Characteristics of Xanthosoma sagittifolium roots during cooking, using physicochemical analysis, uniaxial compression, multispectral imaging and low field NMR spectroscopy

To effectively promote the industrial utilization of cocoyam (Xanthosoma sagittifolium) roots for enhanced food sustainability and security, there is a need to study their molecular, mechanical and physicochemical properties in detail. The physicochemical and textural characteristics of the red and white varieties of cocoyam roots were thus analysed by low field nuclear magnetic resonance relaxometry, multispectral imaging, uniaxial compression testing, and relevant physicochemical analysis in the current study. Both varieties had similar dry matter content, as well as physical and mechanical properties. However, up to four fast-interacting water populations were observed in the roots, dependent on the root variety and their degree of gelatinization during cooking. Changes in the relaxation parameters indicated weak gelatinization of starch at approximately 80 °C in both varieties. However, shorter relaxation times and a higher proportion of restricted water in the white variety indicated that this variety was slightly more sensitive towards gelatinization. A strong negative correlation existed between dry matter and all multispectral wavelengths >800 nm, suggesting the potential use of that spectral region for rapid analysis of dry matter and water content of the roots. The small, but significant differences in the structural and gelatinization characteristics of the two varieties indicated that they may not be equally suited for further processing, e.g. to flours or starches. Processors thus need to choose their raw materials wisely dependent on the aimed product characteristics. However, the spectroscopic methods applied in the study were shown to be effective in assessing important quality attributes during cooking of the roots.
Analysis of the production of salmon fillet - Prediction of production yield

The aim was to investigate the influence of raw material variation in Atlantic salmon from aquaculture on filleting yield, and to develop a decision tool for choosing the appropriate raw material for optimized yield. This was achieved by tracking salmon on an individual level (n = 60) through a primary production site. The majority of the salmon exhibited a heavier right fillet compared to the left fillet after filleting. No explicit explanation was found for this observation although the heading procedure was shown to have a large impact. A Partial Least Square model was built to predict the yield after filleting. The model was based on six pre-processing variables and allowed an acceptable prediction of the filleting yield.
with a root mean square error cross validation of 0.68. The presented model can estimate the slaughter yield for a certain batch before ordering from the slaughterhouse. This may facilitate optimal planning of the production of salmon fillets by ordering and assigning the right batch to the right product category to obtain an optimal yield and quality.

**General information**
State: Published
Organisations: National Food Institute, Research Group for Food Production Engineering, University of Iceland, Fast-Q
Authors: Johansson, G. Ø. (Intern), Guðjónsdóttir, M. (Ekstern), Nielsen, M. E. (Ekstern), Skytte, J. L. (Intern), Frosch, S. (Intern)
Number of pages: 8
Pages: 80-87
Publication date: 2017
Main Research Area: Technical/natural sciences

**Publication information**
Journal: Journal of Food Engineering
Volume: 204
ISSN (Print): 0260-8774
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.71 SJR 1.479 SNIP 1.842
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.467 SNIP 1.873 CiteScore 3.58
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.524 SNIP 1.975 CiteScore 3.44
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.348 SNIP 1.908 CiteScore 3.1
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.394 SNIP 1.993 CiteScore 2.84
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 1.329 SNIP 1.922 CiteScore 2.84
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 1.439 SNIP 1.793
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 1.411 SNIP 1.623
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 1.301 SNIP 1.521
Scopus rating (2007): SJR 1.044 SNIP 1.958
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 1.101 SNIP 1.546
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 0.808 SNIP 1.441
Scopus rating (2004): SJR 0.857 SNIP 1.454
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 0.882 SNIP 1.6
Scopus rating (2002): SJR 1.202 SNIP 1.481
Laser-light backscattering response to water content and proteolysis in dry-cured ham

