Abstract vector sketch generation using differentiable rendering and GANs

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Abstract

The abstract paragraph is *optional* for the extended abstract and *mandatory* in the final project report.

1 Overview

Drawings are an important part of creative processes - we draw to discuss ideas, express emotions, outline a prototype. However, drawings are hard to process by machine as they use high-level abstractions to convey shapes and depth information, support structures and auxiliary lines (see Figure 1 for reference). But that's what make sketches interesting, as they are inexact depiction of familiar objects.

Sketch generation is a known problem, however less popular than general image generation, because less training data is available. Another problem for generation is data representation: digital drawings are often stored in the SVG (scalable vector graphics) format, when we store individual strokes and shapes as mathematical expressions. This allows for scaling and editing without loss in quality, opposed to raster format (storing pixels). To visualize vector graphics (and compare it with target image, for example) we need a rasterizer, and for deep learning applications we need a differentiable rasterizer.

1.1 Idea

Hypothesis

2 Implementation details

Third-party code

Github

Resources I will use my machine with NVidia 2080Ti GPU (11 GB) and Google Colab to run experiments in parallel.

3 Guidelines Extended Abstract and Final Project Report

3.1 Timeline – Dates Importantes

- March 13th (11:59PM AoE): Extended Abstract submission – Soumission du pré-rapport (**max 2 pages**).
- April 23rd (11:59PM AoE): Project Report submission – Soumission du rapport de projet (**max 8 pages**).
- End of April: Project Presentations (Optional if a paper presentation has already been done) – Présentation des projets (facultative si une présentation de papier à déjà été faite)

Penalty policy: 10% of the grade per 24h late. Example: you submit March 14th at 1:00AM (AoE) you get a penalty of 10%. You submit March 15th at 2:00AM (AoE) you get a penalty of 20%.

Note that each time you edit your submission it *removes* the previous timestamp.

3.2 Details

The goal of the extended abstract is to separate the generation and confirmation of hypotheses. This process is inspired from the Pre-registation experiement NeurIPS 2020 workshop. The idea is to separate the formulation of a scientific hypothesis to its validation:

> *Pre-registration changes the incentives by reviewing [...] before experiments are conducted. The emphasis will be on whether the experiment plan can adequately prove or disprove one (or more) hypotheses. Some results will be negative, and this is welcomed. This way, good ideas that do not work will get welcomed. Finally, the clear separation between hypothesizing and confirmation will raise the statistical significance of the results.*

As a summary the process is:

- Come up with a project (empirical or theoretical). The goal here is to pinpoint new questions.
- Write the extended abstract without confirmatory experiments/proofs by motivating this idea. (Providing context and motivations)
- Run the experiments/work on the proofs and report your results.

3.3 Pages limits

The extended abstract should be **maximum 2 pages long** (not including refs) and the final report should be **maximum 8 pages long** (not including refs). You can also have an appendix for proofs and additional results but the focus of the evaluation will be on the 8 pages of the main text.

3.4 Code

The code can be an important aspect of the project. If it is the case it *must* be part of the project report. The source can be shared with the project report but it is strongly advised to share a Github repository (or any other version control system) containing the frequent commits of code. Here is a summary of the guidelines:

1. A good practice is to start a Github repository as soon as possible and to frequently commit you updates on the code.
2. I advice you to use a strong IDE (integrated development environment). My advice is Pycharm (you can get a free license as a student).
3. It is fine to use some open source code if you are transparent about it! (If you pretend it is your own code it is considered as plagiarism)
4. If you need advice about the coding workflow/good practices come to the office hours.

Regarding the project contributions, doing a new experiment that is well motivated and requires the design of some new code is a sufficient contribution for the project. The motivations and descriptions of the new experiment(s) should be presented in the extended abstract.

3.5 Resources

In order to access the feasibility of your project. You should roughly indicate the computational resources you will have access to (cluster, personal GPU, collab,...)

References

References

A Figures

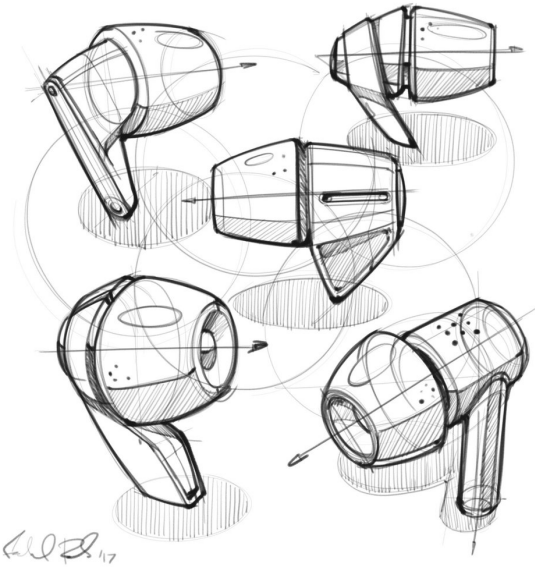

Figure 1: Example of a design sketch. Source: fedriodesign

Figure 2: Example of a design sketch