

1a Back to Basics: Hand Drawing

Within this assignment you will be using the art of hand drawing to create the foundation from which you will build your skill set in the realm of digital fabrication. You absolutely do NOT need to be good at drawing to proceed with the assignments. All we are looking for is form generation and development using a type of art that is easily

accessible to people of all ages and backgrounds. The method you choose and what you draw is completely up to you. If you need inspiration, we have provided a few different examples below. Now is the time to slow down for a moment and generate a design through any method of your choosing, as long as you are doing it by hand, of course!

Instructions

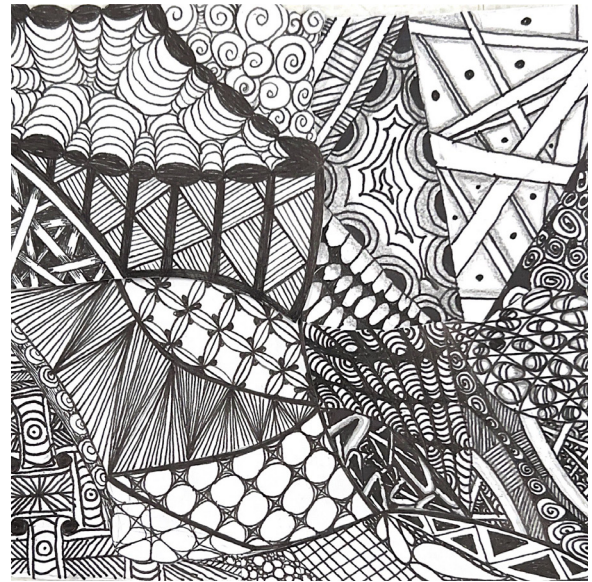
1. Start with a 3.5" x 3.5" piece of paper, a pencil, and a black pen.
2. Sketch out your design in pencil and outline it by using a black pen. You could even draw the whole thing in pen first if you're feeling bold.

NOTE: If you're not sure what to draw, we have developed some alternative Assignments with prompts that can help guide you: Zentangle (1b), Abstraction (1c), or Non-Objective (1d). The possibilities are endless!*

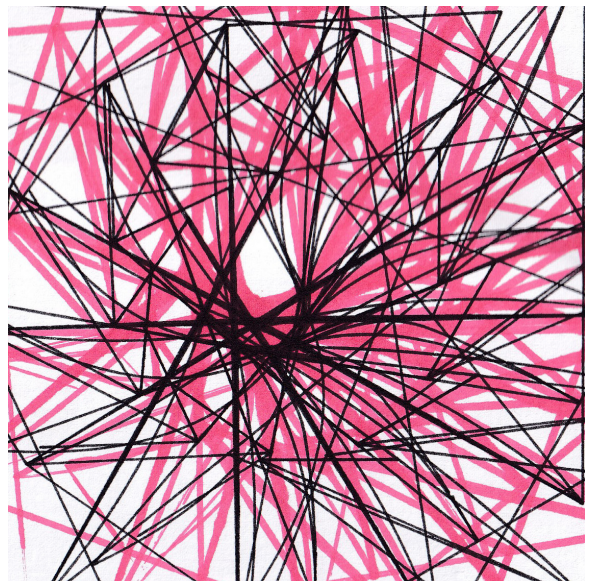
3. Do as many iterations as you would like in order to get a design that makes you proud. It can be as simple or as complex as you wish. Only one design is necessary to proceed with the next assignments in Module 1.

5. And that's it. Now, that wasn't so bad, was it?

* You only need to do one version of Assignment 1: 1a, 1b, 1c, or 1d.