Laser backscattering imaging (LBI) is a low-cost technology proposed to determine non-invasively composition and microstructural characteristics of agro food and dairy products. The aim of this work was to define the effect of different acquisition conditions (wavelength, object distance and angle of laser incidence) and to analyse the laser-light backscattering changes caused by additional hot air drying and proteolysis of dry-cured ham slices. The feasibility of the technology to determine water content and proteolysis (which is related to textural characteristics) of commercial sliced dry-cured ham was also evaluated. Results showed that a red laser (635 nm) is more convenient than a green laser (532 nm) to analyse dry-cured ham but no preferable angle or object distance to evaluate dryness or proteolysis was found. Nevertheless, light scattering parameters were modified depending on the acquisition conditions used. Laser backscattering was influenced by both dryness and proteolysis intensity showing an average light intensity decrease of 0.2 when decreasing water content (1% weight loss) and increasing proteolysis (equivalent to one-hour enzyme action). However, a decrease of scattering area was only detected when the water content was decreased (618 mm² per 1% weight loss). Changes on scattering of light profiles were only observed when the water content changed. Although there is a good correlation between water content and LBI parameters when analysing commercial samples, proteolysis index has an important effect on the response. This fact hinder estimation of dry-cured ham composition and textural characteristics of dry-cured ham. (C) 2017 Elsevier Ltd. All rights reserved.

General information
State: Published
Organisations: National Food Institute, Research Group for Food Production Engineering, IRTA
Authors: Fulladosa, E. (Ekstern), Rubio-Celorio, M. (Ekstern), Skytte, J. L. (Intern), Munõz, I. (Ekstern), Picouet, P. (Ekstern)
Number of pages: 8
Pages: 235-242
Publication date: 2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Food Control
Volume: 77
ISSN (Print): 0956-7135
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.86 SJR 1.462 SNIP 1.719
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 1.509 SNIP 1.72 CiteScore 3.65
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 1.389 SNIP 1.718 CiteScore 3.27
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.273 SNIP 1.745 CiteScore 3.14
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 1.264 SNIP 1.916 CiteScore 3.1
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
Gum tragacanth (GT) exuded from an Iranian Astragalus species was γ-irradiated at 0, 0.75, 1.5, 3, 5, 7, 10 kGy and used to stabilize a model oil in water emulsion system. Stability and physicochemical properties of emulsion samples were investigated with respect to the effect of irradiation treatment on functional properties of gum tragacanth. Particle size distribution, interfacial tension, zeta potential, steady shear and oscillatory rheological measurements were used to characterize and evaluate the emulsion samples and obtain more information about the possible stability mechanism. Emulsions were prepared by homogenizing 10% w/w sunflower oil with 90% w/w aqueous gum dispersions and stored quiescently at 25°C for 120 days. Results indicated that using 1.5 kGy irradiated GT was more effective in providing optimum values of apparent viscosity, number mean diameter, electrosteric repulsion and structure strength for getting maximum emulsion stability. GT significantly reduced the interfacial tension of the oil and water system, but no significant differences were observed among all irradiation treated and non-irradiated samples. This study revealed that, GT acts as a bifunctional emulsifier and irradiation treatment has a great positive influence on its ability to reduce droplets collision frequency and stabilize oil in water emulsion.
Non-invasive volume estimation of fish fillets/cutlets using structured light

**General information**

**State:** Published  
**Organisations:** National Food Institute, Research Group for Food Production Engineering  
**Authors:** Skytte, J. L. (Intern), Ekgreen, M. H. (Intern), Jessen, F. (Intern)  
**Number of pages:** 1  
**Publication date:** 2016
Peelability and quality changes during ice maturation of shrimp (Pandalus borealis)

General information
State: Published
Organisations: National Food Institute, Research Group for Food Production Engineering, University of Copenhagen, Royal Greenland A/S, Launis A/S
Authors: Gringer, N. (Intern), Skytte, J. L. (Intern), Dang, T. T. (Ekstern), Olsen, K. (Ekstern), Bøknæs, N. (Ekstern), Schlippe-Steffensen, K. (Ekstern), Orlien, V. (Ekstern), Jessen, F. (Intern)
Number of pages: 1
Publication date: 2016

Discriminating Yogurt Microstructure Using Diffuse Reflectance Images

The protein microstructure of many dairy products is of great importance for the consumers’ experience when eating the product. However, studies concerning discrimination between protein microstructures are limited. This paper presents preliminary results for discriminating different yoghurt microstructures using hyperspectral (500-900nm) diffuse reflectance images (DRIs) – a technique potentially well suited for inline process control. Comparisons are made to quantified measures of the yoghurt microstructure observed through confocal scanning laser microscopy (CSLM). The output signal from both modalities is evaluated on a 24 factorial design covering four common production parameters, which significantly change the chemistry and the microstructure of the yoghurt. It is found that the DRIs can be as discriminative as the CSLM images in certain cases, however the performance is highly governed by the chemistry of the sample. Also, the DRIs shows better correlation to the CSLM images and are more discriminative when considering shorter wavelengths.

