

## Activity 2 - Practical Image Processing

To replicate the graph shown in Figure 1, an image processing software, GIMP, was used to get the pixel coordinates of the plot.

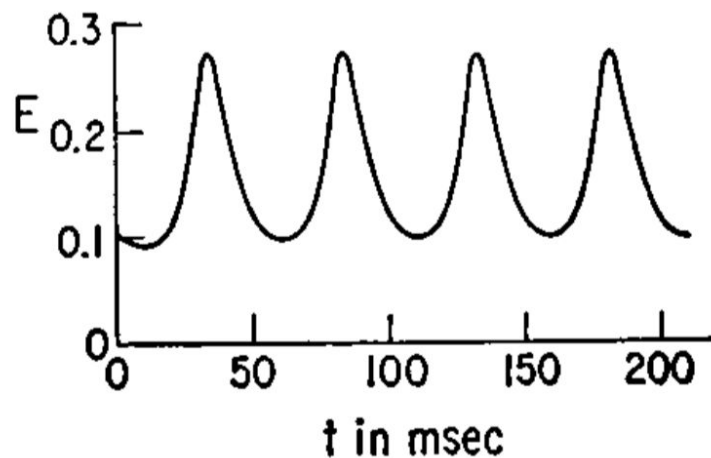


Figure 1. Hand drawn plot of energy vs. time.<sup>[1]</sup>

These pixel coordinates were then converted to axes/graph coordinates using the formula:

$$X \text{ graph coordinate} = X \text{ pixel coordinate} * ((X \text{ graph maximum} - X \text{ graph minimum}) / X \text{ pixel width} + X \text{ graph minimum})$$
$$Y \text{ graph coordinate} = Y \text{ pixel coordinate} * ((Y \text{ graph maximum} - Y \text{ graph minimum}) / Y \text{ pixel width} + Y \text{ graph minimum})$$

These X and Y graph coordinates were then used to plot a replicate graph for the original hand drawn plot in Figure 1. Shown in Figure 2 are the two plots superimposed-- the original hand drawn plot and the replicate/reconstructed plot.

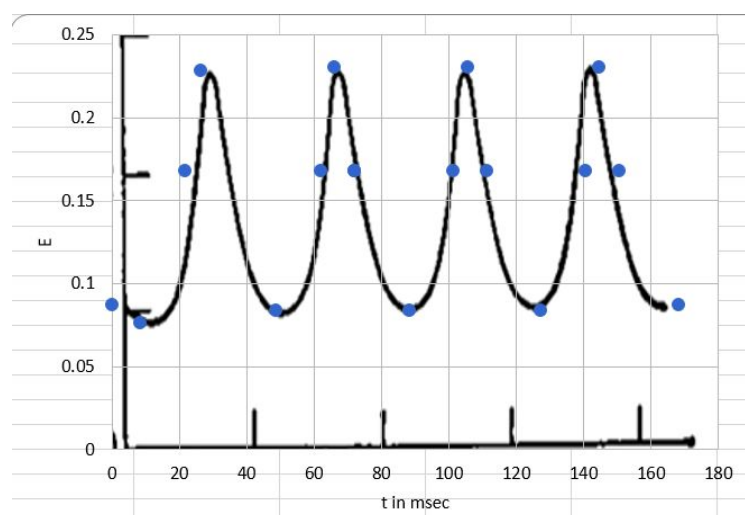


Figure 2. The original (black line) and the reconstructed (in blue dots) plots.

It can be seen that although the shape of the plots are similar, the graph was not replicated perfectly. The reason for this is that the formulas used for obtaining the graph coordinates from the pixel coordinates were just rough estimates for such pixel-to-axes conversion.

Overall, the activity about practical image processing was fun for me. I had a hard time overlaying the original plot on the background of my reconstructed graph because I was using a Macbook and I do not have Microsoft Excel installed. In the end though, I was able to do it and fix the superimposing plots using the offset setting. It is really fascinating how easily we got to replicate a graph using only GIMP and Google spreadsheet. This activity has taught me that I can just easily scan plots I made in scratch or in paper and use the pixel-to-graph coordinates conversion formula to have a better plot made in Excel or in Python.

### Self evaluation

Technical correctness	5
Quality of presentation	4
Initiative	1
<b>Total</b>	<b>10</b>

### References

[1] Wilson, H. R., & Cowan, J. D. (1972). Excitatory and Inhibitory Interactions in Localized Populations of Model Neurons. *Biophysical Journal*, 12(1), 1-24. doi:10.1016/s0006-3495(72)86068-5

[2] Converting pixel coordinates to graph coordinates:

<https://chrisheydrick.com/2013/12/24/converting-pixel-coordinates-to-graph-coordinates-redux/?fbclid=IwAR0fceV26DJaIzgR0giTamapF9tuM9agWgpJnGxmi43OCZxVcv4at30dclo>

### Appendix

Here are the obtained X and Y graph coordinates for the following X and Y pixel coordinates:

X pixel coordinate	Y pixel coordinate	X graph coordinate	Y graph coordinate
0	277	0	0.086923077
29	291	8.309455587	0.076153846
76	172	21.7765043	0.167692308
92	93	26.36103152	0.228461538
251	172	71.91977077	0.167692308

170	281	48.71060172	0.083846154
216	172	61.89111748	0.167692308
231	91	66.18911175	0.23
251	172	71.91977077	0.167692308
308	281	88.252149	0.083846154
354	172	101.4326648	0.167692308
369	91	105.730659	0.23
389	172	111.4613181	0.167692308
444	281	127.2206304	0.083846154
491	172	140.6876791	0.167692308
505	91	144.6991404	0.23
526	172	150.7163324	0.167692308
587	277	168.1948424	0.086923077