Student Zentangle Collaboration (1b)



Student Abstraction Example (1c)

1b Back to Basics: Zentangles

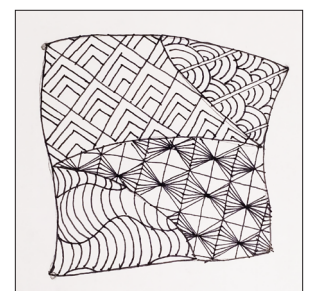
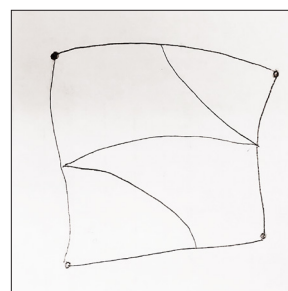
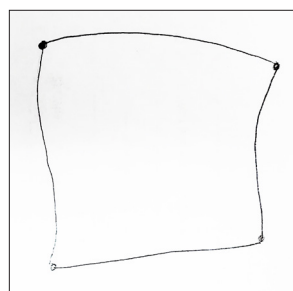
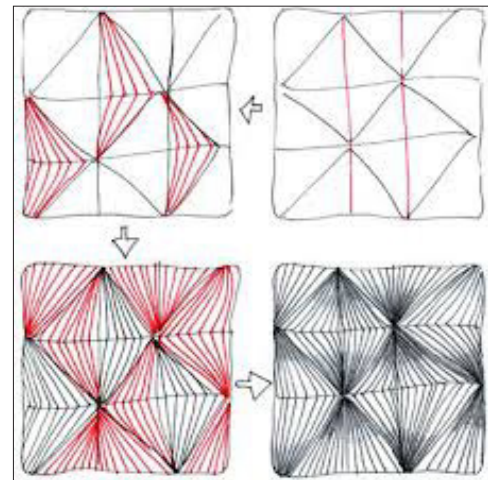
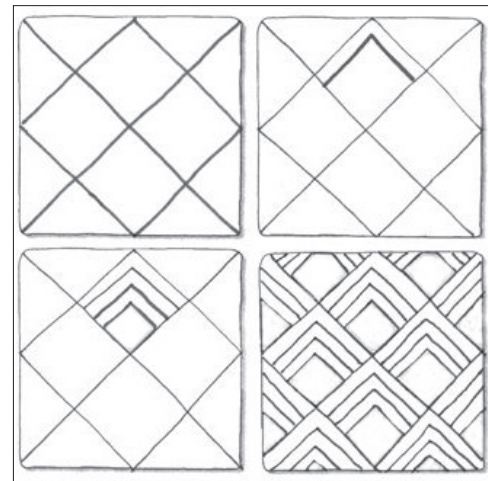
So you're having trouble coming up with something to draw, huh? Well, you have come to the right place. Zentangles are an excellent place to start if you're not quite sure where to start. Here, you don't have to be good at drawing to create something. So what is a Zentangle you may ask? Zentangles are essentially a series of predefined strokes

that are combined to create the end result of a pattern. From here, you can create an aggregate of as many designs as you would like on your tiny 3.5" x 3.5" piece of paper.

Final Deliverable:
One image of your final drawing

Instructions

1. Start with a 3.5" x 3.5" piece of paper, a pencil, and a black pen.
2. Put 4 dots on your paper with a pencil and lightly connect them using straight or curvy lines. Now you have your border.
3. Still using your pencil, inside your border make a few light lines from edge to edge to create a few sections.
4. From here you can follow any number of step-by-step Zentangle pattern guides. We have provided a few simple examples but if these are not complex enough for your tastes, you can find more by searching the Internet. Also, check out the Zentangle resource on our website: Pen Plotter > A1 attachments.
5. You can make your design as simple or as complex as you would like! Just keep in mind that you should avoid any type of fill or shading as you won't be able to transfer them into the next assignments.
6. Proceed to M1A2



1c Back to Basics: Abstraction

If Zentangles aren't your thing, you could try your hand at abstraction! With this style of art, you do no attempt to make the object you are trying to depict look realistic. Instead, you capture the feeling and essence of the object through shapes and possibly a variety of colors. You can draw what is around you, you can use reference photos, and you

can even draw your favorite logo! In most cases, logos are some form of abstraction, so if you don't believe you could make an abstraction drawing you're proud of, try out sketching a logo (school, sports, brand, or otherwise).

