IAPR special project

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Image segmentation : strategy

- Color HSV separation :
  - Red -> arrow (robot)
  - Blue and black -> digits and math operators

- Morphology to clean up
- Connected component (region growing) for tracking

=> (x,y) robot position

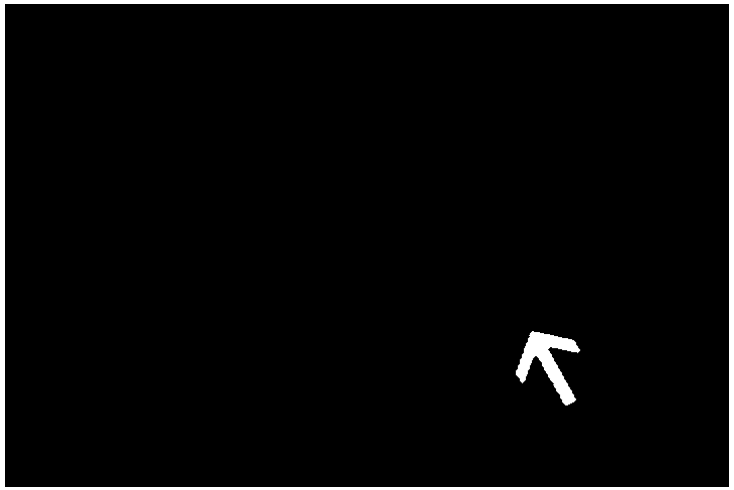
At each frame :

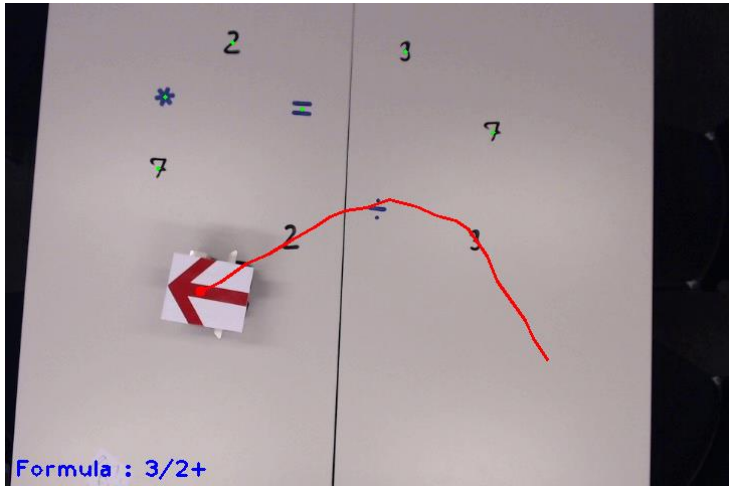
- Robot-chars distance discrimination => formula
- If character is '=' sign => formula result
- Info display on the frame

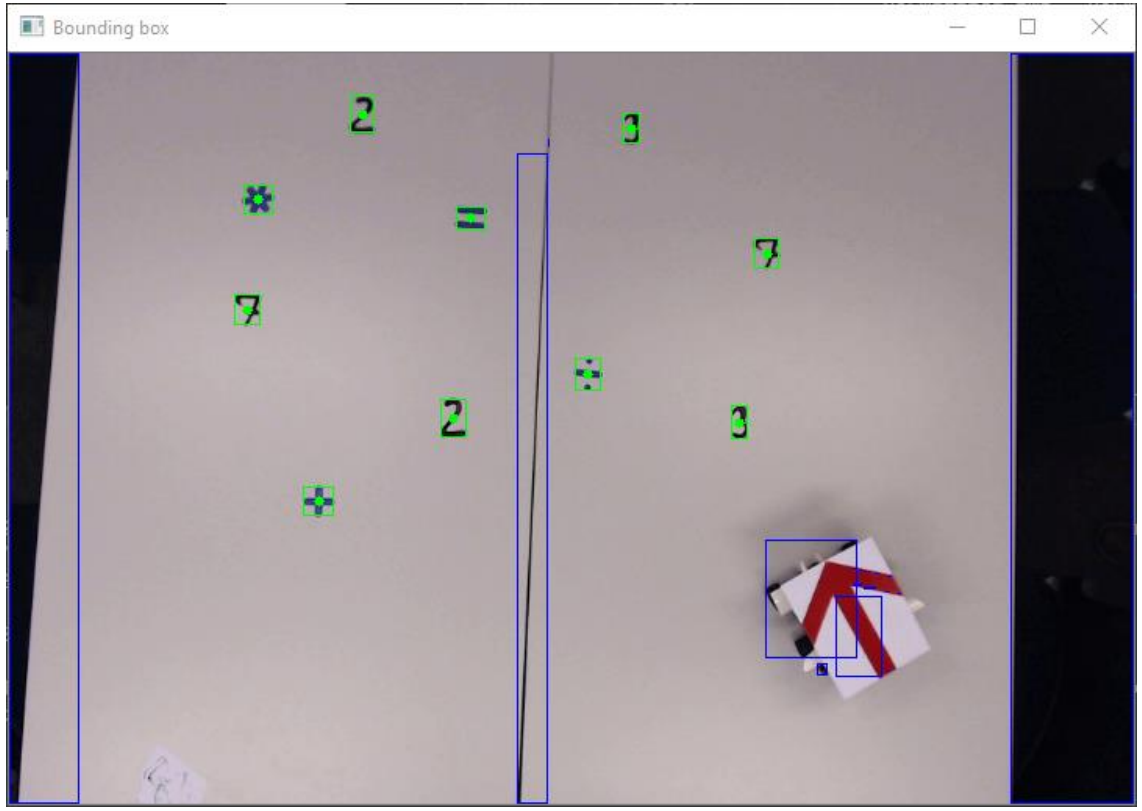
- Morphology to fuse unique chars in unique objects
- Contours and bounding boxes to isolate chars
- Range to discriminate
- Inertia axes for redressing (mod 180°)
- MNIST normalization
- CNN / custom classification

