

Identifying pokémon cards with computer vision

github.com/hugopeixoto/ptcg-detection

Hugo Peixoto (he/him)
hugopeixoto.net

My pokémon



Process overview

- Grab frame from webcam stream
- Extract the card from frame
- Search our dataset for a similar card

Lowering of expectations



Grabbing a dataset

<https://pkmncards.com/>

~14 thousand cards

The screenshot shows the search results for 'set:chilling-reign' on the pkmncards.com website. The page displays a grid of Pokémon cards. At the top, there is a search bar with the text 'Search for Pokémon cards' and a search icon. To the right of the search bar, it says 'Advanced · Sets · ???'. Below the search bar, it shows 'results 1 thru 233 / 233' and 'page 1 / 1'. There are also sorting options: 'sort by...' followed by dropdown menus for 'date: released', 'auto', and 'images'. The cards shown are:

- Weedle** (Basic, 40 HP): Pierce 20.
- Kakuna** (Basic, 80 HP): Stiffen.
- Beedrill** (Basic, 130 HP): Persist Sting, Jet Spear 110.
- Ledyba** (Basic, 60 HP): Collect, Punch 20.
- Ledian** (Basic, 90 HP): Rapid Draw 20, Air Slash 100.
- Heracross** (Basic, 120 HP): Horn Attack 20, Single-Horn Throw 40+.
- Celebi V** (Basic, 190 HP): Leaflet Dance, Slash Back 60.
- Celebi Vmax** (Basic, 310 HP): Curative Forest, Max Plunk 130.

Detecting the card

1080px



1920px

Detecting the card



Red



Green



Blue

Detecting the card



Grayscale / Luma channel

Detecting the card



Detecting the card



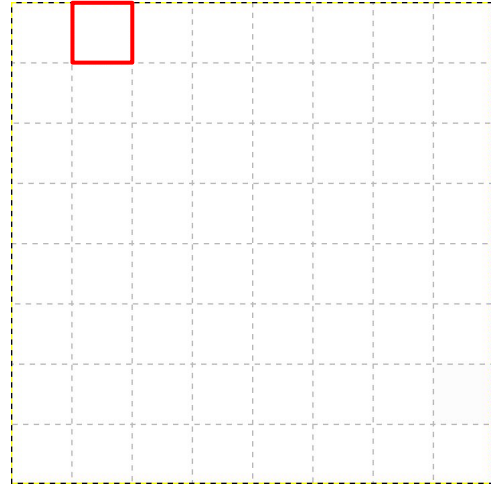
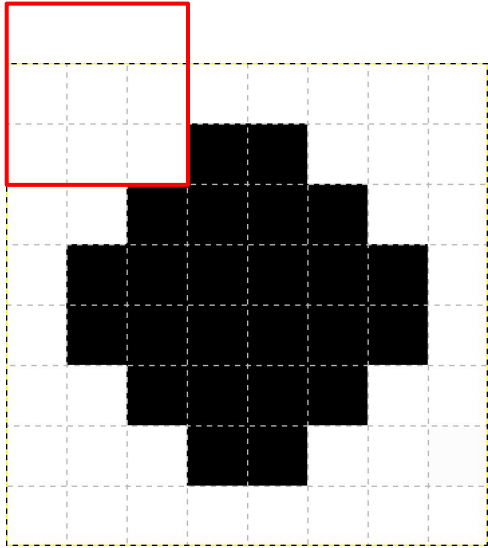
Sobel operator

Detecting the card



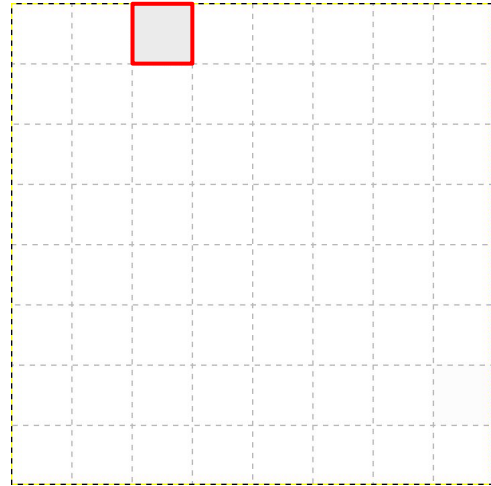
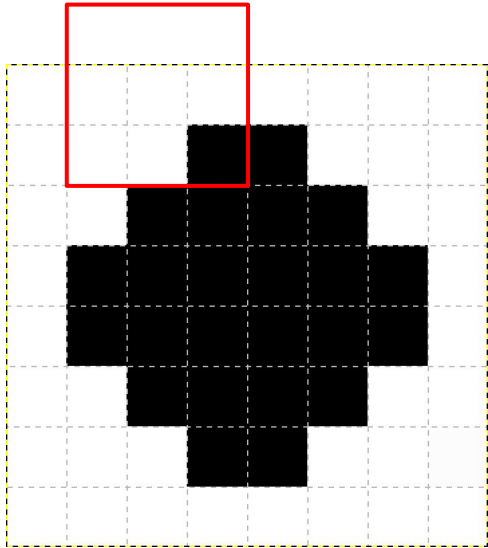
Kernel-based image filters

Detecting the card



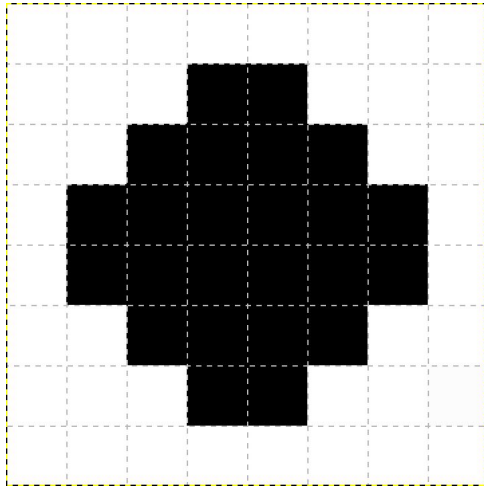
Kernel-based image filters

Detecting the card



Kernel-based image filters

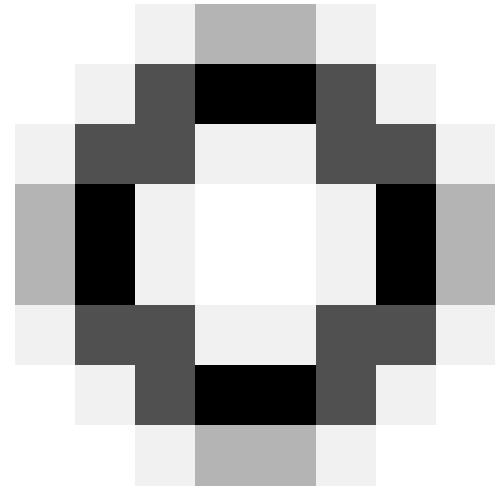
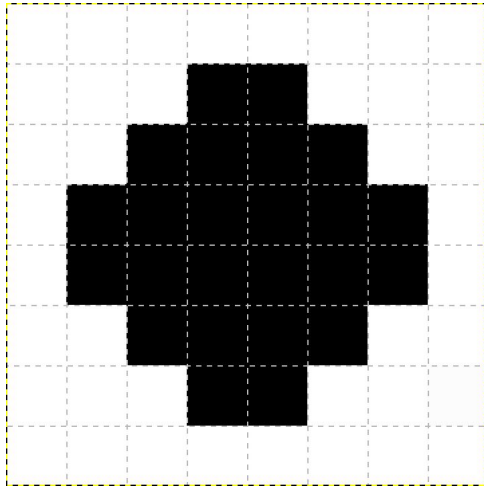
Detecting the card