Final Deliverable:
One image of your final drawing

Instructions

1. Start with a 3.5" x 3.5" piece of paper, a pencil, and a black pen.
2. Select an object around you, or a picture, and then break it down into its most basic shapes. For example, an acorn can be broken down into a simple oval with a triangle on top.
3. Play around with the positioning of the shapes to convey a sense of movement or distortion. You might want to do a few iterations until you get your intended result.
4. Add a new perspective of the object to your sketch. Since abstract art only has grounds in reality but is by no means perfectly portraying realism, you can test out overlaying multiple different perspectives on top of each other to give the viewer a sense of the 3D object on a 2D medium.
5. Once you get a form that you are happy with, outline it with your black pen (or any other color you may wish to use) so it will be easier to scan in the next assignment. Avoid any color fills or shading as they cannot be applied in future assignments.
6. Proceed to M1A2



Ball State Beneficence Logo



Simple Flower Abstraction

Non-Objective is another great option if you don't have any idea what to draw. This style of art is different from abstraction in the sense that it doesn't have to have any ground in reality. Here, you don't have to have any intention of portraying real life objects. Non-Objective art is typically a way to express the emotion of something or

someone through the use of shapes and colors. Many claim that non-objective art is a way to convey simplicity and purity without the need to explicitly define the meaning with words.

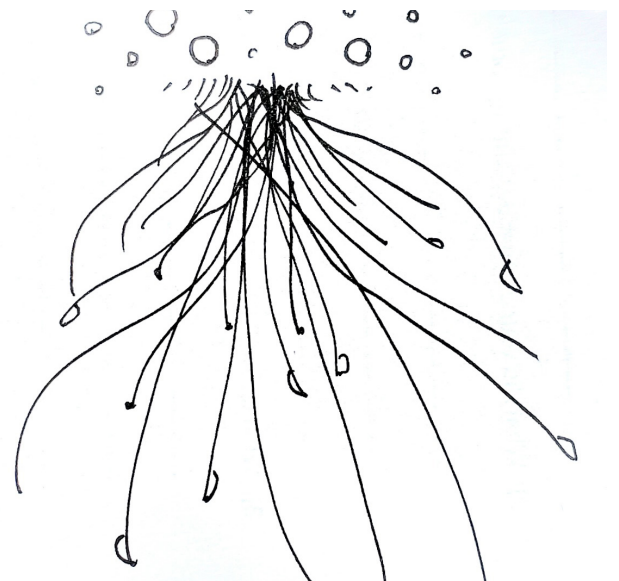
Final Deliverable:
One image of your final drawing

Instructions

1. Start with a 3.5" x 3.5" piece of paper, a pencil, and a black pen.
2. Try to show something that can't be seen, possibly a sound or a feeling. You can represent this through basic art principles (rhythm, movement, etc) and elements (shapes, color, etc).
3. Play around with the positioning of the shapes to convey a sense of movement or distortion. You might want to do a few iterations to try to get a form that works for you.
4. Non-Objective art doesn't have to be complex visually, you can take this opportunity to focus on visual balance of relatively simple forms.
5. Once you get a form that you are happy with, outline it with your black pen (or any other color you may wish to use) so it will be easier to scan in the next assignment. Try to avoid any color fills or shading as they cannot be applied in the future assignments.
6. Proceed to M1A2



Song interpretation



Interpretation of the feeling of spring

For this assignment, you will be scanning in your hand drawn 3.5" x 3.5" square. Although this step may seem tedious, it is one of the most important steps to proceed. Without a high-quality scan, the next assignment might not produce the results you hope for or might prove to be more difficult than necessary. Plus you'll have a digital copy

of your work from the last assignment in case you misplace or spill coffee all over your physical copy. Go on and take that glorious piece of art you created for a joyride to the nearest scanner.

