Tangram modelling: current status

Working idea

Model the ACT-R agent so that given any position performs a sequence of action, compare with human data

Main strategy: use landmarks (“best fit” strategy)

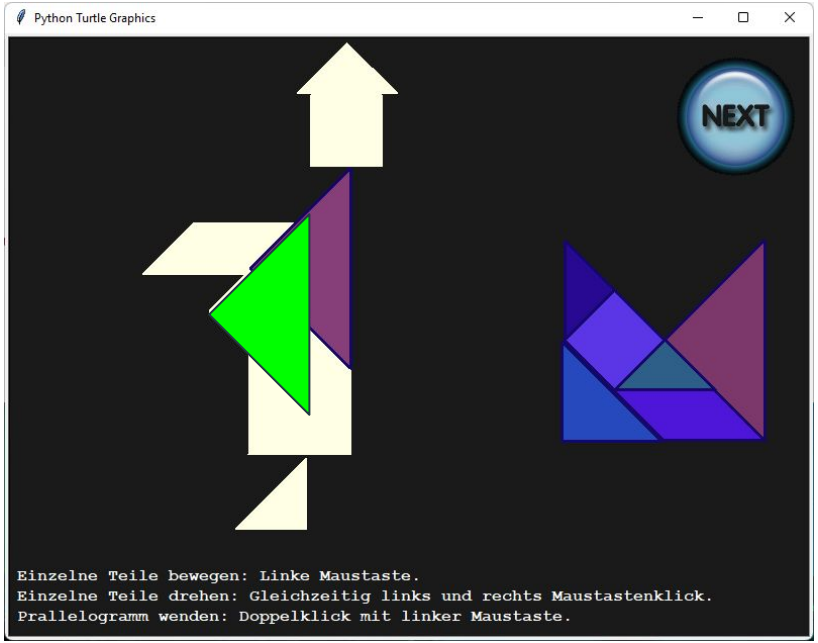
Landmark: region of the target image that fits a given tan *well enough*

The hand-tailored landmarks issue

Hand-tailored landmarks are difficult to deal with:
[BIG-T, UPPER-BACK] removes [BIG-T,BELLY]

Very arbitrary decisions on positions considered
Can’t model saliency changes involving time

The evolution sequence is exponential

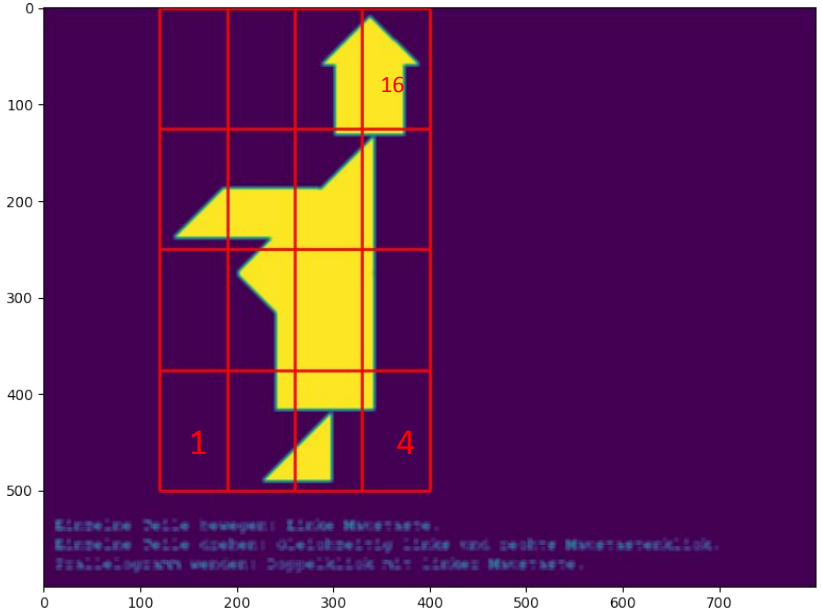


Grid discretization

Avoids having to deal with noisy pixel values and slightly different positions

“Good enough” in most cases if paired with rotation value

The foot is a bit unluckily positioned, but maybe with 5x5 it can be improved



Introducing opencv

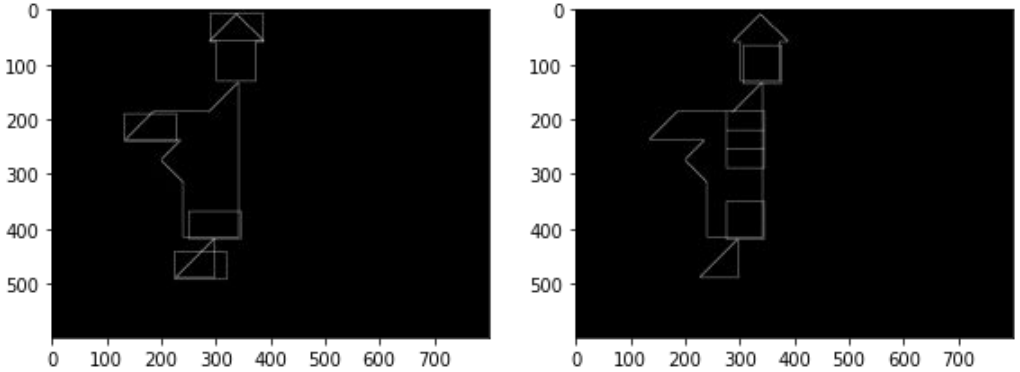
Open source computer vision library

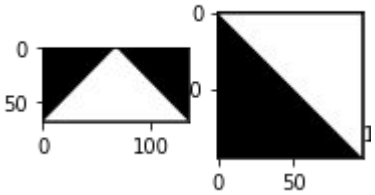
Use a simple template matching algorithm

Returns possible matches

NOT ALWAYS ACCURATE

→ Intersect results with human data





Merging opencv, tangram-app and ACT-R

A LOT of code for interfacing

But it’s done now ;)

Algorithm flow:

Initialize main app, the screen, ACT-R and OpenCV extractor
Load initial configuration on the screen
save screen picture

While NOT all pieces used:

OpenCV loads the image, extracts the landmarks, compares with data
Store up to 6 strongest landmarks plus “unfeasible region” if present
Load 6+1 in imaginal buffer
Actr.run: will try to retrieve a landmark and decide the next action accordingly
Take-action or Backtrack
Update the screen, save new picture

Some details on the ACT-R model

```
(sgp :mas 7)

;; (sgp :rt ???)

(chunk-type landmark
      piece-type grid orientation)

(chunk-type puzzle-state
      PIECES-AVAILABLE

      LANDMARK-1 LANDMARK-2 LANDMARK-3

      LANDMARK-4 LANDMARK-5 LANDMARK-6

      SPECIAL-LANDMARK )
```

```
;; PRODUCTIONS

(p RETRIEVE-LANDMARK …)

(P ACT-AND-UPDATE …)

(P UNFEASIBLE-REGION-FOUND …)

(P STILL-UNFEASIBLE …)|| (P REGION-REMOVED …)

;; (P FAIL-TO-RETRIEVE …)
```