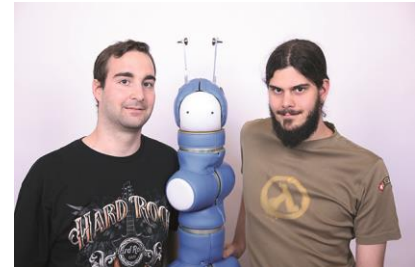


Intelligenter Vision für Würstchenbrat-Roboter

Process automation using robots and sensors becomes increasingly important in a society with a high cost of labour. This has an impact on all economic sectors, from agriculture to manufacturing to the service industry. The high costs caused by wages has a strong effect on the prices in gastronomy. As a consequence this leads to the point where the sale of traditionally barbecued sausages during a fair is not profitable. As solution to this problem it should be evaluated if an automation of the barbecue process using a robot is feasible. The grilling process should be modelled after the movements of a human grill chef in order to preserve the traditional characteristics of the barbecuing and to achieve a show effect for the customer. This thesis deals with the planning and implementation of a system for recognition of grilled food. The system consists of three components: Camera, image processing and a robot arm. Within the scope of this thesis all three components are implemented including the communication between them. As input device for sausage detection a time of flight mass spectrometer and colour camera were evaluated.

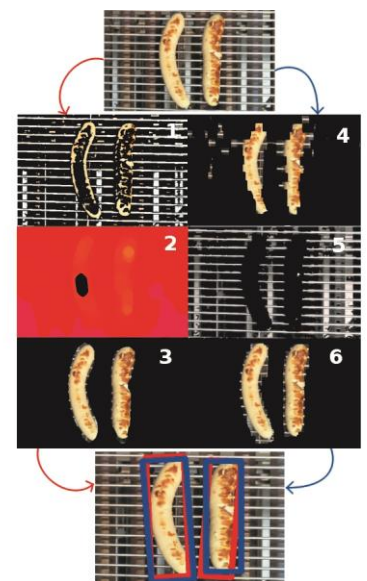
The created system gets its input data for image processing from a color camera. The system executes the grill process autonomously using a robot arm. Positions for the robot are acquired via image processing.

The implemented system controls a robot which is grilling the sausages autonomously. The positions of the sausages which are fed to the robot are calculated using image processing based on data from the colour camera. Using a combination of different image filters based on a variety of concepts sausages are reliably detected even under varying light conditions.



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In the camera picture (top) filters (middle) are applied to mark grilled food with rectangles(bottom)

- (1) Emphasise contours
- (2) Increase colour differences using saturation multiplication
- (4) Removal of reflecting surfaces and non brown colours
- (5) Substraction of the large areas from the original image
- (3&6) Found food