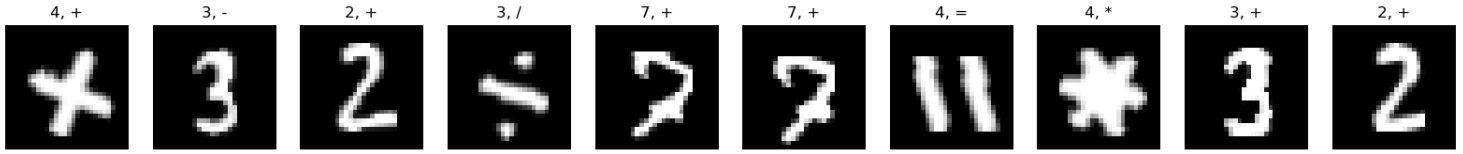
=> Characters (x,y) positions and classifications (list)

Image segmentation : results





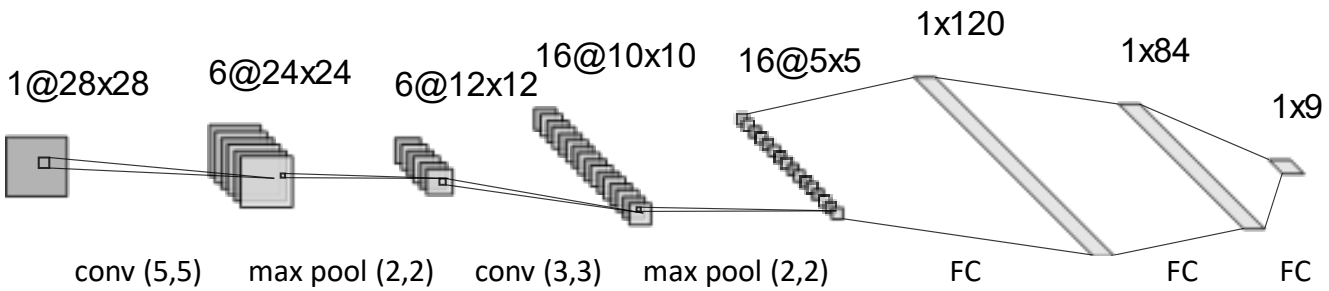




OCR : strategy

Digits :

- CNN based on LeNet-5
- Training on MNIST with 0° and 180°



Math operators :

Criteria :

Numbers of contours

- 3 => ‘/’
- 2 => ‘=‘

Width / height ratio of single contour :

- > 2 => ‘-’

Fourrier descriptor (4th one)

- < 0.1 => ‘*’
- > 0.1 => ‘+’

OCR : results

Digits :

- 98% accuracy on MNIST (0° and 180°)
- 100% accuracy on the 6 digits of the provided video
- Has little statistical significance for generalization to other videos

Math operators :

- 100% accuracy on the 4 math operators of the provided video
- Has little significance for generalization to other videos

Differentiation :

Alternating between the two of them because we know we start with digit.