

MA Drawing: Learner Agreement Sheet

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Overall aims and objectives

- Expanding my knowledge in science (physics/mathematics in mechanical engineering) and its relationship with drawing.
- To be able to compare research methods in two different fields of art and engineering specifically in PHD level.
- Gaining the ability and understanding of how I can approach art through science.
- Learning and practicing the ability of collaboration with someone else to create art or research together.

What is your plan and rationale for both your practice and research within this unite and how do you think that they support each other?

Based on my own experience in architecture, urban design and engineering fields, I am very interested to use this opportunity to examine the idea of drawing as an application in mechanical engineering field. I would research on notebooks of a PHD student as an example of drawing usage in her research. This research and collaboration is a great chance for me to investigate the idea of coding in creation of a drawing and also analyzing the hand drawn pieces by using algorithm and different computational techniques. There is a coding software (Matlab) which is one of the most common application in mechanical engineering therefore it would be very helpful to work with a PHD student in this field to learn it better. This software can be very useful for me because it provides the possibility of analysing the drawings based on my narrative. I will be able to write a function or an equation which follows my art practice concept to run the analysis on drawings. As a result I would get a new layer of drawing based on the initial input. Another aspect that I am very interested in is to share the result of this research with another artist like Mathew Richie who has the experience of working with science, computer aid software, drawing and especially mathematics.

Monte Carlo: An example of a simulation technique that I can use it in the Matlab to perform my analysis. A physical system that can be described through a probability distribution function (pdf) can be simulated using the Monte Carlo technique by randomly sampling from the pdf's of the input variables. Performing further calculations, one can describe the evolution of the system and obtain its final output probability distribution. Using the coordinates of the points in each section of a drawing as the defined domain of possible inputs, the new points inputs can be randomly generated by inversely sampling from each of the pdf's. This entails sampling a random number ϵ from the interval of $U[0,1]$ and equating the randomly picked number with

the cumulative distribution function (cdf) of the original points ($F(x)=\epsilon$). Finally, the sampled value x can be found by inverting the cdf as $x=F^{-1}(\epsilon)$. The cdfs corresponding to a Weibull distribution and a Gamma distribution are as follows

$$cdf_{Weibull} = \begin{cases} 1 - e^{-\left(\frac{x}{\lambda}\right)^k} & x \geq 0 \\ 0 & x < 0 \end{cases} \quad (1a)$$

$$cdf_{Gamma} = \frac{\gamma(k, \frac{x}{\lambda})}{\Gamma(k)} \quad (1b)$$

Where λ is the scale factor and k is the shape factor of the distribution. $\gamma(k, x/\lambda)$ and $\Gamma(k)$ functions are respectively the lower incomplete Gamma function and the Gamma function evaluated at k . By using this method, different sets of new drawings can be generated from the original one. Increasing the number of iterations will result in a drawing closer to the original one however generated using a mathematical based technique.

What background research will you undertake to help you formulate this proposal?

- This proposal has three features for me to follow: research methods in very detailed PHD level subject, learning how to use new coding software which works based on image, and study of hand drawn notebooks of a PHD student in mechanical engineering field. In order to achieve the best result, background knowledge in mathematics and physics are essentials.
- Investigating the idea of coding in contemporary art and looking at different artists' approaches in this matter.

What resources will you need to secure to carry out your proposal?

- Installing the coding software (Matlab) in our digital media center.

What skills do you have in this area?

- Research and analysis skill.
- Familiar with different soft-wares which are related to coding techniques.

What skills do you anticipate needing to acquire or develop?

- Scientific research methods.
- Collaboration and team work techniques.