NEWSLETTER

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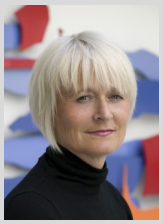
iPROCESS INNOVATION



iProcess aims to change the food industry

The food industry in Norway prioritizes flexible robotic automation as means to be able to cope with the high biological variation in food raw material and to maximize the raw material utilization. Therefore, expectations towards such solutions are high since it is expected that flexible robotic automation will be able to increase profitability for the food industry in their production operations.

The research focus to develop flexible automation solutions for the food industry is to develop new and effective methods that will be able to substitute human based manual operations by developing solutions that integrate artificial eye (camera), brain (deep learning), and hand (robot arm).

SINTEF Ocean, in collaboration with leading national and international research institutes, is conducting research to develop new concepts for better prediction of raw material quality using Big Data and deep learning, enable robotic handling and processing of raw material, improve information flow along the food value chain, and develop new business models in order to maximize the innovation process from research to industrial applications. The focus in the beginning of the project was on defining relevant cases together with the industrial partners. The selected case studies are of high relevance to the industrial partners and are characterized by research activities of high level and novelty potential. These are complex challenges for which there are no commercial solutions, and we work multidisciplinary in order to maximize the effect of the research in iProcess.

Marit Aursand, Project Manager

IPROCESS - THE GREEN SHIFT IN FOOD INDUSTRY

Artificial Eye, brain and hands: Research towards developing new solutions based on "artificial eye, brain and hand" is expected to be a next generation technology that will bring the Norwegian seafood, food and aquaculture industry closer to the consumer and contribute to the circular bioeconomy.

Foto: TYD

In order to achieve the goals for a more sustainable food production and to reduce the amount of the climate emissions, the flexible robotic automation technology will enable to increase raw material utilization, reduce food loss and waste, and to cope with biological variation of raw material from fish to wheat. This is the leading motto for the scientists in iProcess: «More value – less loss and waste».

iProcess is multidisciplinary project that addresses all these topics for a more sustainable food processing industry in Norway. Major vendors develop technological solutions and machinery that are not suitable for the small size production volumes in Norway. 17% of total emissions in EU are generated through processing of food, and globally there are more than 1.3 billion tons of food going to waste every year. In Norway alone, the food waste is estimated at 320.000 tons.

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Large portions of raw material today are lost in the different segments of the food value chain, and especially in the processing stage, due to the lack of a suitable technology that can cope with the high biological variation of raw material. The food industry in Norway is characterized with much lower production volume than what is common globally and the access to the currently available technology is not suitable for the Norwegian production model. Therefore, there is a great need for flexible, modul-based solutions that can be suited to Norwegian production and which can tackle the high biological variation in the raw material. Scientists contributing in iProcess aim to develop new concepts and methods within novel use of spectroscopic sensors, 3D CT CAD modelling, data acquisition, robot vision, learning and automation technology. Joining together the artificial "eye, brain and hand", results in concepts contributing to a more flexible, profitable and sustainable food processing industry.

Foto: Unni Skoglund

CASE STUDIES

A central task is to understand variations based on use of **Big Data** from novel rapid and on-line measuring methods for raw materials and product differentiation. TINE has expressed need for measuring different quality parameters of milk used for cheese productions, different parameters in cheese making processes and quality parameters in both fresh and ripen cheese in order to use Big Data strategy to identify the connections between milk qualities, processing parameters and the quality of the final cheese product. The final goal is to handle and control relevant parameters to obtain standard end-product quality.

Robotic cutting operation of pork leg (ham). From the research perspective, this case is an interesting research activity involving all the task in one of the work package (WP3) from 3D visual recognition, 3D CAD modelling based on internal characterisation, visual servoing, machine learning, robot control and gripper tool design. The initial approach and aim is to be able to reproduce robotically the cuts made from a skilled operator, and a more complexity will be added to the approach as time progresses.

ROBOTIC GRASPING

One of the greatest challenges in robotics today is the contact processing of a robot with an object and dexterous handling of compliant objects. This is particularly emphasised when it comes to dealing with handling and grasping in harvesting, post harvesting and processing operations of fragile and compliant food raw materials. The food industry is showing and increased interest for flexible robot based automation solutions that are also suitable for small-scale production volumes. Robotic optimal grasping and imitation of the complex manual dexterity of skilled human operators is therefore a prerequisite to enable a higher uptake of robotic automation in food industry.

In iProcess we are currently working with grasping of fragile food objects such as lettuce. Lettuce is an irregular, fragile compliant object of variable shape and size. Lettuce is a highly fragile product that requires adaptability when it comes to tactile sensing and exertion of forces during grasping. A RGB-D sensor is used to capture the images and algorithm extracts the relevant visual features necessary for estimating the grasping pose. Preliminary results are very promising.

PROJECT FACTS:

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Project owner: SINTEF Ocean
Project Manager: Dr. Marit Aursand
R&D partners: SINTEF Ocean, Nofima, SINTEF Raufoss Manufacturing, NMBU, UiS, NTNU, KU Leuven, INRIA, DTU, ACT Logimark
Industry– and equipment partners: Nortura, Norilia, Bama, TINE, Norway Seafoods and Produsentpakkeriet.
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