General information
State: Published
Organisations: National Food Institute, Research Group for Food Production Engineering, Department of Applied Mathematics and Computer Science, Image Analysis & Computer Graphics, DuPont Nutrition Biosciences Aps
Authors: Skytte, J. L. (Intern), Møller, F. (Ekstern), Abildgaard, O. H. A. (Intern), Dahl, A. B. (Intern), Larsen, R. (Intern)
Number of pages: 12
Pages: 192-203
Publication date: 2015
Evaluation of Yogurt Microstructure Using Confocal Laser Scanning Microscopy and Image Analysis

The microstructure of protein networks in yogurts defines important physical properties of the yogurt and hereby partly its quality. Imaging this protein network using confocal scanning laser microscopy (CSLM) has shown good results, and CSLM has become a standard measuring technique for fermented dairy products. When studying such networks, hundreds of images can be obtained, and here image analysis methods are essential for using the images in statistical analysis. Previously, methods including gray level co-occurrence matrix analysis and fractal analysis have been used with success. However, a range of other image texture characterization methods exists. These methods describe an image by a frequency distribution of predefined image features (denoted textons). Our contribution is an investigation of the choice of image analysis methods by performing a comparative study of 7 major approaches to image texture description. Here, CSLM images from a yogurt fermentation study are investigated, where production factors including fat content, protein content, heat treatment, and incubation temperature are varied. The descriptors are evaluated through nearest neighbor classification, variance analysis, and cluster analysis. Our investigation suggests that the texton-based descriptors provide a fuller description of the images compared to gray-level co-occurrence matrix descriptors and fractal analysis, while still being as applicable and in some cases as easy to tune.

Practical Application

Confocal laser scanning microscopy images can be used to provide information on the protein microstructure in yogurt products. For large numbers of microscopy images, subjective evaluation becomes a difficult or even impossible approach, if the images should be incorporated in any form of statistical analysis alongside other measuring modalities or sensory data. Instead, automated image texture analysis can be used to provide objective descriptions of the images, and we provide a comparative study for a broad range of the many image texture analysis available. All of the investigated techniques should be applicable for any type of pseudo homogeneous image structures.

General information

State: Published
Organisations: Department of Applied Mathematics and Computer Science, National Food Institute, Research Group for Food Production Engineering, Image Analysis & Computer Graphics, Dublin City University, Arla Strategic Innovation Center, DuPont Nutrition Biosciences Aps
Authors: Skytte, J. L. (Intern), Ghita, O. (Ekstern), Whelan, P. F. (Ekstern), Andersen, U. (Ekstern), Moller, F. (Intern), Dahl, A. B. (Intern), Larsen, R. (Intern)
Pages: E1218-E1228
Publication date: 2015
Main Research Area: Technical/natural sciences

Publication information

Journal: Journal of Food Science
Volume: 80
Issue number: 6
ISSN (Print): 0022-1147
Ratings:
BFI (2017): BFI-level 1
Web of Science (2017): Indexed Yes
BFI (2016): BFI-level 1
Scopus rating (2016): SJR 0.77 SNIP 1.013 CiteScore 1.92
BFI (2015): BFI-level 1
Scopus rating (2015): SJR 0.83 SNIP 0.985 CiteScore 1.97
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): SJR 0.937 SNIP 1.11 CiteScore 2.07
BFI (2013): BFI-level 1
Scopus rating (2013): SJR 1.011 SNIP 1.079 CiteScore 2.24
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): SJR 0.978 SNIP 1.086 CiteScore 1.98
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): SJR 0.934 SNIP 1.058 CiteScore 1.9
ISI indexed (2011): ISI indexed yes
Non-Invasive Assessment of Dairy Products Using Spatially Resolved Diffuse Reflectance Spectroscopy