0	0	360	806	806	360	0	0
0	360	1081	1140	1140	1081	360	0
360	1081	1081	360	360	1081	1081	360
806	1140	360	0	0	360	1140	806
806	1140	360	0	0	360	1140	806
360	1081	1081	360	360	1081	1081	360
0	360	1081	1140	1140	1081	360	0
0	0	360	806	806	360	0	0

Sobel operator

Detecting the card



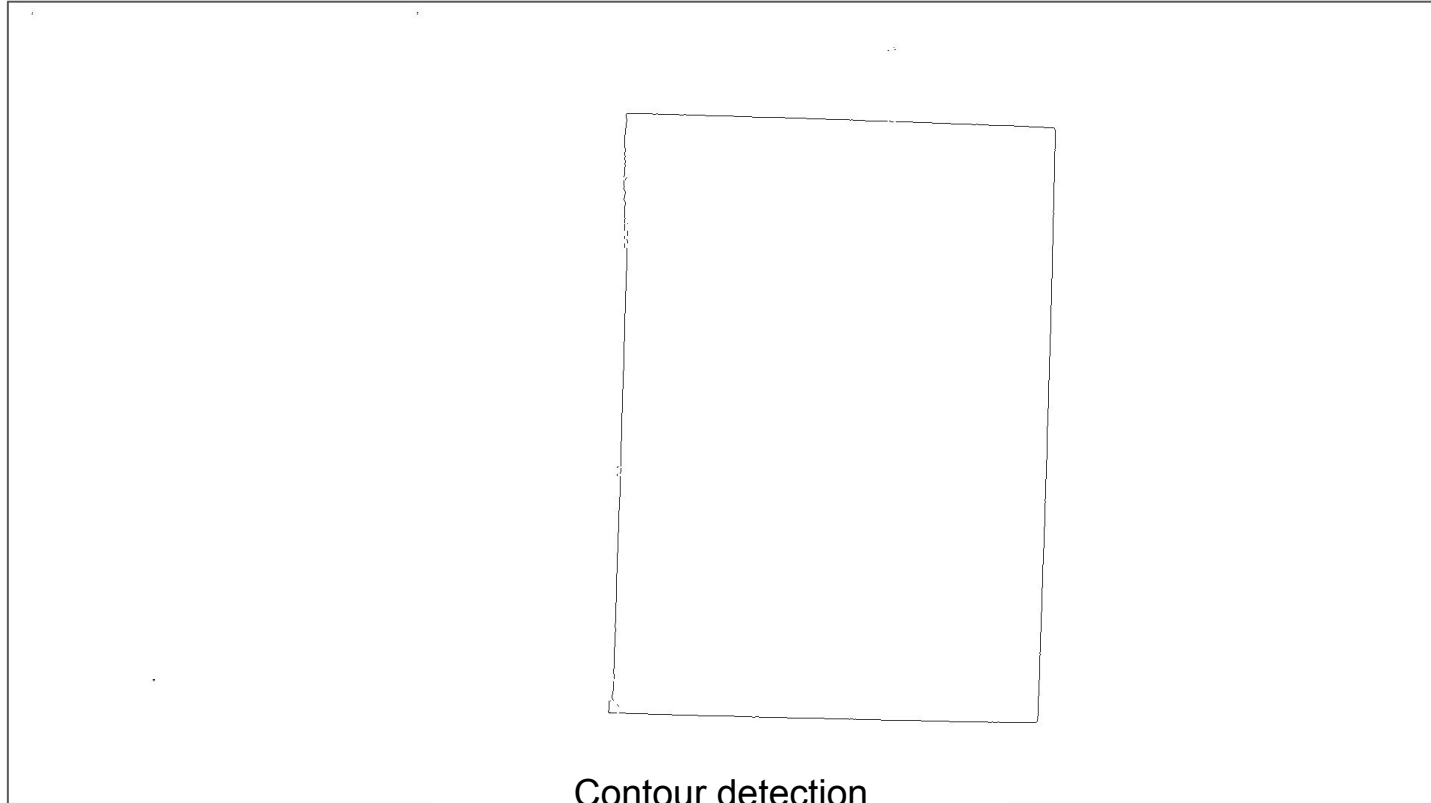
