Image Vectorization for Architecture

Senior Projects Proposal

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Problem Statement

Raster (pixel-based) images often contain excess information

- Preserve target information while removing excess
- Video call, (usually) only face is of interest, not background
- Geometric images (e.g., architecture), shape-based representation is much more efficient

Convert raster images to a **vector (shape-based) graphics** format?

- Can have information loss as long as target information is preserved

Proposed Solution

Improve image vectorization so that we:

- Retain most information of interest
- Remove most excess information

Use cases:

- Highly shape-based images (e.g., architectural photographs or sketches)
- Machine learning preprocessing

Background

Numerous pre-existing algorithmic approaches to vectorization

1. Edge detection & tracing (two colors only)
2. Blue-noise sampling & triangulation
3. Existing use-cases: charts, maps, clip-art, fonts

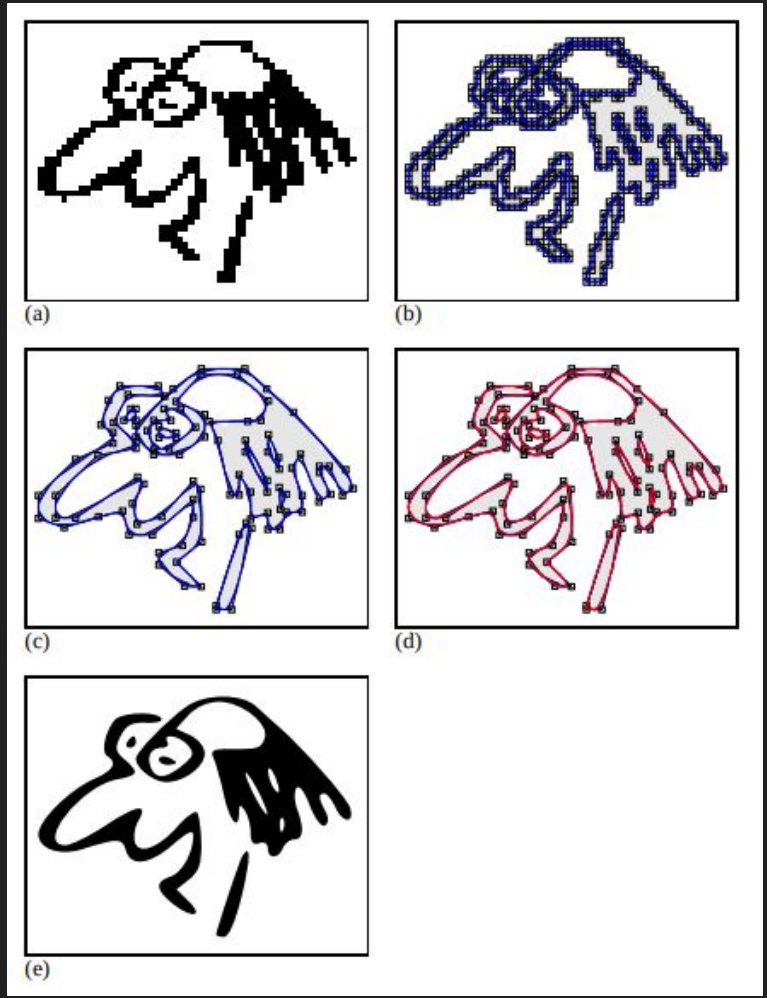
Does not appear to be many machine learning approaches

- Only for simple shapes (e.g. clip-art and fonts)

Potrace

- 2 colors only
- Shape reduction

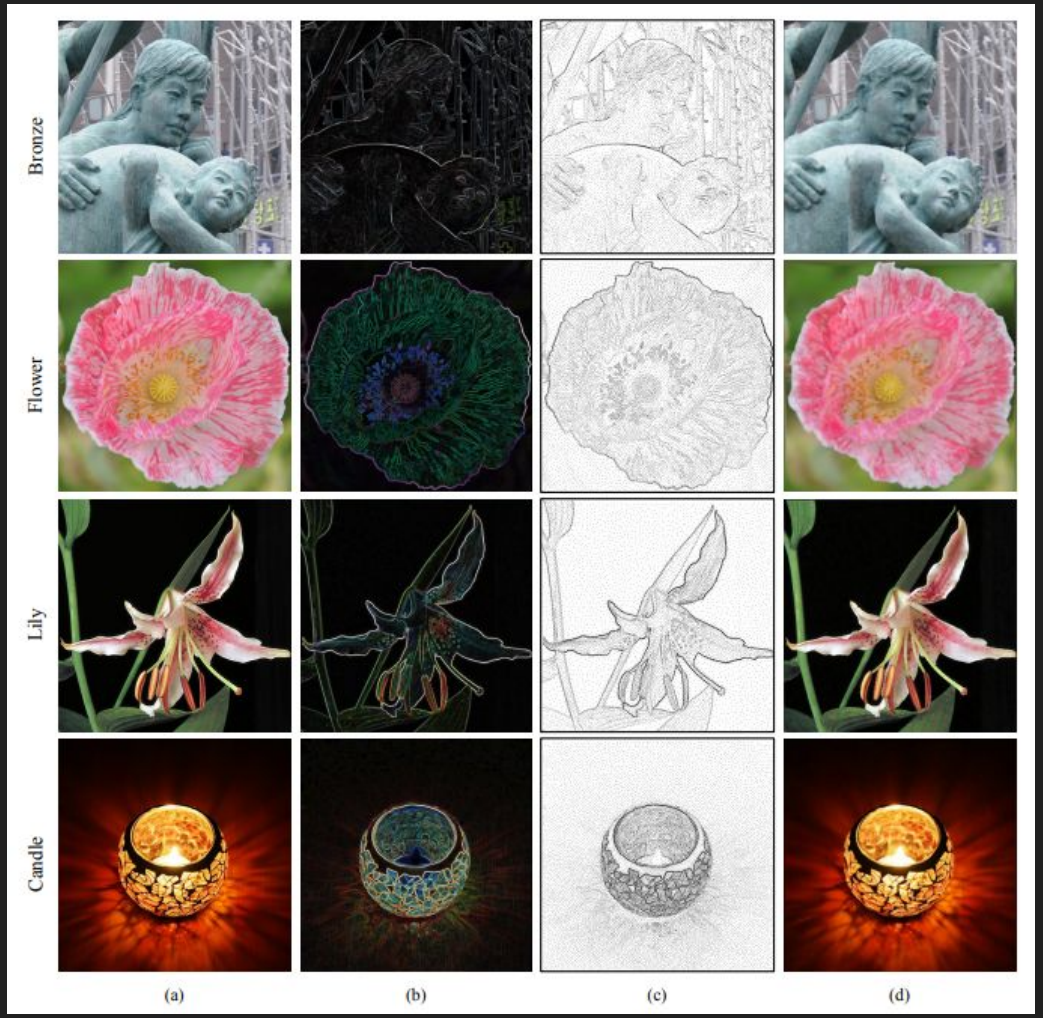
Selinger, Peter. "Potrace: a polygon-based tracing algorithm." Potrace (online), http://potrace. sourceforge. net/potrace. pdf (2009-07-01) 2 (2003).



