter's wheel became widespread throughout the Old World but was unknown in the Pre-Columbian New World, where pottery was handmade by methods that included coiling and beating.

A potter's wheel may occasionally be referred to as a "potter's lathe". However, that term is better used for another kind of machine that is used for a different shaping process, turning, similar to that used for shaping of metal and wooden articles.

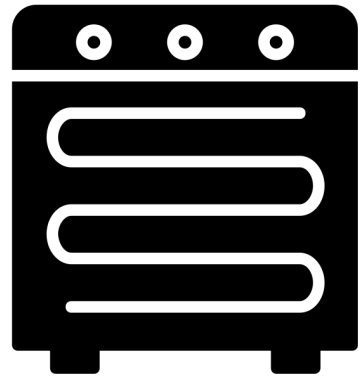
Tutorials

<https://www.youtube.com/watch?v=mqCJsYnl6Fc>

<https://www.youtube.com/watch?v=NpimQeM4zYY>

Infrared Oven

Tools: Software, Hardware and Tutorials



An infrared heater or heat lamp is a body with a higher temperature which transfers energy to a body with a lower temperature through electromagnetic radiation. Depending on the temperature of the emitting body, the wavelength of the peak of the infrared radiation ranges from 780 nm to 1 mm. No contact or medium between the two bodies is needed for the energy transfer. Infrared heaters can be operated in vacuum or atmosphere.

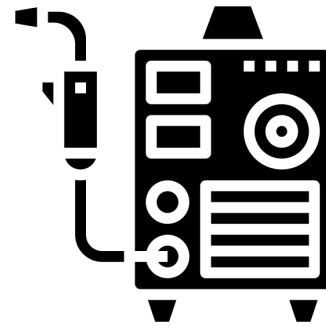
Tutorials

<https://www.youtube.com/watch?v=4qJawkyzrmA>

<https://www.youtube.com/watch?v=etLOLUowvPI>

Welding Machine

Tools: Software, Hardware and Tutorials



A welding power supply is a device that provides or modulates an electric current to perform arc welding.[1] There are multiple arc welding processes in common use ranging from relatively simple Shielded Metal Arc Welding (SMAW) to more complicated welding processes using inert shielding gas like Gas metal arc welding (GMAW) or Gas tungsten arc welding (GTAW). Welding power supplies primarily serve as devices that allow a welder to exercise control over whether current is alternating current (AC) or direct current (DC), as well as the amperage and voltage. Power supplies for welding processes that use shielding gas also offer connections for gas and methods to control gas flow. The operator can set these factors to within the parameters as needed by the metal type, thickness, and technique to be used. The majority of welding power supplies do not generate power, instead functioning as controllable transformers that allow the operator to adjust electrical properties as needed.

Tutorials

<https://www.youtube.com/watch?v=1hoW5g4LPHk>

<https://www.youtube.com/watch?v=CJLcBejSVro>

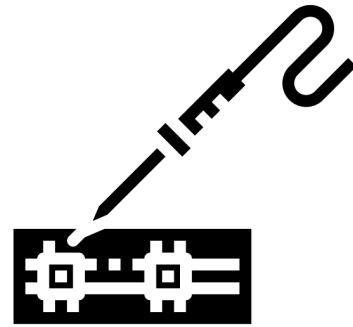
<https://www.youtube.com/watch?v=twUAa5LWUvk>

Observations

- Requires protective eyewear and hand gloves

Soldering Station

Tools: Software, Hardware and Tutorials



A soldering station is a multipurpose power soldering device designed for electronic components soldering. This type of equipment is mostly used in electronics and electrical engineering. Soldering station consists of one or more soldering tools connected to the main unit, which includes the controls (temperature adjustment), means of indication, and may be equipped with an electric transformer. Soldering stations may include some accessories – holders and stands, soldering tip cleaners, etc.

Soldering stations are widely used in electronics repair workshops, electronic laboratories, in industry. Sometimes simple soldering stations are used for household applications and for makers and hobbies.

Tutorials

<https://www.youtube.com/watch?v=1hoW5g4LPHk>

<https://www.youtube.com/watch?v=CJLcBejSVro>

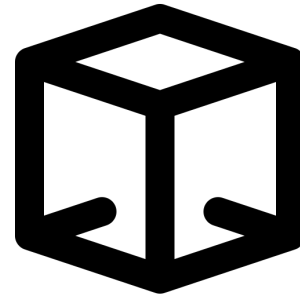
<https://www.youtube.com/watch?v=twUAa5LWUvk>

Observations

- Requires protective eyewear and hand gloves

Vacuum Forming

Tools: Software, Hardware and Tutorials



Vacuum forming is a simplified version of thermoforming, where a sheet of plastic is heated to a forming temperature, stretched onto a single-surface mold, and forced against the mold by a vacuum. This process can be used to form plastic into permanent objects such as turnpike signs and protective covers. Normally draft angles are present in the design of the mold (a recommended minimum of 3°) to ease removal of the formed plastic part from the mold.

