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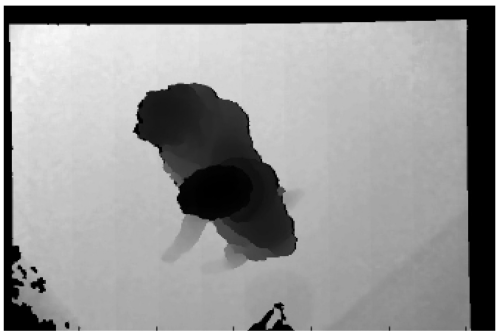
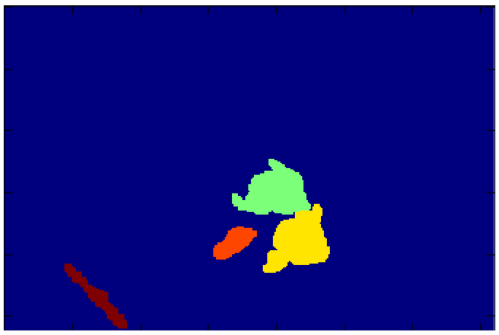
Human Shape Recognition using a Microsoft Kinect Camera

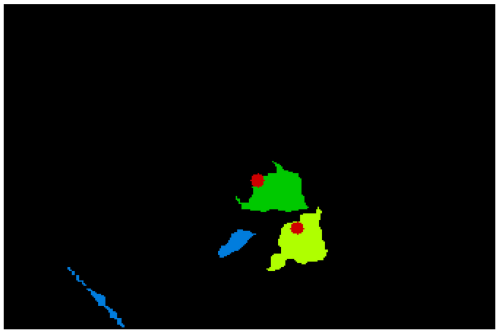
Fast and Robust Human Shape Recognition with uncertainty measure using an overhead mounted Microsoft Kinect Camera



Raw data showing two people close to each other



Segmentation result using watersheds.



Final classification result. Blue segments denote background. Red points denote centers of a human.

Introduction: The Institute for Communication Systems (ICOM) at Hochschule für Technik Rapperswil (HSR) is currently developing a solution to track and count people. The system is supposed to recognize people walking by and track their movements. The system uses overhead mounted Microsoft Kinect cameras to record three dimensional information about the environment. The system is already running, however it includes only a simple approach to distinguish people from objects. It is believed that a better human shape recognition entity could improve the results of the overall system.

Objective: The main goal is to develop a human shape recognition subsystem which can improve the system. The main difficulty of the project is to come up with a classification approach able to make a human/non-human classification with high accuracy. The approach should have the ability to be used in a real time environment. A prototype should be developed to show the capabilities of the system.

Result: The system receives data from a Microsoft Kinect camera in form of a three dimensional pointcloud. The pointcloud is transformed to two dimensional images using a plan view based procedure. A sophisticated image segmentation has been proposed which is able to segment even humans standing close to each other. Out of the segments a feature vector can be constructed. Two classifiers were investigated during this project: a Support Vector Machine classifier and a Relevance Vector Machine classifier. A running prototype has been established for both classifiers and both classifiers were trained using a dataset from collected data. The prototype shows that it is possible to establish such a system and it can achieve very high classification accuracy. Both classifiers achieve an accuracy of more than 98% when tested against a separate validation dataset. The system can easily handle complex situations such as people standing close to each other, people sitting on a chair or moving a trolley. The approach can generalize to new situations and is fast enough to be used in a real time environment.