Sobel operator

Detecting the card



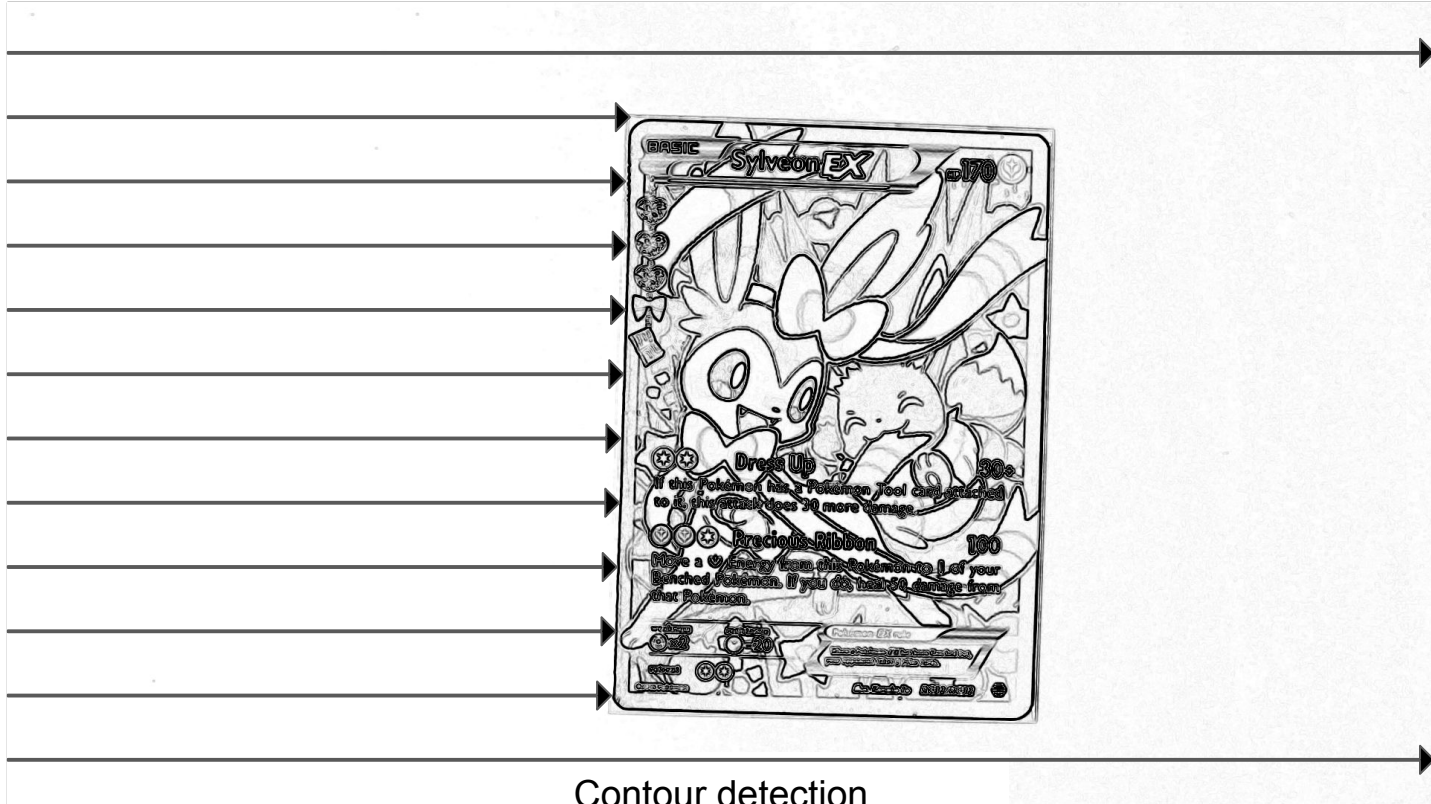
Sobel operator

Detecting the card



Contour detection

Detecting the card



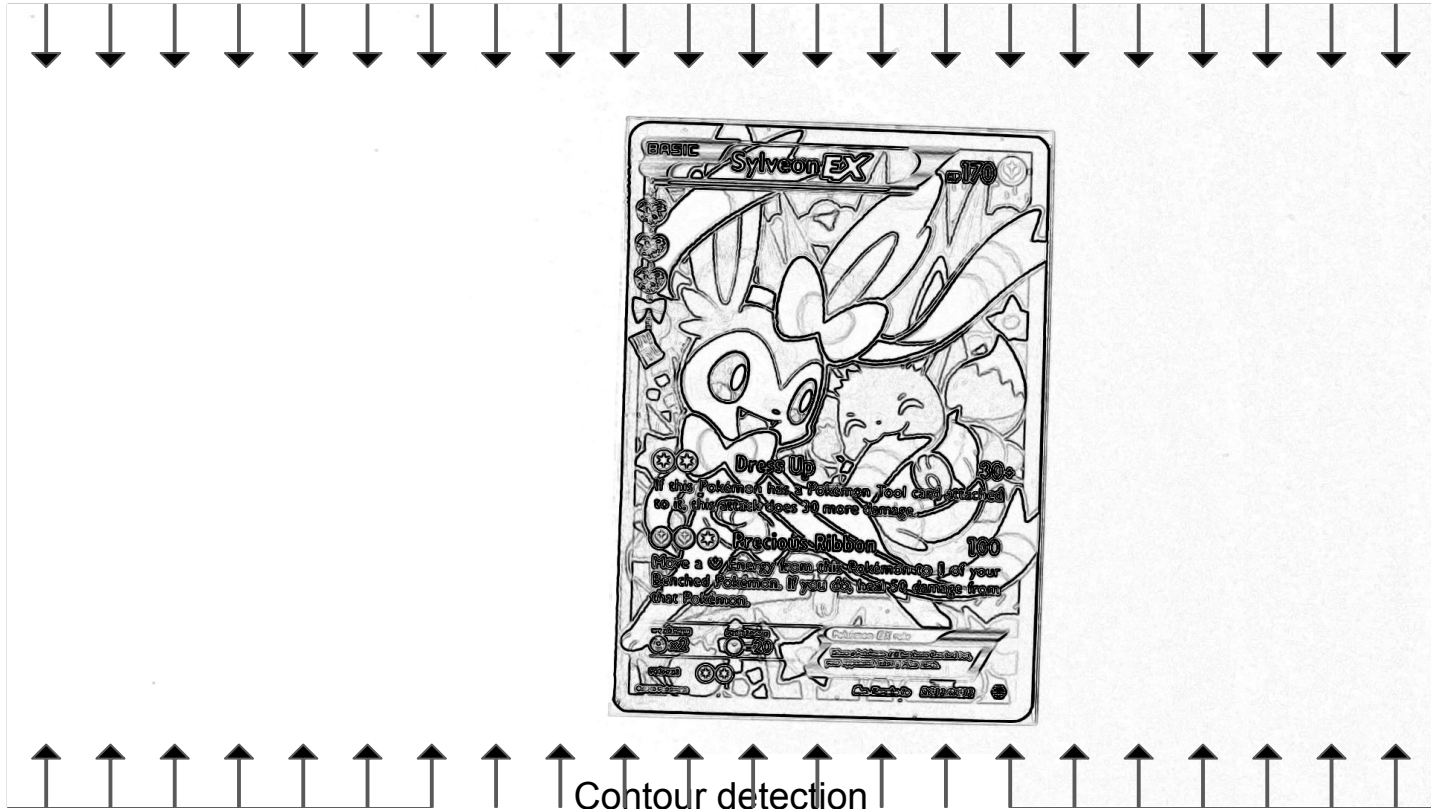
Contour detection

Detecting the card

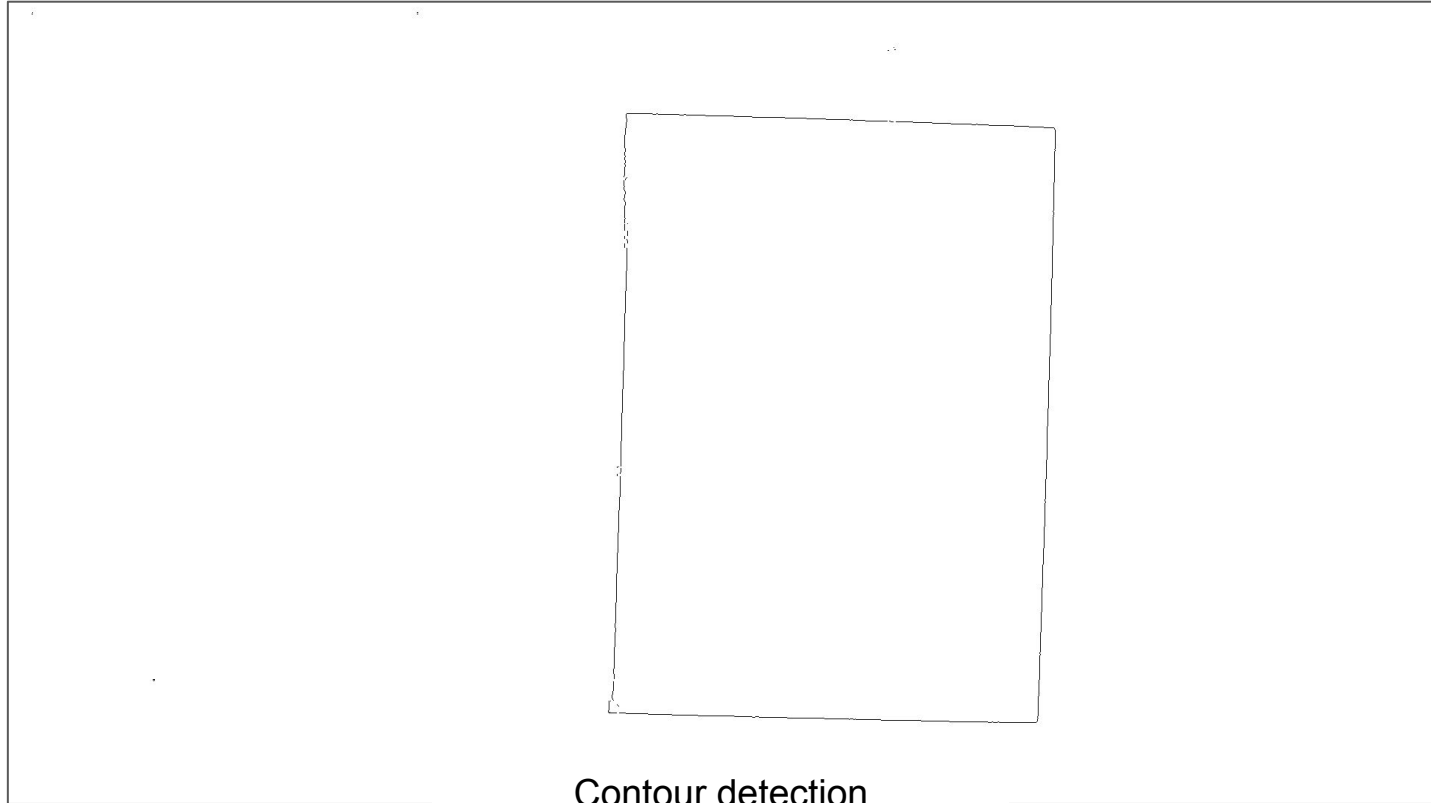


Contour detection

