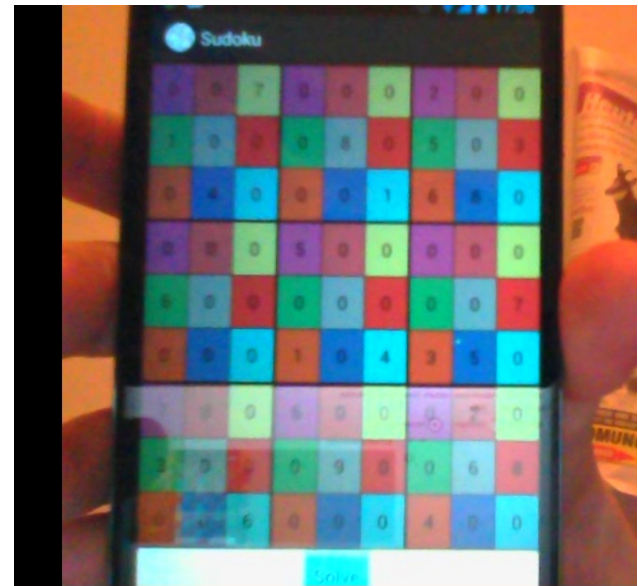
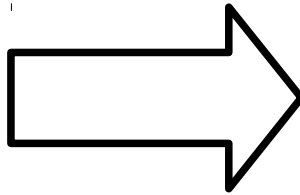
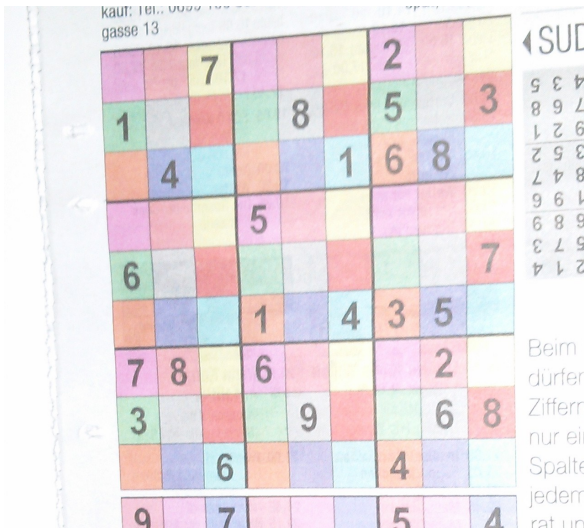


Sudoku Grabber & Solver

Idea

- Grab the sudoku and solve it automatically...
- ... on Android (Nexus 4)
- ... in Color for Heute newspapers



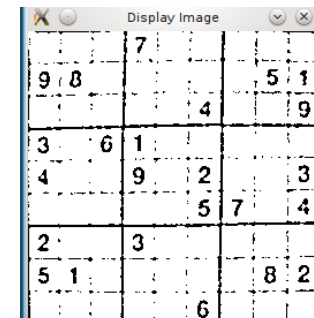
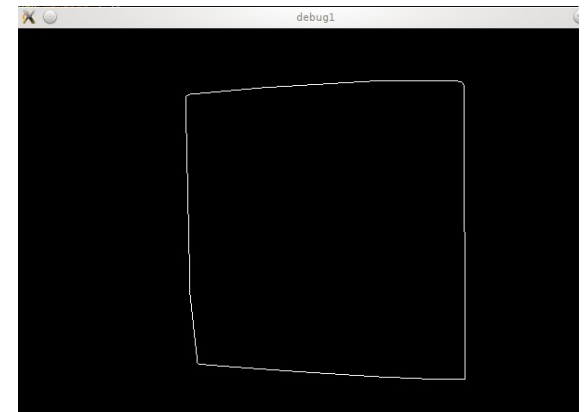
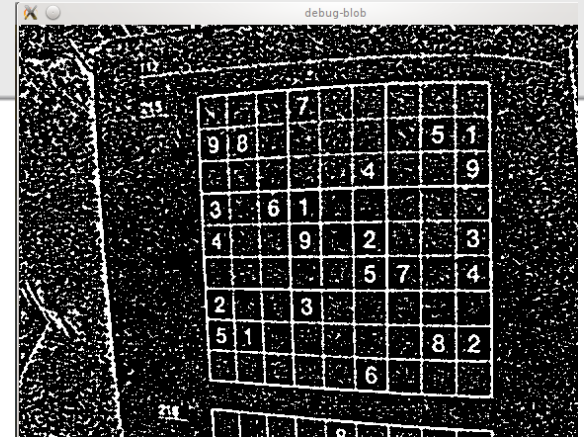
Implementation

- Android:
 - C++ (JNI) and OpenCV
 - Java for GUI
- Matlab:
 - Synthetic training set generation
- Python:
 - Some helper scripts (e.g. annotation of testing data, ...)