The quality of a dairy product is largely determined by its microstructure which also affects its optical properties. Consequently, an assessment of the optical properties during production may be part of a feedback system for ensuring the quality of the production process. This paper presents a novel camera-based measurement technique that enables robust quantification of a wide range of reduced scattering coefficients and absorption coefficients. Measurements are based on hyperspectral images of diffuse reflectance in the wavelength range of 470 to 1020 nm. The optical properties of commercially available milk and yogurt products with three different levels of fat content are measured. These constitute a relevant range of products at a dairy plant. The measured reduced scattering properties of the samples are presented and show a clear discrimination between levels of fat contents as well as fermentation. The presented measurement technique and method of analysis is thus suitable for a rapid, noncontact, and non-invasive inspection that can deduce physically interpretable properties.

General information

State: Published
Organisations: Department of Applied Mathematics and Computer Science, Department of Photonics Engineering, Image Analysis & Computer Graphics, Diode Lasers and LED Systems, NKT Photonics A/S
Authors: Abildgaard, O. H. A. (Intern), Kamran, F. (Intern), Dahl, A. B. (Intern), Skytte, J. L. (Intern), Nielsen, F. D. (Ekstern), Thomsen, C. L. (Ekstern), Andersen, P. E. (Intern), Larsen, R. (Intern), Frisvad, J. R. (Intern)
Pages: 1096-1105
Publication date: 2015
Main Research Area: Technical/natural sciences
Non-invasive spectroscopy, Oblique incidence reflectometry, Diffuse reflectance, Absorption, Reduced scattering, Turbid media, Milk, Yogurt
2D Static Light Scattering for Dairy Based Applications

Throughout this thesis we investigate a recently introduced optical technique denoted 2D static light scattering (2DSLS). The technique is remote sensing, non-invasive, highly flexible, and appears to be well suited for in-line process control. Moreover, the output signal contains contributions from several different optical phenomena, which can be utilised to provide information on chemical composition and underlying microstructure of an investigated sample.

The main goal of this thesis is to provide an exploratory study of the 2DSLS technique in relation to dairy based applications. This includes getting an understanding of the various parameters in the setup as well as understanding the output signal in terms of potential and limitations. Furthermore, suitable ways of quantifying the signal are investigated. Here, both established physical models and statistical descriptions of the signal are evaluated and discussed.

There is a major emphasis on using 2DSLS to discriminate between different protein microstructures in yogurt products. This potentially allows for process control, in relation to microstructure, during yogurt manufacture. As microstructure is critical for consumer acceptability, this specific process control can be highly beneficial. To provide suitable reference measures on the actual microstructure, we investigate how to quantify micrographs of yogurts objectively. We provide a comparative study, that includes a broad range of different image texture descriptors.

DCT-Based Characterization of Milk Products Using Diffuse Reflectance Images

We propose to use the two-dimensional Discrete Cosine Transform (DCT) for decomposition of diffuse reflectance images of laser illumination on milk products in different wavelengths. Based on the prior knowledge about the characteristics of the images, the initial feature vectors are formed at each wavelength. The low order DCT coefficients are used to quantify the optical properties. In addition, the entropy information of the higher order DCT coefficients is used to include the illumination interference effects near the incident point. The discrimination powers of the features are computed and used to do wavelength and feature selection. Using the selected features of just one band, we could characterize and discriminate eight different milk products. Comparing this result with the current characterization method based of a fitted log-log linear model, shows that the proposed method can discriminate milk from yogurt products better.
Decomposition of Diffuse Reflectance Images - Features for Monitoring Structure in Turbid Media

Light scattering in turbid media can be related to the microstructure of media. Thus, light scattering can potentially be used for process control of products where the structure is a key component. However, process control requires robust and sensitive input data to function properly. In this study, we investigate different decomposition methods for extracting light scattering information from images of diffuse reflectance. Both well-established theoretical methods and data-driven methods are considered and evaluated based on their robustness and sensitivity to changes in light scattering properties.