Final Deliverable:
One high-quality scan (.PDF or .TIFF) of your drawing

Instructions

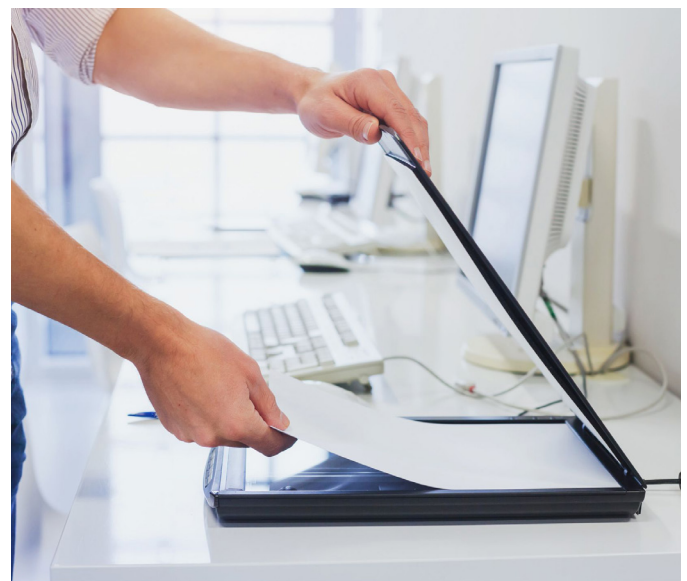
1. Planning is the most important thing you do before you even start scanning. Your 3.5" x 3.5" square is going to be scaled up to a 6.5" x 6.5" square in the next step. A high dpi scan is crucial when you are scaling up images. Check out the scanning resource guide located on our website: Pen Plotter > Assignment 2 attachments.

2. Scanning general rules: Web site image 72-96 dpi (varies with monitor size); laser or inkjet documents 150 dpi; color photo (that you plan to enlarge) 300 dpi

3. If you are scanning with a desktop scanner, you will want to save your document as a TIFF file rather than a JPG. TIFF file format preserves image quality as well as color clarity.

4. If you do not have access to a desktop scanner, most phones have a scanning tool built into them or there are apps you can download that perform the same function. Most will produce PDF or JPG. If you have the option, choose to export your scan as a PDF.

5. Proceed to M1A3



Stock Image of Desktop Scanning



Stock Image of Scanning with Phone

3 Raster to Vector

Now you will start your journey into the digital world. The goal of this assignment is to convert your hand-drawn masterpiece into line work the computer can read. If you're new, you may be wondering what the terms raster or vector means. Well, a raster is an image that is made up of individual pixels. The amount of pixels contribute to the overall quality of an image. As for vectors,

these are made up of points, lines, and curves that are based on mathematical formulas. This results in the ability to scale vector graphics and not lose fidelity as you would with a raster. Using vector-based softwares opens up your art to new mediums and scales, so trace away!

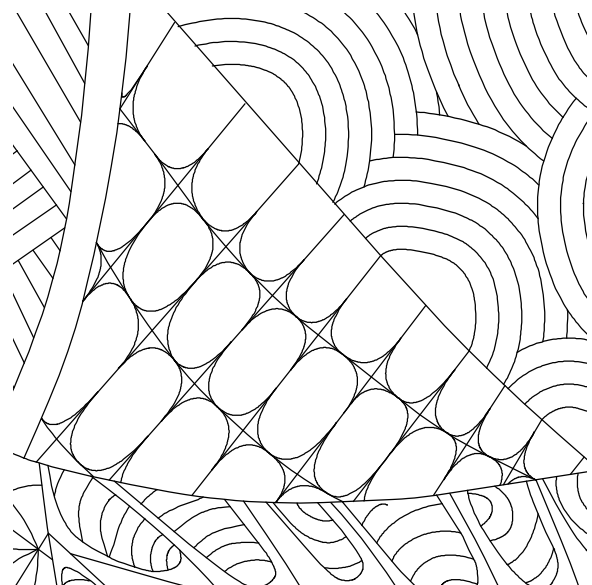
Final Deliverable:
One .SVG file of the vectors from your drawing

