Congealing
or
Finding the Platonic Gate

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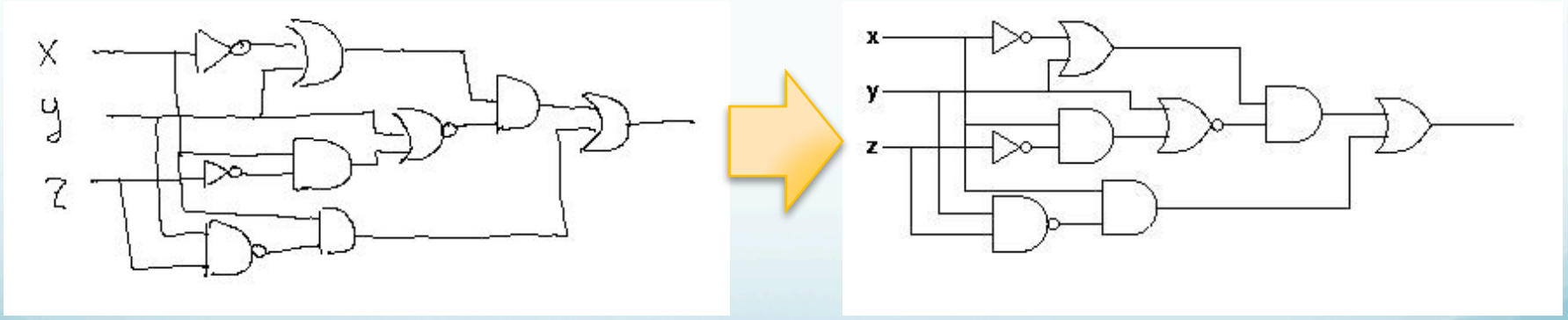
Outline

- Sketching as a whole
  - Gate level recognition
- Our solution: Congealing
  - Motivation
  - Algorithm
  - Results
- Future work

Sketching vs. Design

- Sketching is fast and intuitive
- But there is no automated verification or simulation for sketches
- Putting a sketch into a design program is tedious
- Solution: Make a computer do it!

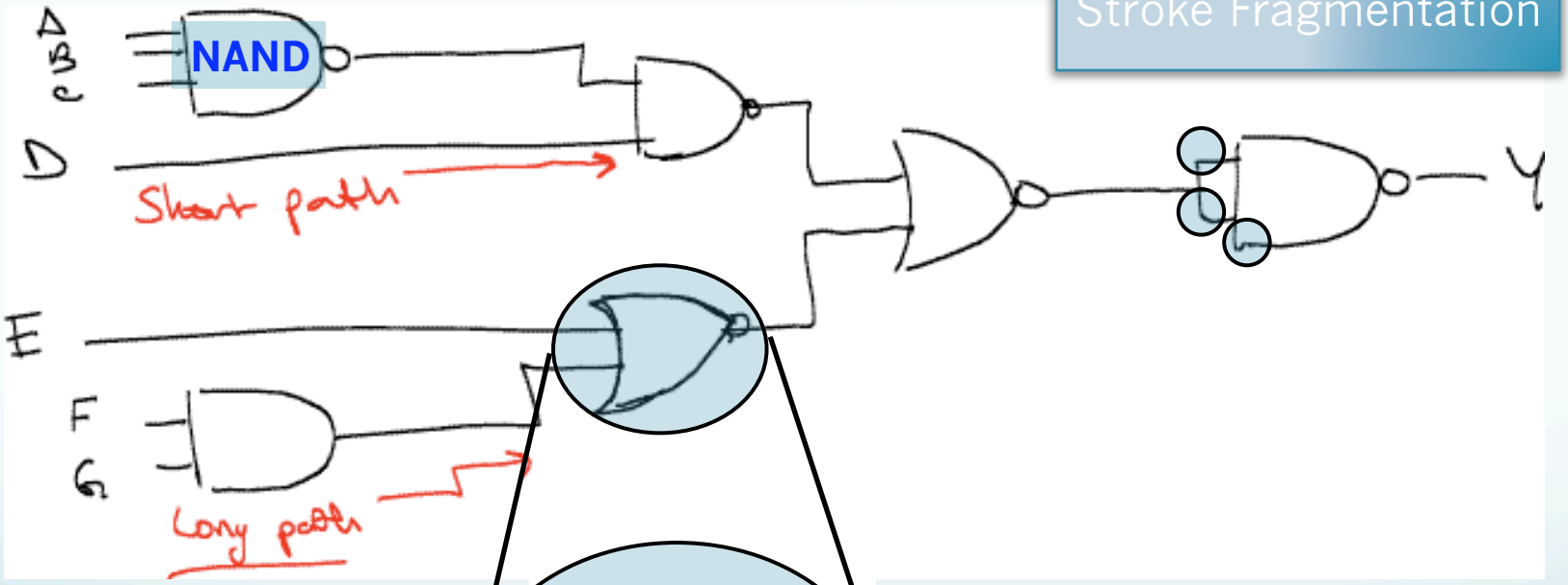


But Sketch Recognition is HARD!