Relatively deep parts can be formed if the formable sheet is mechanically or pneumatically stretched prior to bringing it into contact with the mold surface and applying the vacuum.

Tutorials

<https://www.youtube.com/watch?v=9ynFpxokWIM>

https://www.youtube.com/watch?v=BqV_jsxD0UA

https://www.youtube.com/watch?v=JGFGmOQ29_Q

Observations

- Requires protective hand gloves

Foam Cutter

Tools: Software, Hardware and Tutorials



A hot-wire foam cutter is a tool used to cut polystyrene foam and similar materials. The device consists of a thin, taut metal wire, often made of nichrome or stainless steel, or a thicker wire preformed into a desired shape, which is heated via electrical resistance to approximately 200 °C (390 °F). As the wire is passed through the material to be cut, the heat from the wire vaporises the material just in advance of contact.

The depth of the cut is limited only by the wire length. Width of cut is limited by throat, if any.

Tutorials

<https://www.youtube.com/watch?v=olKEYM-IMWQ>

<https://www.youtube.com/watch?v=3GWzHb4Hd8Y>

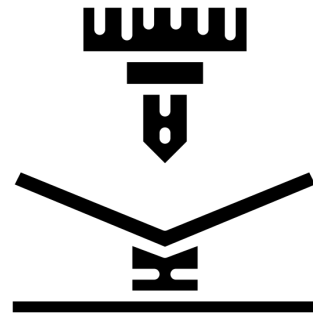
<https://www.youtube.com/watch?v=F8gfGw2ITkg>

Observations

- Requires protective hand gloves

Acrylic Bending Machine

Tools: Software, Hardware and Tutorials



The acrylic bending machine DA is an automatic machine that allows the bending of a wide variety of plastic and acrylic sheets, such as PETG, PVC, polystyrene, in many different forms and sheet measurements.

Tutorials

<https://www.youtube.com/watch?v=ZEiN44L2PFs>

<https://www.youtube.com/watch?v=wEWCWgwM034>

Observations

- Requires protective eyewear and hand gloves

Woodworking Bench

Tools: Software, Hardware and Tutorials



A workbench is a table used by woodworkers to hold workpieces while they are worked by other tools. There are many styles of woodworking benches, each reflecting the type of work to be done or the craftsman's way of working. Most benches have two features in common: they are heavy and rigid enough to keep still while the wood is being worked, and there is some method for holding the work in place at a comfortable position and height so that the worker is free to use both hands on the tools. The main thing that distinguishes benches is the way in which the work is held in place. Most benches have more than one way to do this, depending on the operation being performed.

Tutorials

<https://www.youtube.com/watch?v=1C1kfdQilfA>

<https://www.youtube.com/watch?v=m4e5BRqRwy8>

https://www.youtube.com/watch?v=PpYMMep_Tmk

Observations

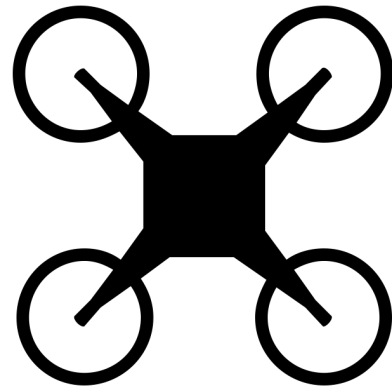
- Requires protective eyewear and hand gloves

Equipment and Tools : Techniques

Educational making activities

Drone Building

Tools: Software, Hardware and Tutorials



A quadcopter or quadrotor is a type of helicopter with four or more rotors.

Although quadrotor helicopters and convertiplanes have long been flown experimentally, the configuration remained a curiosity until the arrival of the modern UAV or drone. The small size and low inertia of drones allows use of a particularly simple flight control system, which has greatly increased the practicality of the small quadrotor in this application.

Software

CAD Software

Tutorials

<https://www.youtube.com/watch?v=5r2pS1oloCw>

https://www.youtube.com/watch?v=9DY9Cn8Ld_A

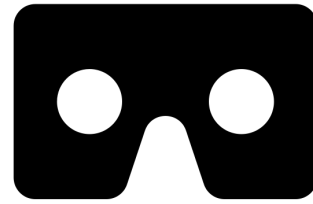
<https://www.youtube.com/watch?v=Latlzd50EIo>

Observations

- You must follow the laws about drones in your country before building one.

