METHODS FOR IMPROVING CROWDSOURCING

OF IMAGES WITH LEGO BLOCKS

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1. BACKGROUND

- Data collection by means of crowdsourcing, Figure 1, can be costly or produce inaccurate results. Methods have been proposed for solving these problems.
- However, it remains unclear what methods work best in scenarios with multiple similar objects of interest present in the same image, which is important for training computer vision with applications e.g. making sure your flat-packed furtniture has all the correct screws included.

2. DEFINITIONS

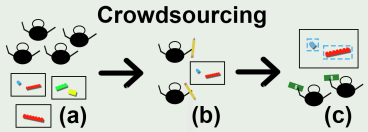

Figure 1: Workflow of crowdsourcing. (a) Pool of workers and jobs. (b) Workers performing annotation. (c) Finished annotation, and workers get paid.

IoU, Intersection over Union

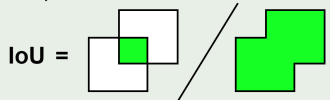

Figure 2: Showing how the intersection over union metric works.

3. OBJECTIVE

The main objective was to find out:

- *What parameters should be optimized?* Found to be IoU, Figure 2, for quality and time spend by workers for cost.
- *What methods are worth considering*? Found by literature study, can be seen in section 4.
- *What do the selected methods score on the parameters?* Found by an experiment, can be seen in section 5.

4. METHODS

M1. Majority vote, baseline
Takes mean bounding box of workers.

M2. Majority vote plus
Same as M1 but rejects boxes with 0 IoU.

M3. Rejecting workers
Gives bad workers lower weight in vote.

M4. Rejecting workers plus
Same as M3 but uses predicted accuracy.

M5. Decomposing tasks
Splits drawing and labeling task into two.

5. RESULTS

- In Figure 3 the peformance of the methods can be seen. From the figure it can be concluded that all tested methods perform better than the baseline.
- In Table 1 the relation between cost and quality can be seen. The decomposing task method, M5, can be seen to produce the highest correct image per dollar.

	M1	M2	M3	M4	M5
Mean IoU	0.620	0.729	0.709	0.741	0.673
Mean ratio correct images*	0.738	0.935	0.903	0.929	0.845
Mean cost per image	$0.30	$0.30	$0.25	$0.25	$0.12
Mean correct image per dollar	2.461	3.115	3.619	3.667	7.320

Table 1: Relation between cost and quality of the selected methods. Rejecting workers plus, M4, has the highest mean IoU. Decomposing tasks, M5, has the lowest cost per annotation and also the highest mean correct image per dollar.

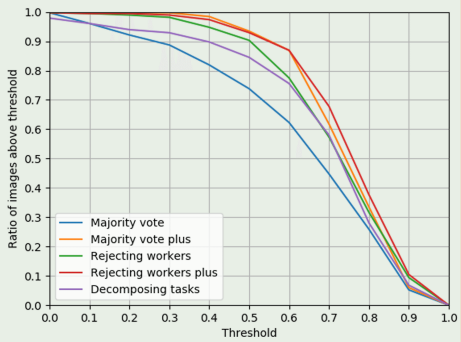

Figure 3: Ratio of images with an IoU above thresholds. All tested methods perform better overall than the baseline method majority vote.

6. CONCLUSION

- From our experiment we concluded that a clear trade-off exists between cost and quality.
- The improved rejecting workers method, that uses worker credibility, showed to have the highest mean quality.
- The method that decomposed the components of the task and distributed them was the cheapest method to use overall and also best when looking at mean quality over cost, it was worse quality wise.
- These results were similar to the expected performance of the methods. From this we concluded that the best method for crowdsourcing is dependent on the error tolerance of the computer vision model that will be used and the budget available.

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