Blue-noise sampling

- Multiple colors
- Variable resolution

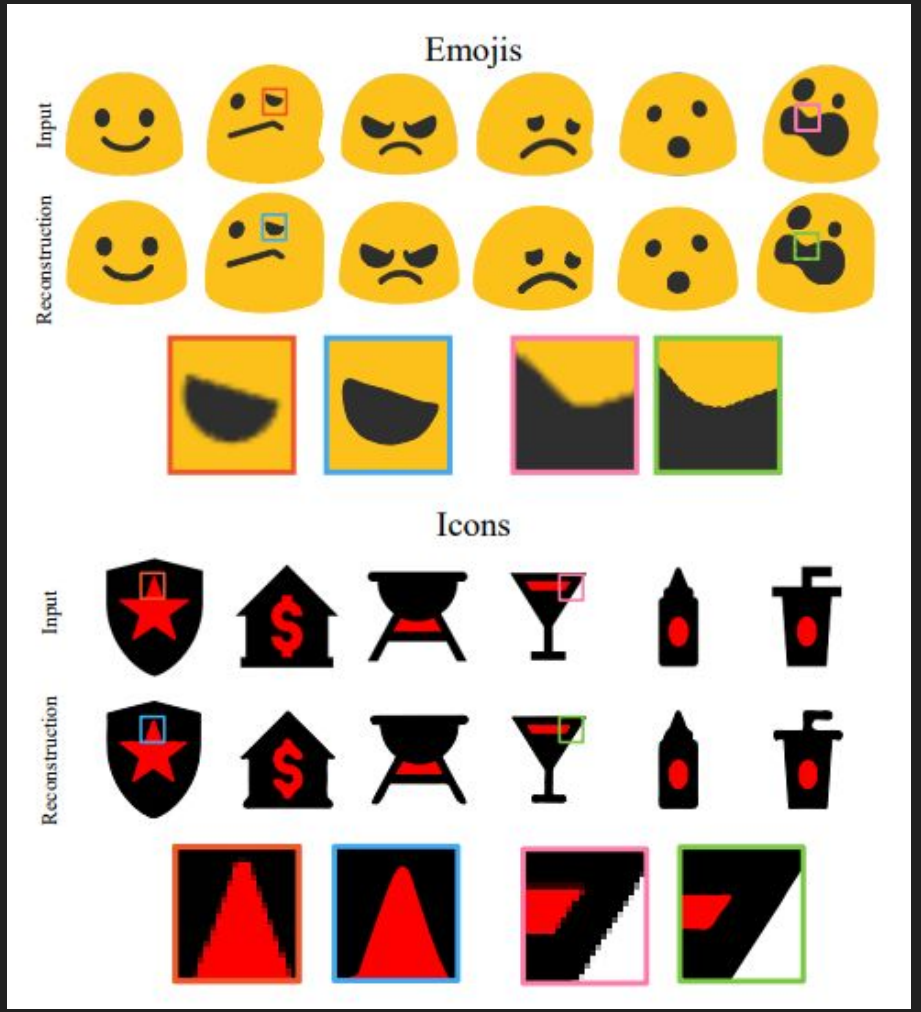
Zhao, Jiaojiao, Jie Feng, and Bingfeng Zhou. "Image vectorization using blue-noise sampling." Imaging and Printing in a Web 2.0 World IV. Vol. 8664. International Society for Optics and Photonics, 2013.



Im2Vec

- Hardcode # shapes/colors

Reddy, Pradyumna, et al. "Im2vec: Synthesizing vector graphics without vector supervision." Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition. 2021.



Experimental Design

1. Experiment with sampling methods
2. Two possibilities
   a. Use machine learning on the blue-noise sampled points or triangulated points
   b. Use shape reduction on the trangulated points

Project Timeline

1. Brainstorming
2. Reimplementation of previous work
3. **Project pitch**
4. First implementation
5. Iterative design process...
6. Write report

Q&A