Faculty of Computer Science 2007-2008 Seminar Series

Computer Vision for Industrial Applications

By

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Computer Vision has become one of the most challenging research areas in computer science because of its applicability in industry on the one hand side and its need of interdisciplinary problem solving capabilities on the other hand side.

After a brief introduction into computer and active vision systems and their distinct features a number of sample vision projects developed at the Bonn-Rhein-Sieg University are presented. They mainly address the same application area of face and hand gesture recognition. In the second part of the presentation, current research results on a vision based body part detection and tracking system is presented, which applies two synchronized camera systems. In order to meet reliability and the real time demands given for work safety systems, a coarse-to-fine strategy has been developed. For that, the most prominent feature of an operator working at a machine is detected first and subsequently more difficult ones are processed, which are spatially related or neighboured to the previous ones. The initial position of the operator is detected by applying a Gaussian Mixture Models (GMM) based foreground/ background segmentation algorithm and evaluated using a case based reasoning (CBR) approach. In a third step, his/her body posture is analyzed and the arms, hands, and fingers are detected applying model knowledge assumptions derived from previous processing steps.

In a third part of the presentation a machine vision inspection system is presented which is designed as a length measuring sensor. It is developed to be applied to a range of heat shrink tubes, varying in length, diameter and color. The challenges of this task were the precision and accuracy demands as well as the real-time applicability since it should be realized in regular industrial line production. A multi-measurement strategy has been developed, which measures each individual tube segment several times with sub pixel accuracy while being in the visual field. The developed approach allows for a contact-free and fully automatic control of 100% of produced heat shrink tubes according to the given requirements with a measuring precision of 0.1mm. Depending on the color, length and diameter of the tubes considered, a true positive rate of 99.99% to 100% has been reached at a true negative rate of > 99.7. In the conclusions the special features of active vision systems are summarized and discussed.

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STUDENTS ARE ENCOURAGED TO ATTEND

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