VR

Tools: Software, Hardware and Tutorials



Virtual reality (VR) is a simulated experience that can be similar to or completely different from the real world. Applications of virtual reality can include entertainment (i.e. video games) and educational purposes (i.e. medical or military training). Other, distinct types of VR style technology include augmented reality and mixed reality, sometimes referred to as extended reality or XR.

Software

Cospaces <https://cospaces.io/edu/>

Tutorials

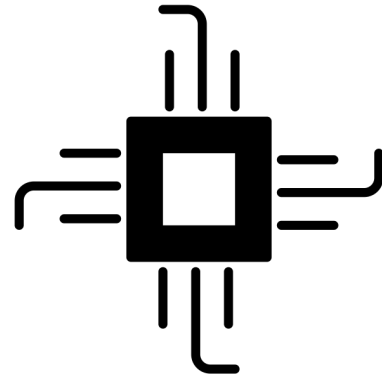
<https://www.youtube.com/watch?v=8qNmRi-gNqE>

Observations

- A mobile phone can be needed
- VR glasses are needed

Circuit Making

Tools: Software, Hardware and Tutorials



An electronic circuit is composed of individual electronic components, such as resistors, transistors, capacitors, inductors and diodes, connected by conductive wires or traces through which electric current can flow. To be referred to as electronic, rather than electrical, generally at least one active component must be present. The combination of components and wires allows various simple and complex operations to be performed: signals can be amplified, computations can be performed, and data can be moved from one place to another.

Software

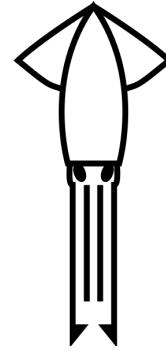
- CircuitMaker: A free-to-use schematic and PCB design tool for the Open Source Hardware community.
- Open Circuit Design Software
- KiCad EDA: A Cross-Platform and Open Source Electronics Design Automation Suite.
- ADS Circuit Design Software
- nagaEDA Circuit Design Software
- OpenSce Circuit Design Software
- QSapecNG Circuit Design Software
- Simulide: is a circuit simulator software that allows you to test your circuits before prototyping
- gerbv: is an open source Gerber file viewer for RS-274X only.

Tutorials

<https://www.youtube.com/watch?v=6Maq5lyHSuc>

Draw 2D vectors

Tools: Software, Hardware and Tutorials



Vector graphics are computer graphics images that are defined in terms of points on a Cartesian plane, which are connected by lines and curves to form polygons and other shapes. Vector graphics have the unique advantage over raster graphics in that the points, lines, and curves may be scaled up or down to any resolution with no aliasing. The points determine the direction of the vector path; each path may have various properties including values for stroke color, shape, curve, thickness, and fill.

Software

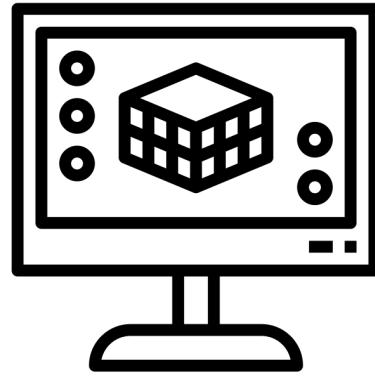
Adobe Illustrator
Inkscape
FreeCAD
LibreCAD

Tutorials

<https://www.youtube.com/watch?v=8f011wdiW7g>

3D Modeling

Tools: Software, Hardware and Tutorials



Translates programs consisting of specific numbers and letters to move the spindle (or workpiece) to various locations and depths. Many use G-code. Functions include: face milling, shoulder milling, tapping, drilling and some even offer turning. Today, CNC mills can have 3 to 6 axes. Most CNC mills require placing the workpiece on or in them and must be at least as big as the workpiece, but new 3-axis machines are being produced that are much smaller.

Software

Tinkercad (online via tinkercad.com)
3D Slash

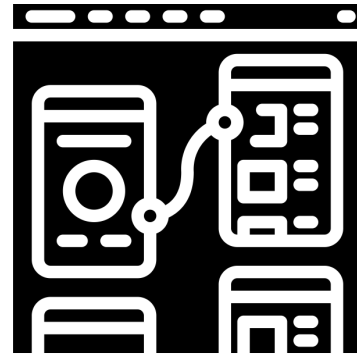
Tutorials

<https://www.youtube.com/watch?v=gsz2PNcAcPA>

<https://www.youtube.com/watch?v=X8MO7SeED5g>

Electronic prototyping with coding

Tools: Software, Hardware and Tutorials



There are many tools for prototyping with electronics, used for everything from new musical instruments to intelligent rooms, custom input devices and interactive art pieces. These tools attempt to reduce the difficulty of working with electronics and expand the number of people who can experiment with the medium. Many of them, however, are either commercial products – expensive and closed – or research projects unavailable for use by most people. Others consist only of circuit boards, providing no tools to simplify their programming.