Algorithms

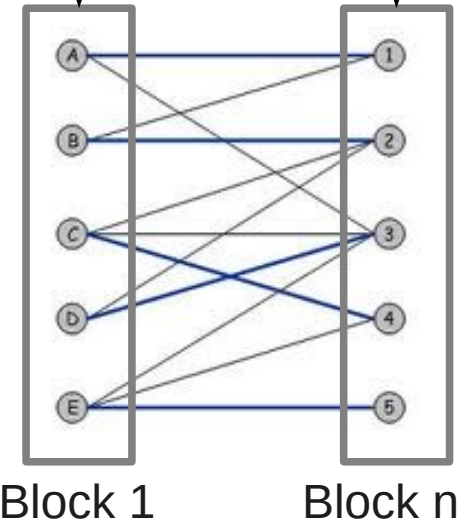
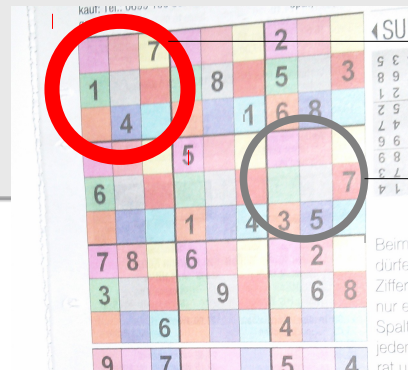
- Detection of the Sudoku:
 - First attempt: Hough transform
 - Does not work well for newspapers
 - Find biggest blob in image
- Segmentation:
 - Black & white: Sauvola
 - Heuristics to remove noise
- Digit recognition:
 - Random Forests + HOG on segmented digits
 - Worked quite well, but pretty expensive
 - HOG on grayscale might have worked better
 - Classifier takes long time to load on Android



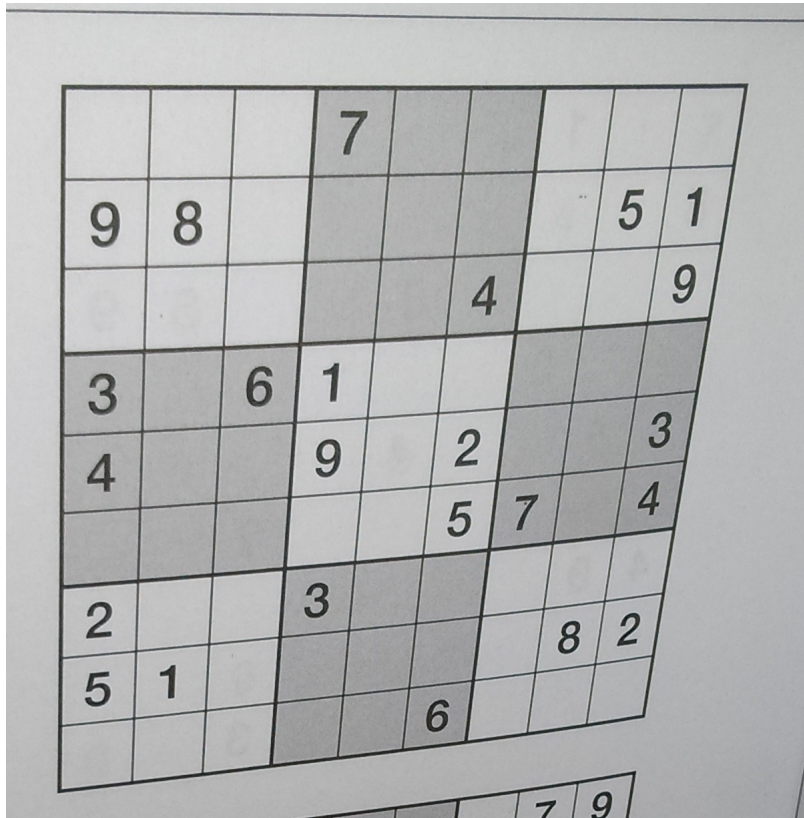
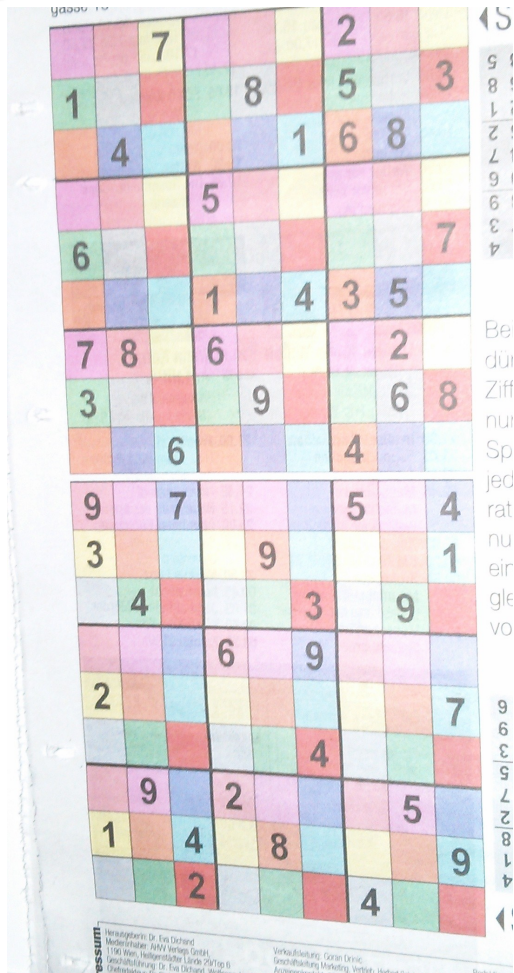
Algorithms

- Color:

- Difficult, not very saturated colors in Heute
- To segment text: kmeans in each cell, $k = 2-3$
- To find color:
 - Impossible with single k-means
 - Bad saturation
 - Different illumination due to Android-torchlight
 - Segment each 3x3 Block separately
 - Do bipartite matching with first block for each block (Munkres algorithm)
 - Works OK if colors in first block not totally messed up
 - Assumes that each color is present in each cell
 - Works for Heute



Demo



Things I would do differently

- Do no segmentation, recognize text directly
 - Needs better training samples
- Use better camera from the beginning

Thank you