Detecting the card

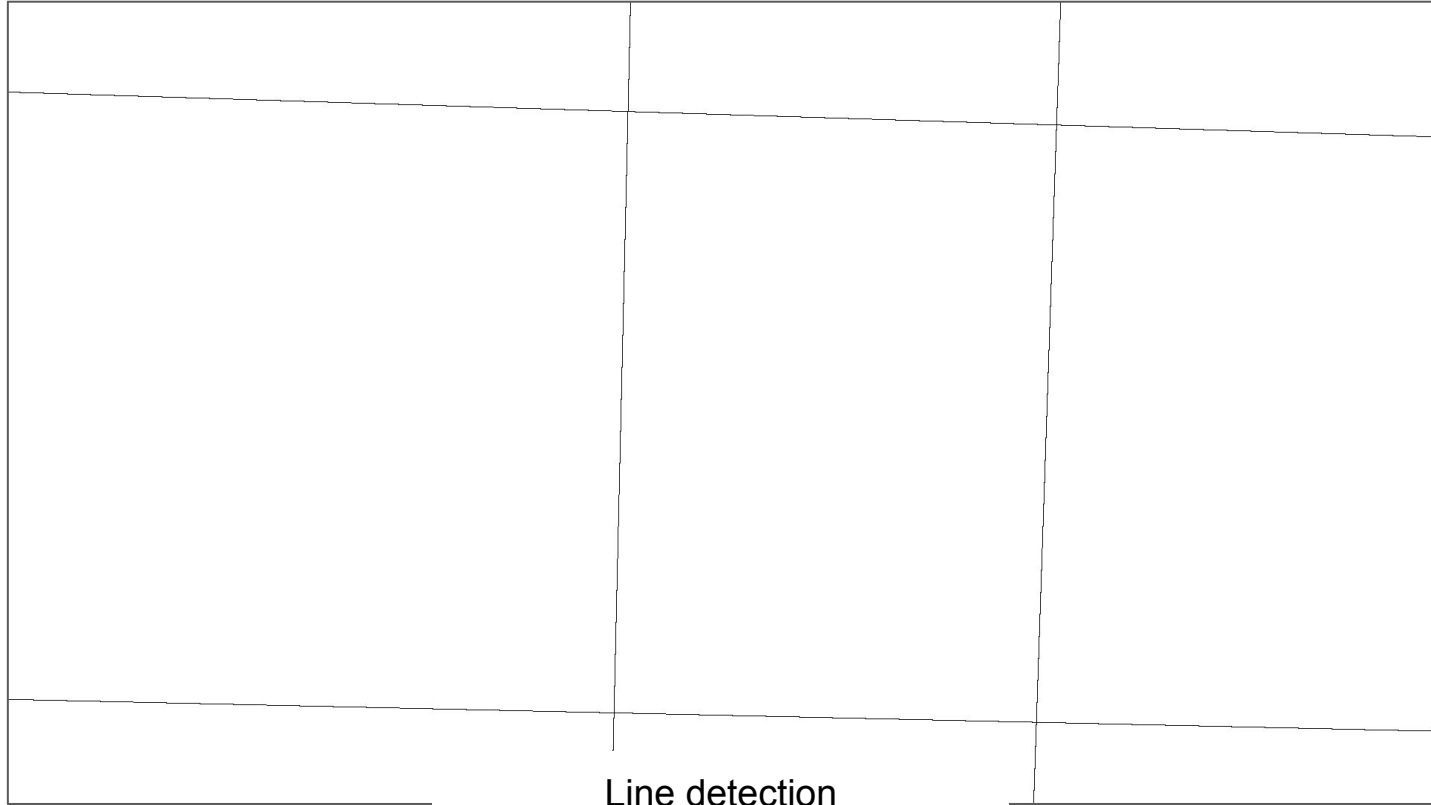


Detecting the card

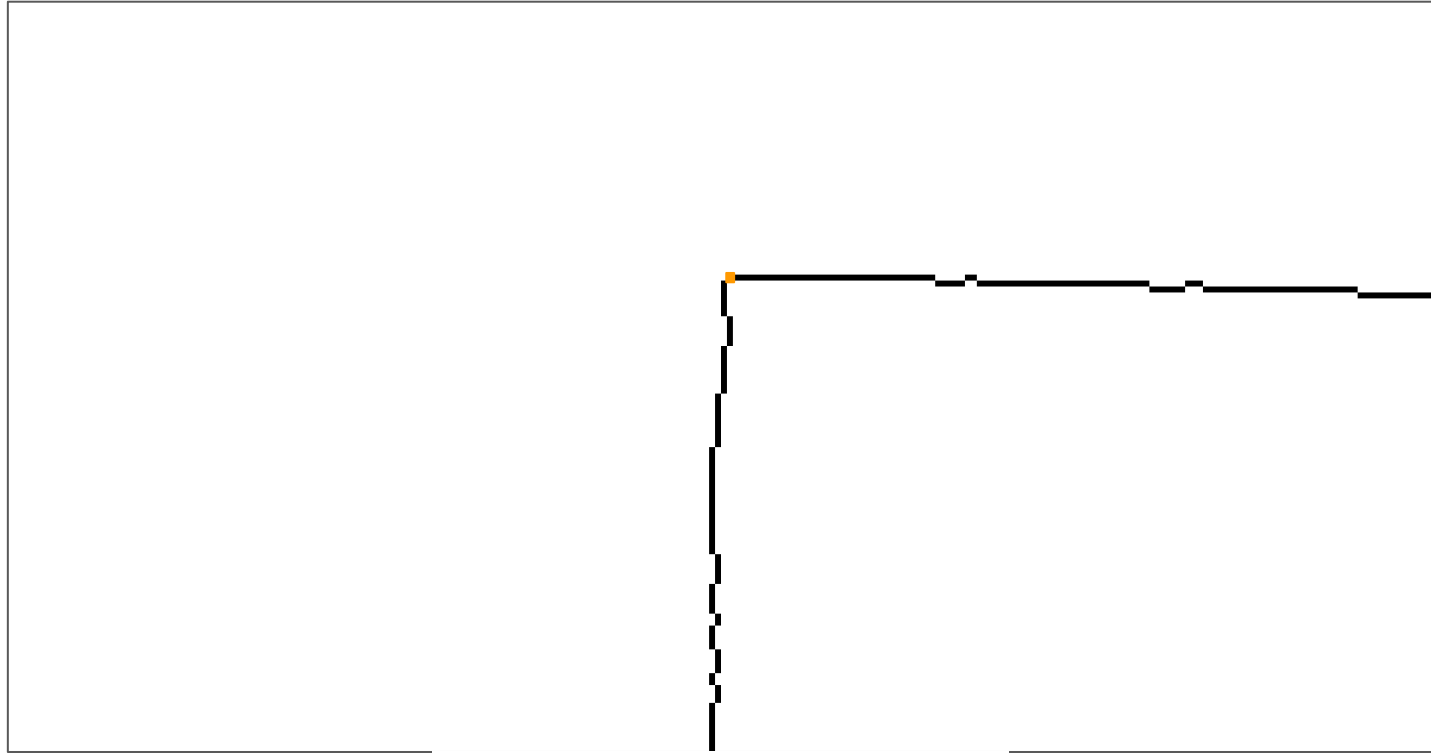


Contour detection

Detecting the card

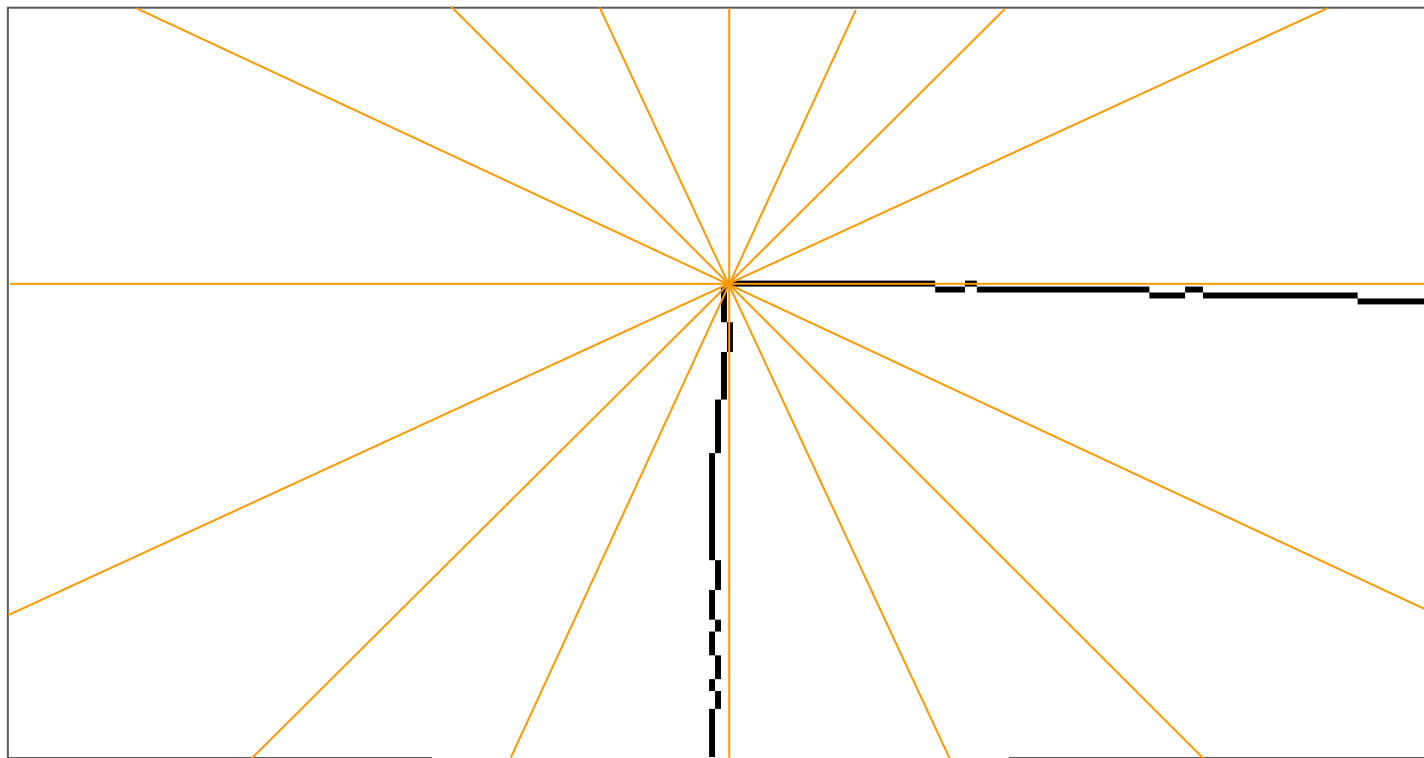


Detecting the card



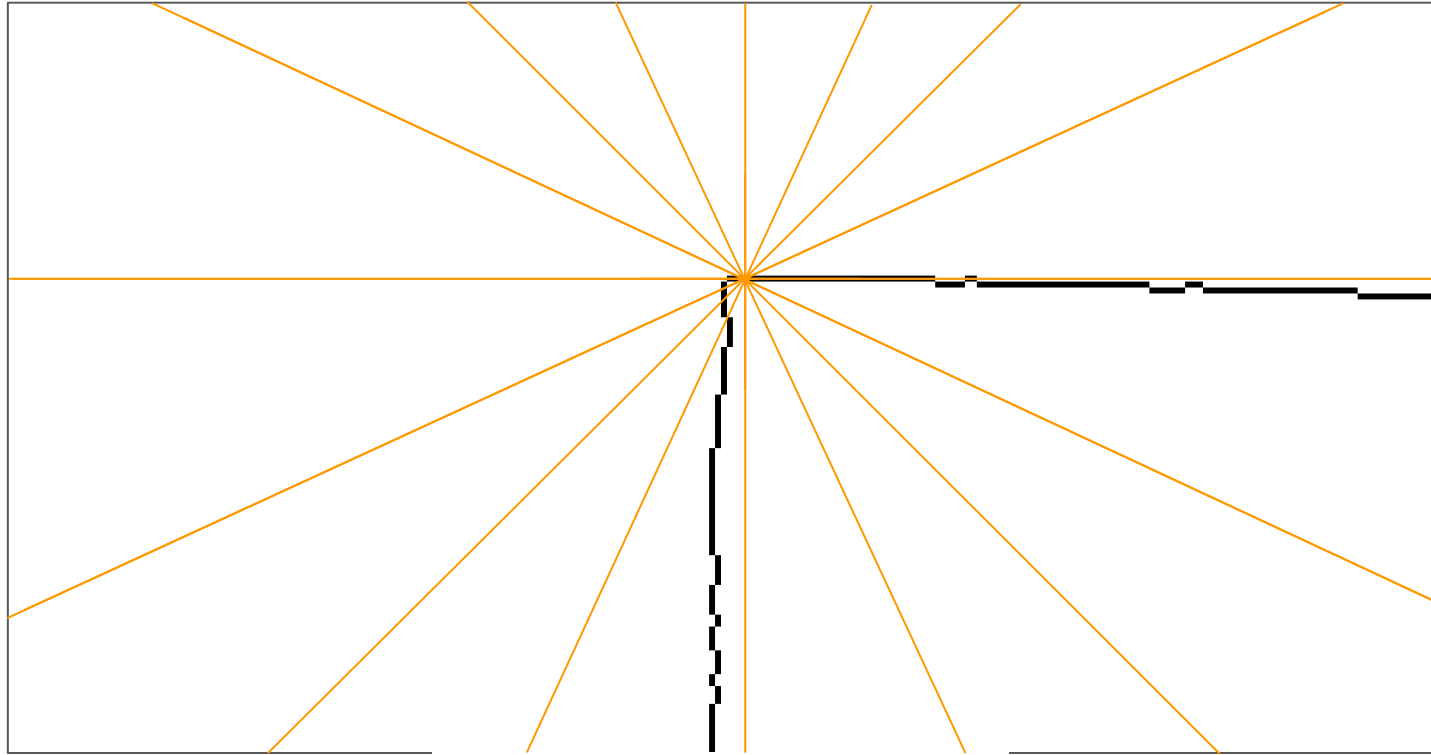
Hough transform

Detecting the card