The open source movement, meanwhile, has shown that useful and robust software can be created by a distributed team of volunteers freely sharing the results of their efforts. Open source projects often gather strong communities of people working at many levels: some work on the core code, others contribute small extensions, still others write documentation or offer support, with the majority simply making use of a quality product.

Software

Arduino IDE
Scratch
Makecode

Tutorials

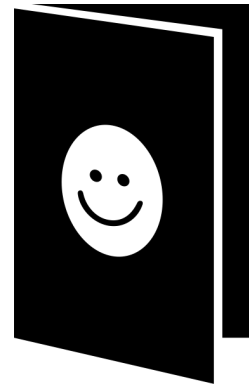
https://www.youtube.com/watch?v=MtiUx_szKbl

Observations

- Different boards: Arduino, Microbit, Touch BareBoard, Beagle-Bone.
- Some knowledge about programming is needed.

Paper circuits

Tools: Software, Hardware and Tutorials



A paper circuit is a low-voltage electronic circuit that is created on paper or cardboard using conductive copper tape, LEDs and a power source such as a coin-cell battery. Creating paper circuits is a good way to teach the basics of electricity and how circuits function. In addition to being educational, they can also be a fun makerspace project that helps to bring artwork and paper craft to life. By adding sensors, buzzers and motors to your circuit, you can also add another dimension of interactivity.

Tutorials

<https://www.youtube.com/watch?v=UcA4EGvO0R4>

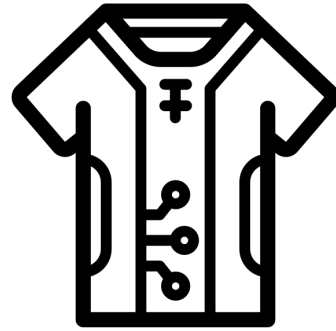
<https://www.youtube.com/watch?v=C88JUVXSzKo>

Observations

- A good resource is:
<https://www.makerspaces.com/paper-circuits/>

E-textiles

Tools: Software, Hardware and Tutorials



Electronic textiles or e-textiles (often confounded with smart textiles) are fabrics that enable digital components such as a battery and a light (including small computers), and electronics to be embedded in them.

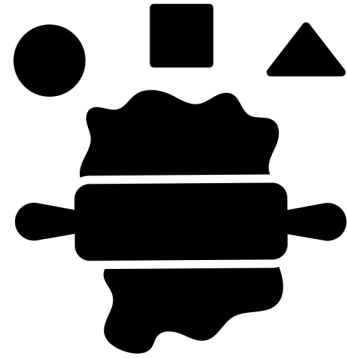
Electronic textiles are distinct from and wearable computing because the emphasis is placed on the seamless integration of textiles with electronic elements like microcontrollers, sensors, and actuators.

Tutorials

<https://www.youtube.com/watch?v=uMBjCjk19GU>

Squishy circuits

Tools: Software, Hardware and Tutorials



Squishy Circuits uses conductive and insulating play dough to teach the basics of electrical circuits, a perfect blend of play and learning.

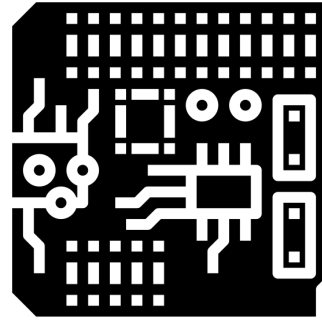
By using conductive and insulating dough, you can create sculptures with embedded lights, motors and buzzers. This project is great for younger students because it utilizes a material they already know...PlayDoh.

Tutorials

<https://www.youtube.com/watch?v=l3EwE5ILSVQ>

PCB making

Tools: Software, Hardware and Tutorials



A printed circuit board (PCB) mechanically supports and electrically connects electronic components using conductive tracks, pads, and other features etched from copper sheets laminated onto a non-conductive substrate. A printed circuit board has pre-designed copper tracks on a conducting sheet. The pre-defined tracks reduce the wiring, thereby reducing the faults arising due to loose connections. One simply needs to place the components on the PCB and solder them.