Instructions

1. After you scan in your hand-drawn 3.5" x 3.5" square by following the instructions in Assignment 2, you should have a raster image. Import this image into any vector graphics program of your choosing. We recommend using Illustrator or Inkscape to proceed.
2. In the vector program of your choice, create a document that is 8.5" x 11" oriented horizontally. Import your scanned raster image and scale it to 6.5" x 6.5".
3. Now, simply trace your hand drawn line work using any of the vector tools that are offered within the software you chose. **Note: Please avoid any type of fill pattern/coloring.**
4. If you don't have any experience with any of the programs that perform these functions, please refer to the tutorials we have provided on the next page of this document.
5. Keep in mind that in the next step you will be plotting this linework using the Axidraw. Be sure to create separate layers for linework that you may want plotted in a different color or with a different pen thickness.
6. Once you are finished tracing your line work, export the file as an SVG file type so it can be imported into Inkscape to run the Axidraw.
7. Proceed to M1A4



Raster Image Scaled



Vector Linework Scaled

Downloads

Inkscape: <https://inkscape.org/release/inkscape-1.2/>

Illustrator: https://www.adobe.com/products/illustrator/campaign/pricing.html?sdid=KKQML&mv=search&ef_id=CjwKCAjwzeqVBhAoEiwAOrEmzTvMs1A6o6UYp_UqL-QpqDKUGuc3ltyifDfnicklkbvTxDJepXeq4RxoClzcQAvD_BwE:G:s&s_

Illustrator for Ball State Students: <https://www.bsu.edu/about/administrativeoffices/information-technology/services/digital-tools/adobe-creative-cloud>

Axidraw Software Installation for Inkscape
https://wiki.evilmadscientist.com/Axidraw_Software_Installation

Tutorials

Inkscape: <https://inkscape.org/learn/tutorials/>

Illustrator: <https://helpx.adobe.com/illustrator/tutorials.html>

4 Plotting: Axidraw Edition

In this assignment, you will be introduced to the mechanics of CNC Plotting. Up until now, you have completed all the necessary digital steps required to plot your line work. Now we will apply that work to setting up and operating an Axidraw, “a simple, modern, precise, and versatile pen plotter, capable of writing or drawing on almost any flat surface.”

What to bring with you

- Flash drive containing your .SVG from M1A3
- Pen(s), markers & paper (printer, watercolor, etc.)

Final Deliverable:

One .JPG or .PNG of finished plotted drawing

Instructions

1. Sign up

To complete this module you must sign up for a time to operate Axidraw. Waiting time may vary depending on Fab Lab loads. Sign up on our website under the Consultation tab. Look for M1: Pen Plotter in the drop down menu. One of our staff will get back to you after sign up to schedule a time.

