
Bachelor Project Proposal:

Investigating the influences of different colour spaces in open-ended 3D recognition

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The focus of this research is on object detection and recognition. Research shows that the incorporation of colour-, as well as shape information, and feeding it to a descriptor increases performance in open-ended 3D object recognition (1). This research intends to explore this subject further. The usage of certain colour spaces could have a larger impact on certain descriptors/ neural networks compared to others. The research question that we try to answer is: *“What is the influence of different colour spaces on descriptors/networks and what colour space leads to the best model(s) for 3D object recognition in an open-ended domain.”*

The bachelor project will include a literature review of relevant work in the corresponding field. It will also include the implementation and execution of a relevant experiment using the C++ programming language utilizing the Robot Operating System (ROS) framework. Finally, a thesis will be written, and results will also be presented.

The descriptors/networks will work with a point cloud representation combined with colour information of different objects. The colour information will be altered for multiple different colour spaces. An example of the different colour spaces that could be explored are: RGB, YUV, YPbPr, HSV, CMY(K) and Greyscale. Performance is determined by multiple measures: QCI, NLC, AIC and accuracy.

The project will make use of an instance-based learning approach to recognize objects using minimal experiments(1), with K-nearest neighbour recognition and compare the dissimilarity of two objects using multiple distance functions.

The research will consist of two rounds of experiments, an offline evaluation and an online evaluation. The offline evaluation will be used to determine the best parameters for the descriptors (bins, distance function) and the networks (bins, distance function, pooling function). Then the descriptors/networks with their corresponding best parameters will be used to find the best K-value for the K-nearest neighbour algorithm and used to research their performance in all the colour spaces. The online evaluation will consist of determining the descriptors/networks performances in an open-ended Test-then-Train scheme.

References

- [1] S. H. Kasaei, M. Ghorbani, J. Schilperoort, and W. van der Rest, “Investigating the importance of shape features, color constancy, color spaces and similarity measures in open-ended 3D object recognition,” *ArXiv*, vol. abs/2002.03779, 2020.