Software

Autodesk Eagle
PCBWizard

Tutorials

<https://www.youtube.com/watch?v=8joLK039fjk>

<https://maker.pro/pcb/tutorial/how-to-make-a-printed-circuit-board-pcb>

Observations

- Might require gloves and take care with some products.

Smartphone Apps creation

Tools: Software, Hardware and Tutorials



MIT App Inventor is an intuitive, visual programming environment that allows everyone – even children – to build fully functional apps for smartphones and tablets. Those new to MIT App Inventor can have a simple first app up and running in less than 30 minutes. And what’s more, our blocks-based tool facilitates the creation of complex, high-impact apps in significantly less time than traditional programming environments. The MIT App Inventor project seeks to democratize software development by empowering all people, especially young people, to move from technology consumption to technology creation.

Software

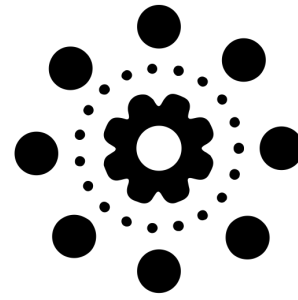
App Inventor <https://appinventor.mit.edu/>

Tutorials

<https://www.youtube.com/watch?v=Vdo8UdkgDD8>

Programming for visual arts

Tools: Software, Hardware and Tutorials



Processing is an open-source graphical library and integrated development environment (IDE) built for the electronic arts, new media art, and visual design communities with the purpose of teaching non-programmers the fundamentals of computer programming in a visual context.

Processing uses the Java language, with additional simplifications such as additional classes and aliased mathematical functions and operations. It also provides a graphical user interface for simplifying the compilation and execution stage.

The Processing language and IDE have been the precursor to other projects including Arduino, Wiring and p5.js.

Software

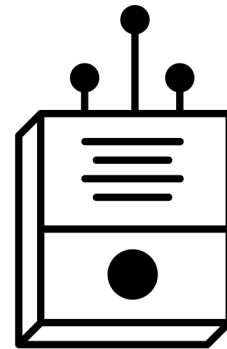
Processing

Tutorials

<https://www.youtube.com/watch?v=2VLalr5Ckbs>

Making Electronic Devices

Tools: Software, Hardware and Tutorials



Building electrical devices is probably the most inexpensive engineering you can do because most electronic components are very cheap. How to actually build devices on your own isn't taught enough in engineering courses.

If you don't know any electrical engineering, you'll obviously need to learn the basics before you can start inventing. A good place to start is the website [instructables](https://www.instructables.com/), finding several tutorials with good explanations and practical knowledge of components at the same time. Engineering classes are hard, and it helps to know that you can invent cool stuff after you've been through them.

Tutorials

<https://www.youtube.com/channel/UC-k-Fhg0P4VqBvQYI-tAMQog>

Bare conductive

Tools: Software, Hardware and Tutorials



Draw circuits and sensors with electrically conductive paint.

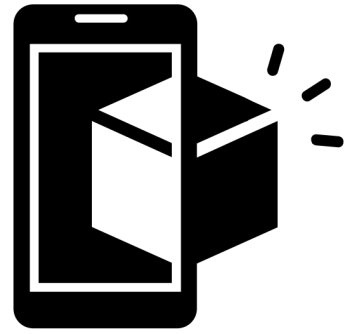
The Electric Paint is a conductive ink which can be used to repair breaks, cold solder or to draw small scale circuits. Electric Paint is non-toxic, dries at room temperature, and can be applied onto any non-conductive, non-hydrophobic surfaces, like paper, plastic, textiles or wood. Electric Paint is water-soluble and can be easily removed with soap and water. For permanent applications, it can be sealed using spray varnish. Use alongside the Touch Board, Pi Cap or Light Up Board to create touch and proximity sensors.

Tutorials

https://www.youtube.com/watch?v=phEke_LZJlk

AR Apps

Tools: Software, Hardware and Tutorials



Augmented reality is a technology that virtually places a 3D visual into a “real-world” experience. This gives the user the appearance that the virtual object is co-existing with them in the physical world.

AR is often used in gaming, bringing a more realistic experience to gamers and engaging more senses. Augmented reality (AR) has become the new trend in the digital world and you can hardly meet a person who is not familiar with it after the boom that Pokemon Go brought into the lives of the average mobile user.

Software

Unity
Cospaces
OpenSceneGraph

Tutorials

https://www.youtube.com/watch?v=MtiUx_szKbl

Makerspace for Inclusion

EU Project N° 2018-I-BE0S-KA205-002425



Digijeunes



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