2. Plotting

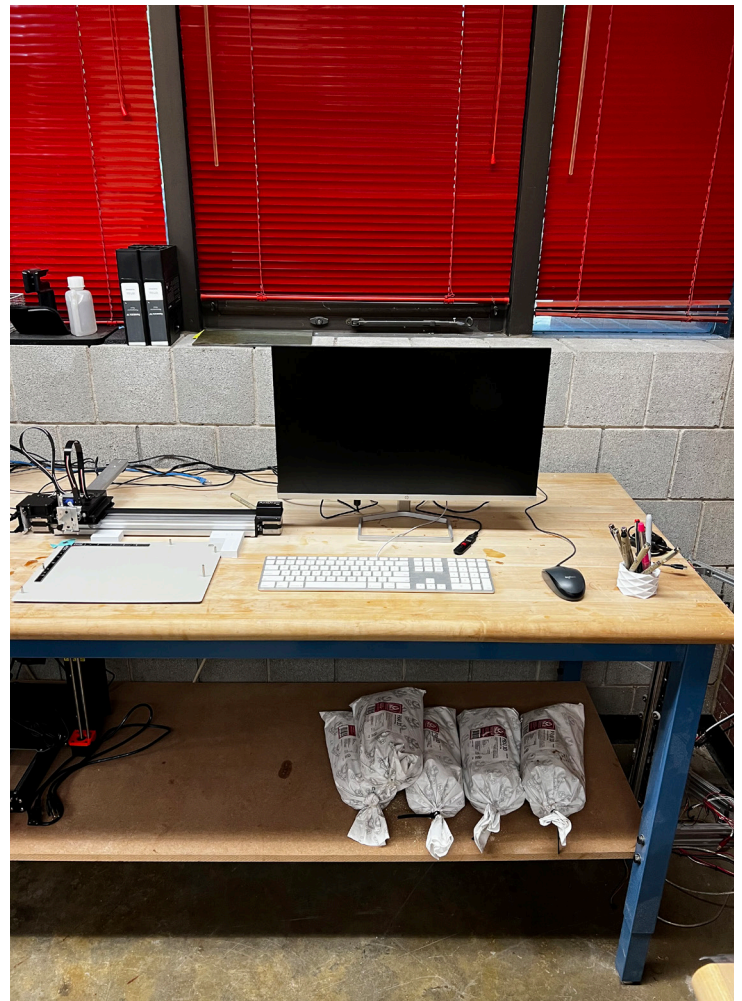
During your assigned time, you will follow the step-by-step instructions required to run the Axidraw. See Attachments on our website: Pen Plotter > A4 attachments. A team member will walk you through how to load pens. After that we will use your .SVG to upload and begin plotting your drawing. If we find errors in your .SVG we will determine the severity of the error and either recommend you resolve these errors and sign up for another time slot or resolve the error within the .SVG (this will be left up to the makercorps team member).

3. Observations

After the plot has started, please remain with the machine until the plot has completed. makercorps team members are not responsible for failed or unattended drawings being discarded.

4. After the plot is complete you may retrieve your drawing.

5. As a final step, scan/capture an image of it, then upload to finish Module 1.



4 Plotting: AxiDraw Station

Username: fablab

Password: axidraw

If importing your linework

Plug in USB Flash Drive

Find .SVG File (in File Explorer) → Right Click → Open With → Inkscape

Adjust File Setup

File → Document Properties

○ Orientation → Landscape

○ Paper Size → 8.5" x 11"

○ Units → Inches

* Ensure your linework is on the right scale before proceeding.

Before Plotting

Extensions → AxiDraw Control... → Setup

○ Toggle Pen between UP, DOWN

- Press Apply, ensure the holder is in the DOWN position before loading a pen

- Load the pen so that the tip is resting on the metal plate (on a scrap piece of paper), then tighten the screw.

- Pen height: Down; (%) Subtract 4 from whatever number is in this bar. (Determines pen pressure on paper)

- Press apply to raise the pen back into the UP position

* Ignore any error menus that may pop up. Your plot will not be affected.

Load Material

Place your material onto the metal bed, and ensure it is aligned in the top left corner. Place magnets or tape around the exterior boundary of the material if it is thin enough to hold it to the bed.

Begin Plotting

Extensions → Axidraw Control... → Plot → Apply

Multi-tool Plotting

The program will plot any object (lines/curve) that is unhidden when you follow the Begin Plotting step above. If you are exporting an SVG from Illustrator, each layer you have will become one "object" in Inkscape. So to save time, you may want to separate all of the lines/curves you wish to be a different color/thickness into different layers before you export from Illustrator.

To open the Layer/ Object Panel

Object → Layers and Objects

1. Determine which line/curves you wish to be plotted with a different pen

→ use the Eyeball button to hide these line/curves for the time being

2. Proceed to plot the line/curves you left unhidden

Repeat these two steps for all of the different tools you are using. Keep in mind that you will have to follow the Before Plotting step each time you change the pen/marker you are using.

- Be sure you are using the same type of pen/marker or else you will have offset issues due to the thickness of the pen casing as you switch between tools.