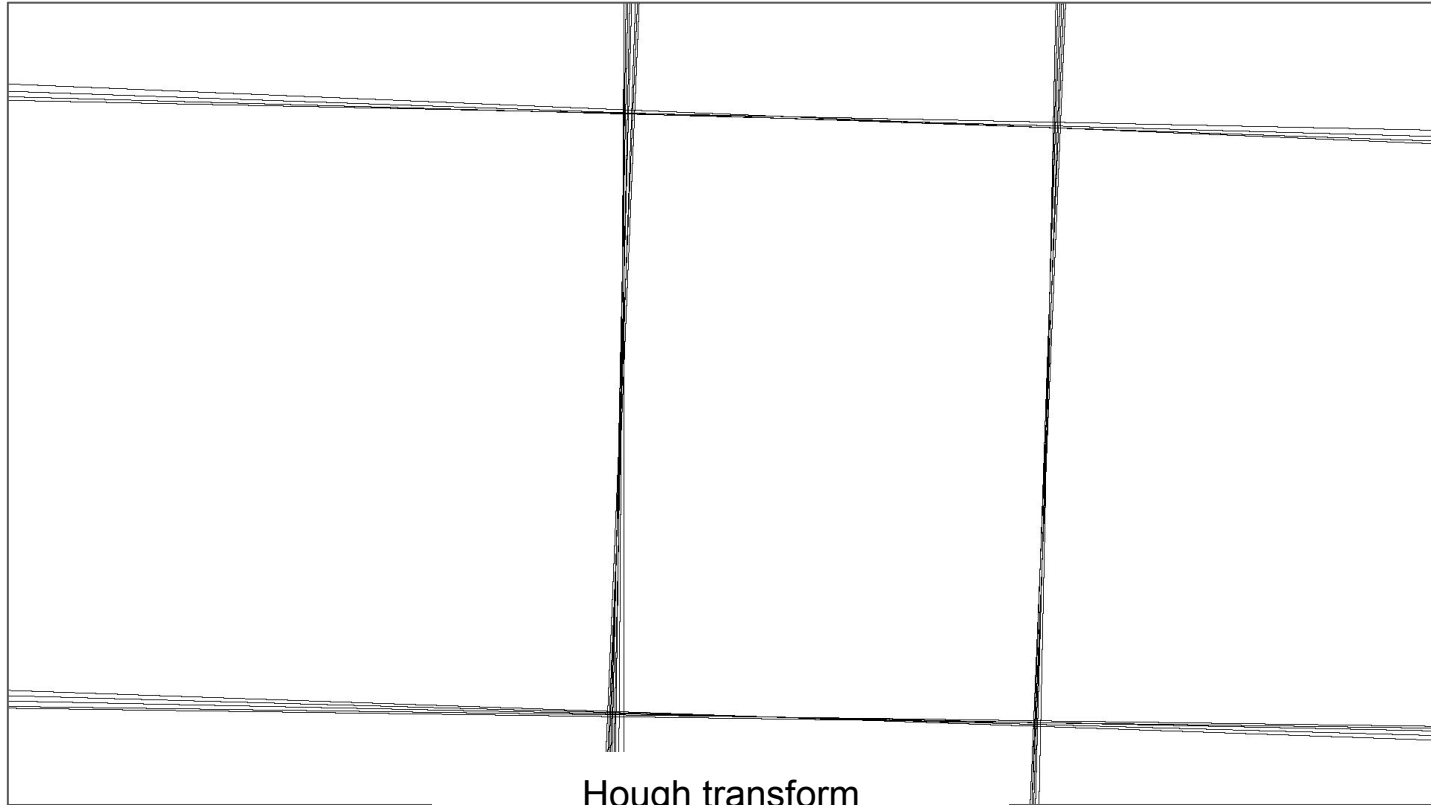
Hough transform

Detecting the card

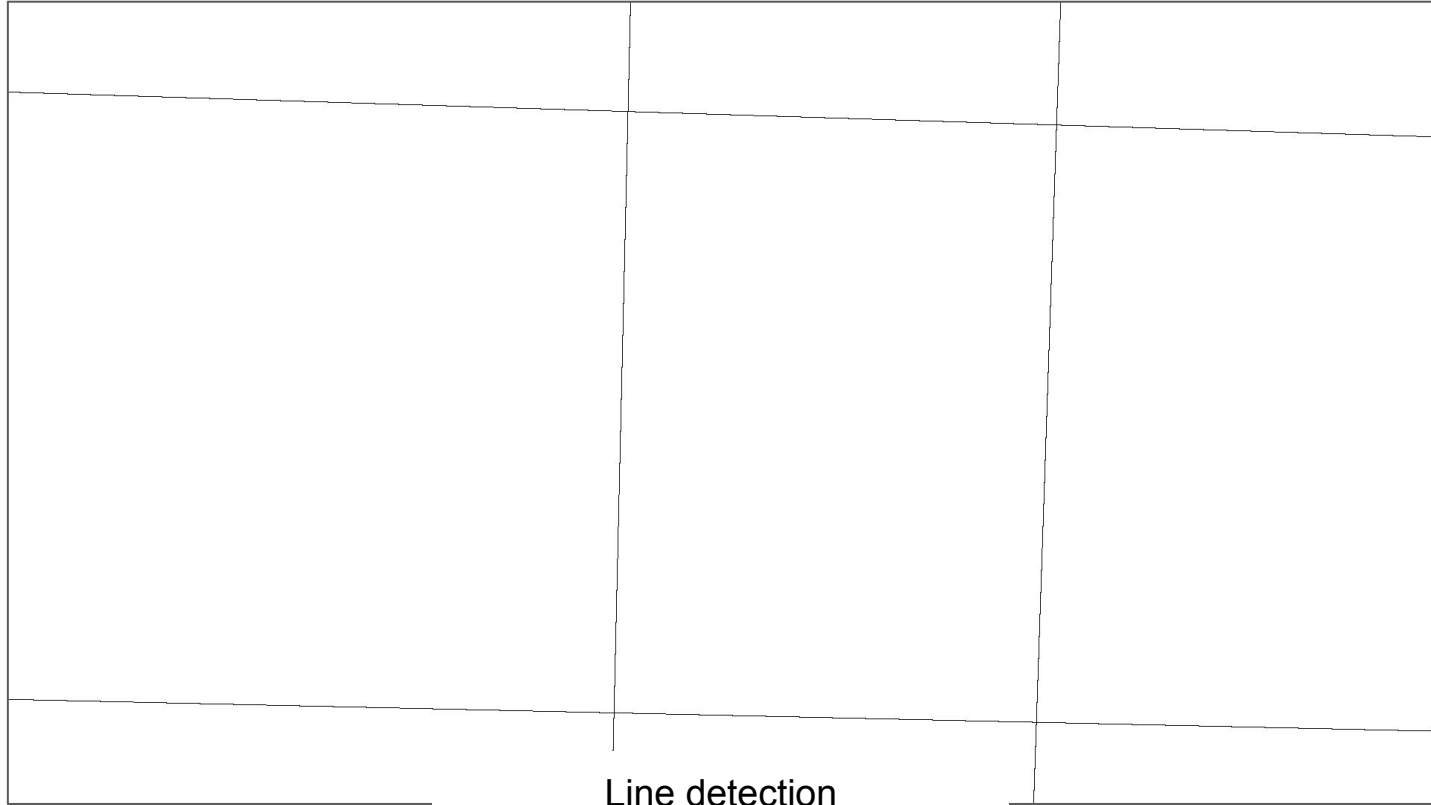


Hough transform

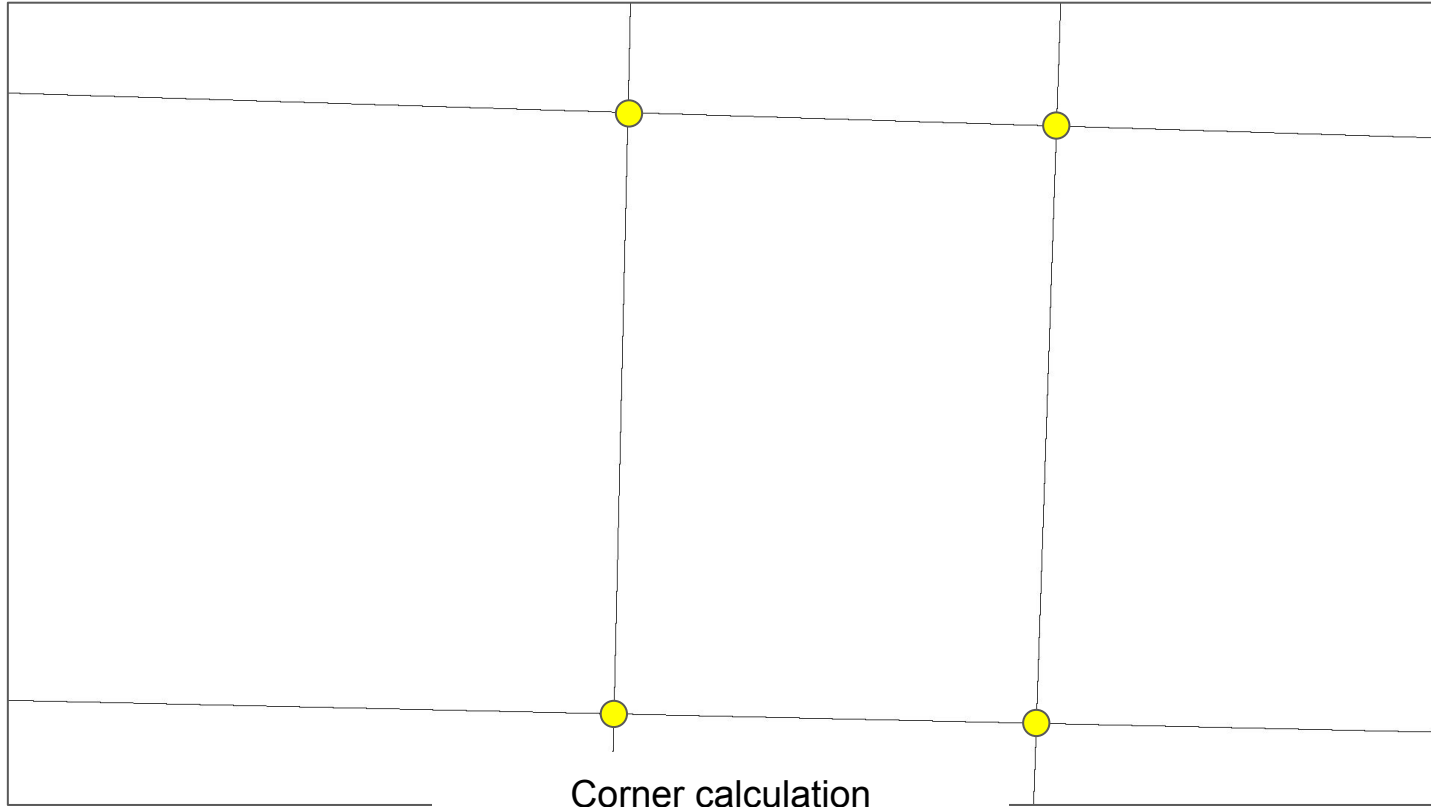
Detecting the card



Detecting the card



Detecting the card



Detecting the card



Fixing the perspective

Detecting the card



