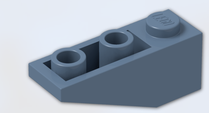
Object Detection of Scattered LEGO Pieces

Research Project (CSE3000) by Hiba Abderrazik | Supervision by Jan van Gemert & Attila Lengyel | May 20, 2020

PROBLEM AND APPROACH



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Goal: Provide a baseline research by testing the performance of established, state-of-the-art object detection models

Approach:

- Generate different data sets
- Research different object detection methods
- Normalize the data sets and run experiments for each model
- Evaluate the results
- *Option 1:* Scale up the amount of pieces in a scene to test/verify the performance of the models on a larger scale
- *Option 2:* If the results are lower than expected, test a modified model that performs better on small, cluttered objects

PROGRESS AND RESULTS

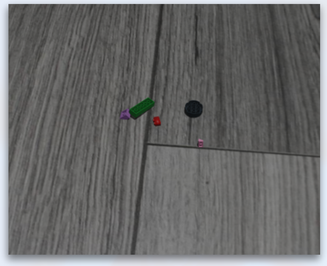


Figure 1: Synthetic data

Figure 2: Real data

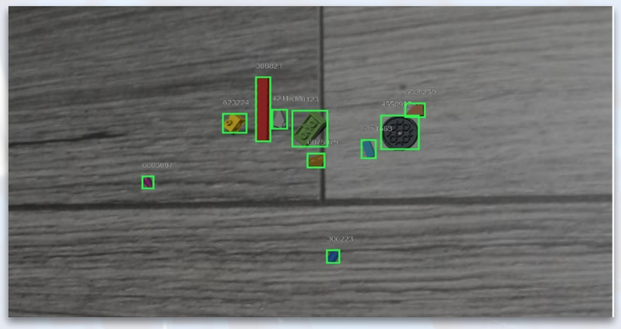
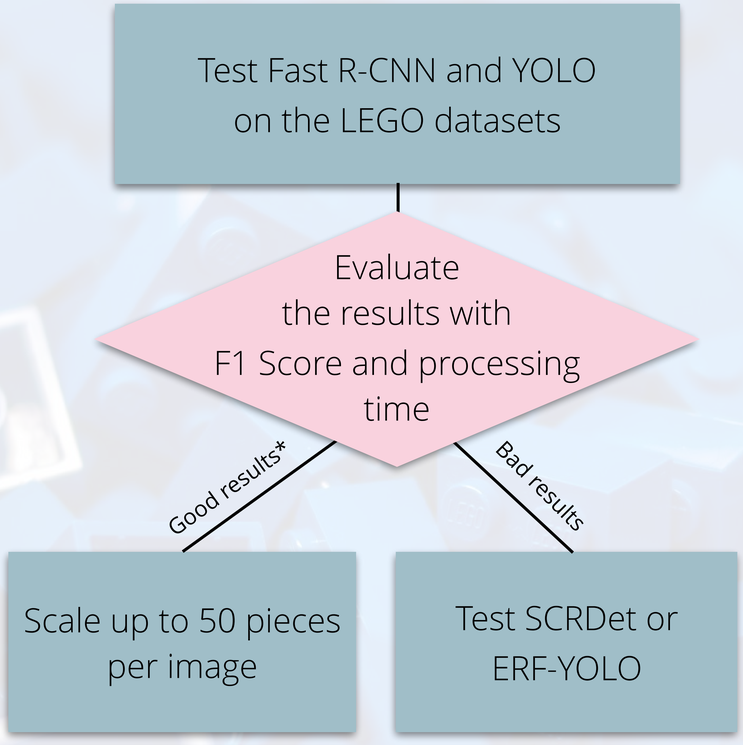


Figure 3: Data annotation

Model	Code to use
Faster R-CNN	torchvision.models
YOLO	YOLOv4 by AlexeyAB
RetinaNet	pytorch-retinanet by yhenon
SCRDet	-
ERF-YOLO	-

Hypothesis: the COCO data set consists of large objects in relatively noise-free scenes, so I don't expect the baseline models to perform well on my data/be scalable to large scenes with many small LEGO pieces

FUTURE PLANS



Future research:

- Scale up the amount of objects per scene
- Scale up the amount of data: ImageNet uses ~3000 images per class whereas our resources only allowed for 25 per class
- Test with a modified model (dependent on the results of my experiments)

* A threshold for mAP to determine "good results" is TBD