Sketch Recognition Subtasks

Symbol Recognition

Stroke Fragmentation

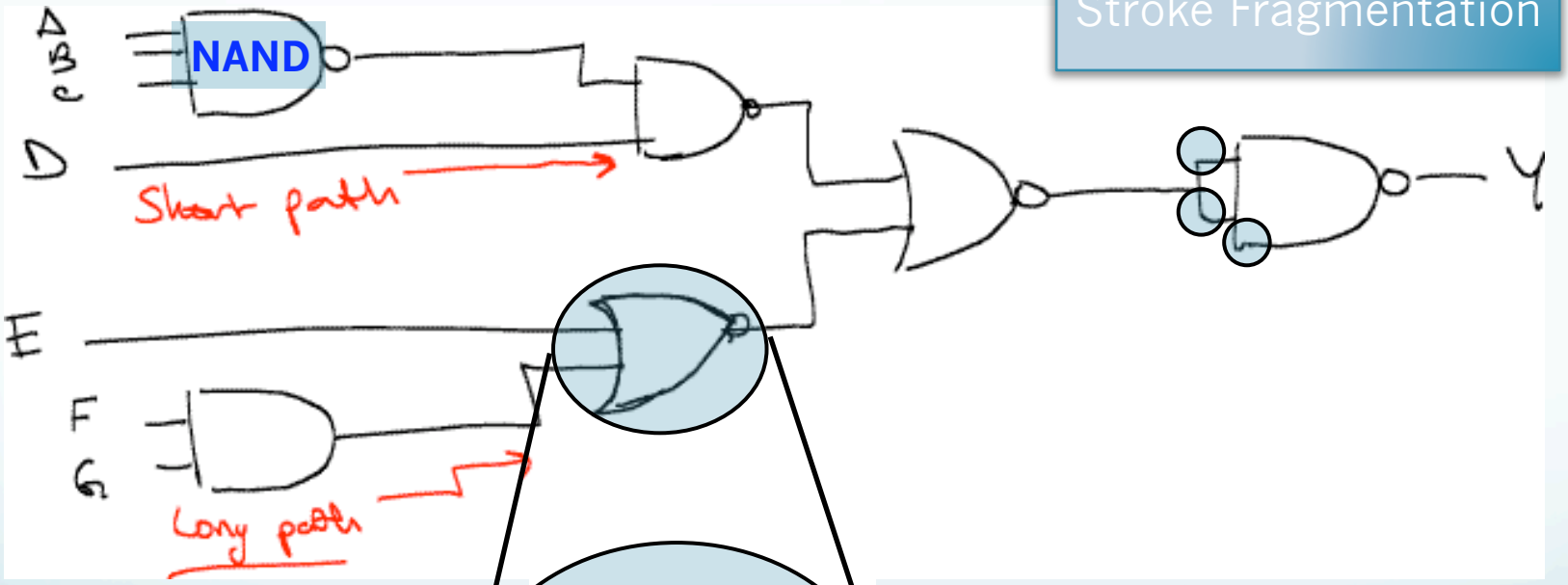


Stroke Grouping

Sketch Recognition Subtasks

Symbol Recognition

Stroke Fragmentation

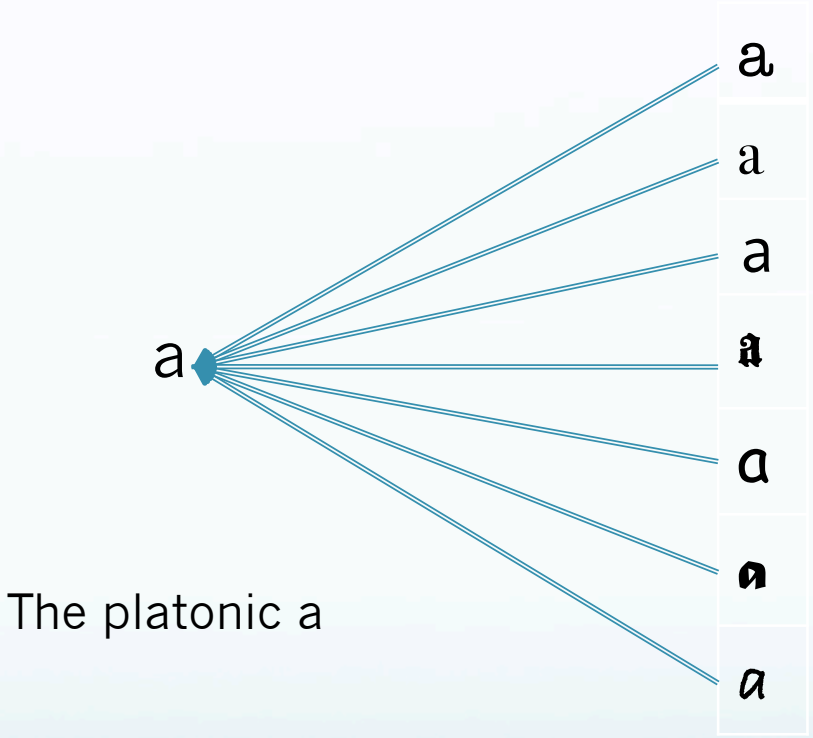


Stroke Grouping

Congealing

- Based on *Learning from One Example Through Shared Densities on Transforms*
- Individual instances of gates vary widely
- We want to create a “platonic gate” to do recognition against

Congealing



The platonic a

Instances of a

Congealing

- Want a computer to be able to do find platonic images automatically
- Assume that there is some transformation from the platonic image to any gate you draw
- Given a set of gates, find the inverse of these transformations
- We assume transforms are affine
  - Scale
  - Shift
  - Shear
  - Rotate

Training

- Want to *minimize* the summed pixel-wise entropy
- Average image
- Metric
  - Binary entropy function

Training

1. Apply affine transform to an individual image
2. If the transformation decreases the total entropy, keep it
3. Repeat 1 and 2 for each image and possible affine transform
4. Repeat 1-3 until improvement stops

Training Results

Training Results

Classification

- Congeal candidate image against a sequence of average images
- This creates a version of the candidate image in platonic space
- Use a simple distance-based classifier on images in platonic space.

Future Work

- Create a generic function that maps from affine transforms to total entropy
  - Will allow us to use a variety of numerical methods
- Testing of the classifier with several metrics
- Recognition of sub-parts of gates to aid in grouping stage of sketch recognition

Questions?