Fixing the perspective

Detecting the card

nalgebra.org



Linear algebra library for the Rust programming language.

Get Started

Fixing the perspective

Detecting the card



Fixing the perspective

Finding a match



Finding a match

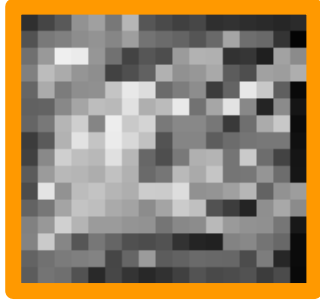


perceptual hashing

Finding a match



resize

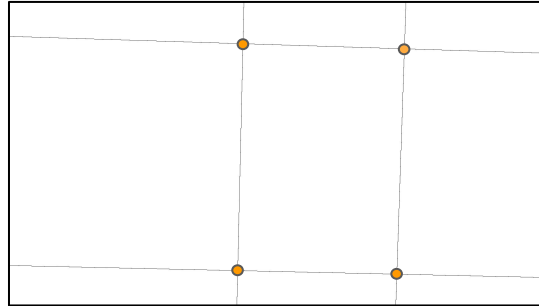
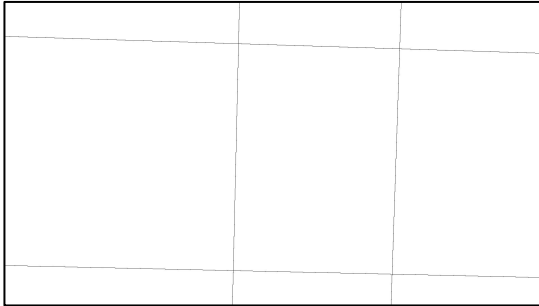
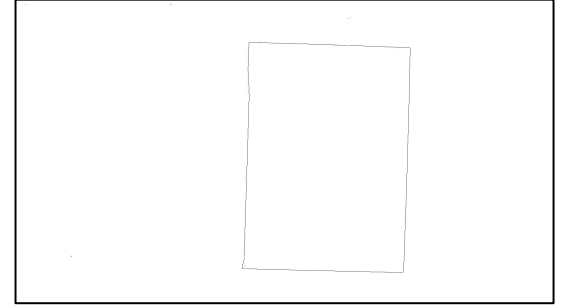
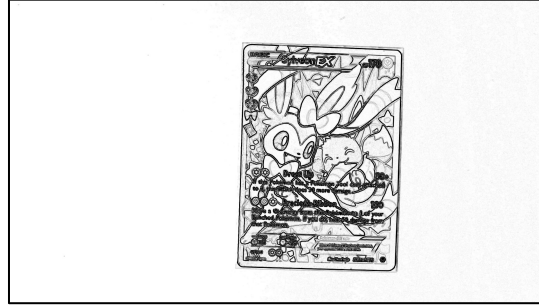
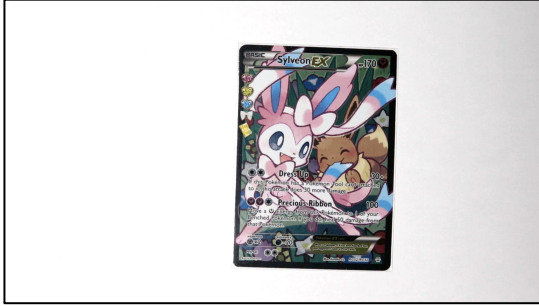


binarize

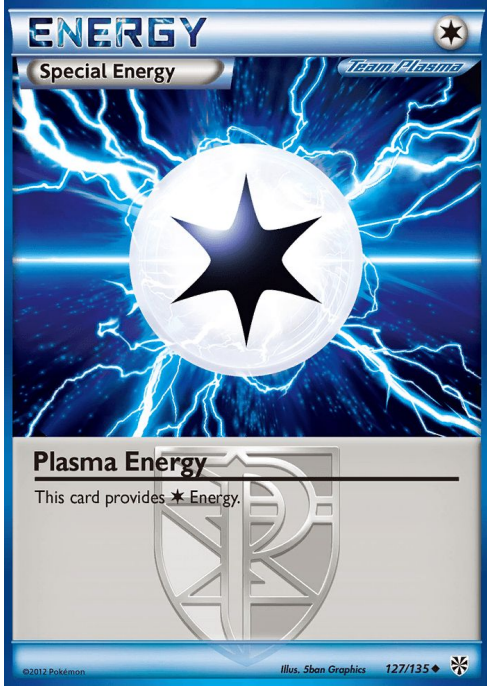
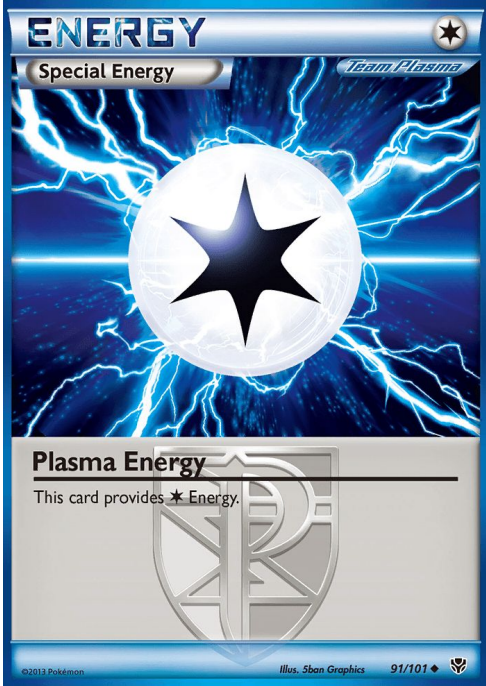


perceptual hashing

Process overview

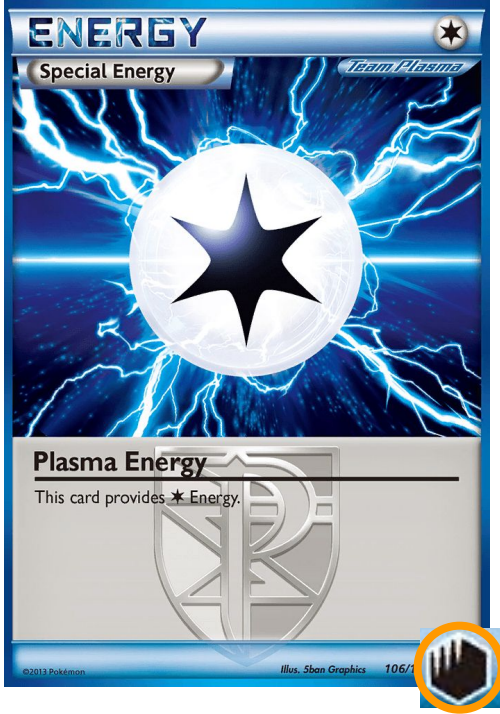
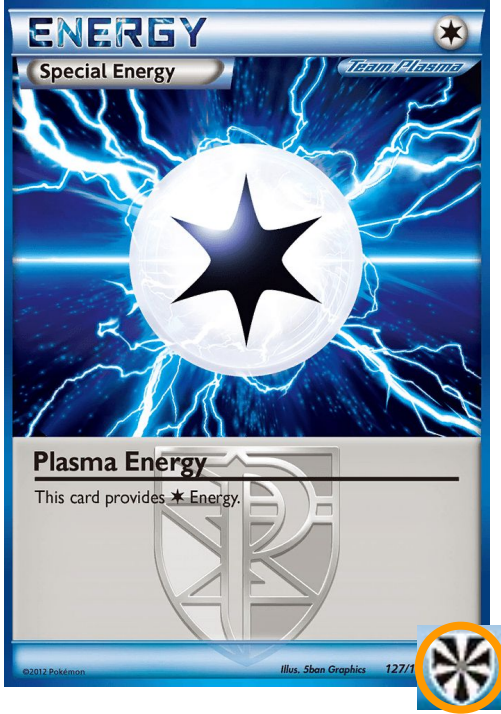
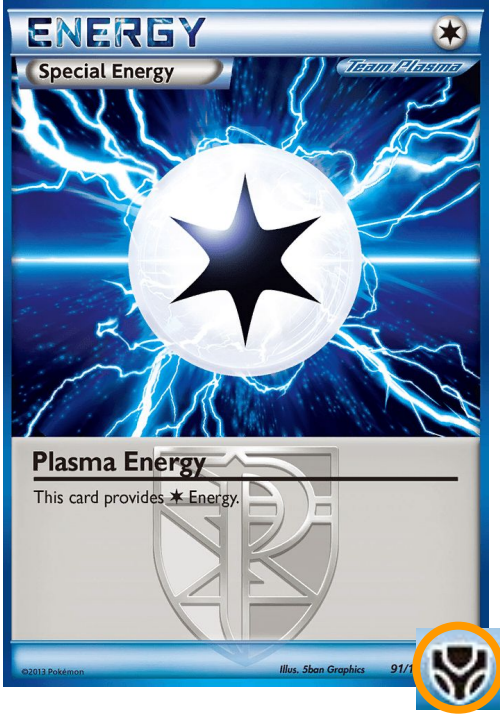


Finding a match



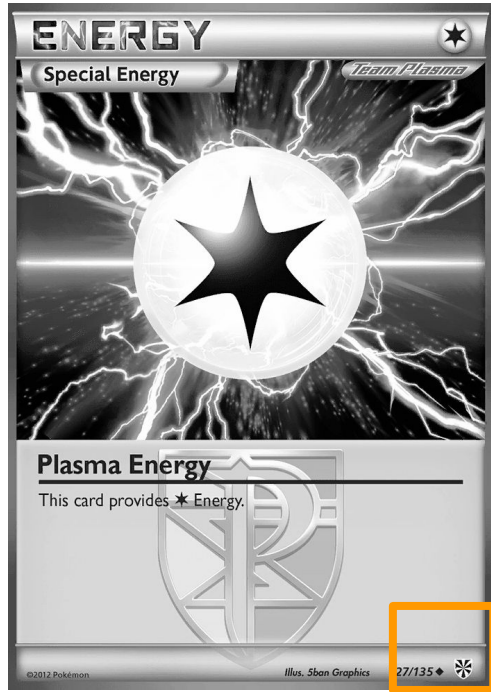
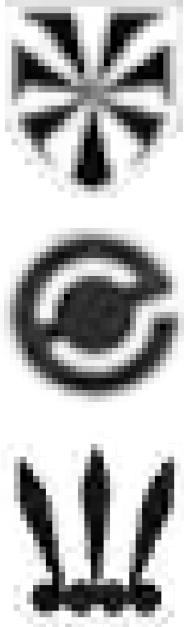
cards from different sets

Finding a match



cards from different sets

Finding a match



template matching

Finding a match



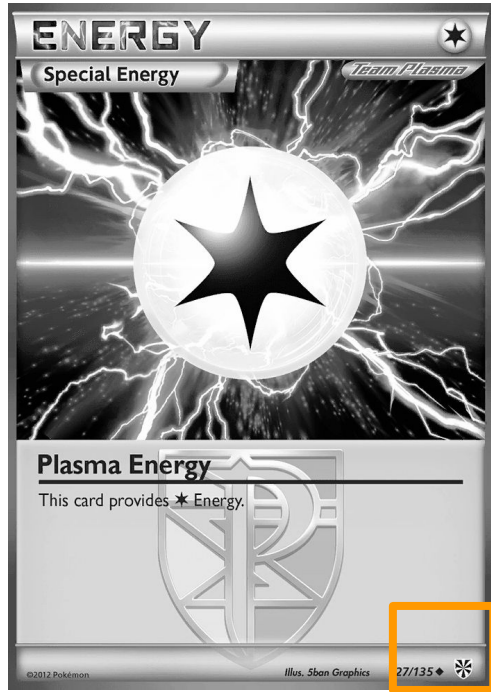
$e < 0.15$



$e < 0.10$



$e < 0.20$



template matching

Demo

Demo link: <https://hugopeixoto.net/pokemon/detection/demo.mp4>

Libraries

Used:

- image <https://crates.io/crates/image> image loading
- v4l <https://crates.io/crates/v4l> video stream
- nalgebra <https://crates.io/crates/nalgebra> perspective fixing
- img_hash https://crates.io/crates/img_hash perceptual hashing

Worth checking:

- imageproc <https://crates.io/crates/imageproc> template matching
- eye <https://crates.io/crates/eye> v4l cross platform
- rust-cv <https://github.com/rust-cv> CV community

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