General information
State: Published
Number of pages: 6
Publication date: 2013

Host publication information
Title of host publication: InsideFood Symposium: Book of proceedings
Main Research Area: Technical/natural sciences
Conference: InsideFood Symposium, Leuven, Belgium, 09/04/2013 - 09/04/2013
Electronic versions:
DecompositionOfDiffuseReflectanceImages.pdf

Spectral characterisation of dairy products using photon time-of-flight spectroscopy

In this paper, we present, for the first time, the absorption and reduced scattering spectra of commercially available milk and yoghurt products, obtained using photon-time-of-flight spectroscopy. The ability of this technique to separate the contributions from absorption and scattering in the sample provides important information on the chemical composition and micro-structural properties, which are not available with the traditional techniques used in dairy production. The instrument operates in the spectral range from 500 nm to 1030 nm. The reduced scattering coefficient varies from 5 cm(-1) for milk with 0.1% fat in the near infrared range, to 60 cm(-1) for yoghurt with 3.0% fat in the green wavelength regime. The absorption is within the range of 0.05-0.5 cm(-1), with only small variation in the absolute value between products. Our results show that the reduced scattering clearly distinguishes milk and yoghurt with the same fat content and can offer a reliable way of monitoring structural formation during milk fermentation.

General information
State: Published
Organisations: Department of Applied Mathematics and Computer Science, Image Analysis & Computer Graphics, Lund University, NKT Photonics A/S
Pages: 375-383
Publication date: 2013
Main Research Area: Technical/natural sciences

Publication information
Journal: Journal of Near Infrared Spectroscopy
Volume: 21
Digital Prototyping of Milk Products

Digital prototyping has revolutionised the automotive industry by providing designers and engineers with digital models of their products that enable virtual product design, visualisation, and simulation [1]. However, digital prototyping does not exist in the food industry as the colloidal nature of most foods make them much more challenging to visualise and simulate realistically. We present models and methods that take steps toward digital prototyping of milk products and other food colloids. To simulate the dynamics of liquid products that only exist digitally, we use deformable simplicial complexes with an optimisation-based, linear finite element method [2,3]. Visualisation of products that only exist digitally requires a model for predicting the optical properties of the product materials. The optical properties (absorption coefficient, scattering coefficients, and phase function or asymmetry parameter) are the input needed for a Monte Carlo based graphical rendering. We have developed a model for predicting the optical properties of milk as a function of its fat and protein contents [4]. However, the model has only been validated to a limited extent. We suggest that diffuse reflectance measurements can be used for more extensive validation and for gathering data that can be used to extend our current model such that it can also predict how the optical properties develop during fermentation or acidification of milk to yogurt.

A well-established way of measuring optical properties is by static light scattering measurements. This, however, is an
invasive procedure where a sample must be placed in a relatively small container (like a cuvette) and scanned by a photon detector orbiting the sample. The container must be small enough to ensure that the sample enters the single scattering regime. Diffuse reflectance measurements have the advantage of being noninvasive. However, the analysis becomes more complex as such measurements include multiple scattering effects. To measure optical properties using diffuse reflectance, we capture high dynamic range images of laser at different wavelengths incident on a sample in situ. The wavelength of the laser is easily adjustable as we use an NKT Photonics SuperK laser [5]. This enables us to retrieve spatially and spectrally resolved diffuse reflectance images. We also acquire images with the laser at several angles of incidence to enable oblique-incidence reflectometry. This enables us to use existing techniques [6,7] for retrieving the apparent optical properties of a sample. The validation consists in comparison of measured optical properties with predicted optical properties.

One of our goals is to extend our model for digital prototyping of milk products such that it can also predict how the optical properties develop during gelation of milk to yogurt. The influence of the colloidal aggregation on the optical properties is described by the static structure factor. As our method is noninvasive, we can use our setup for monitoring an acidification process over time. The challenge is to investigate whether we can use the resulting diffuse reflectance images to measure the static structure factor or similar optical properties of gels. We can see some correlation between measured diffuse reflectance and the rheology of the gel. This indicates that some quantity similar to the static structure factor is measurable using spatially resolved diffuse reflectance. There are ways of predicting the static structure factor for different types of colloids [8]. Thus if we succeed in measuring a similar quantity, we can extend our model and validate the extension.

This work was (in part) financed by the Centre for Imaging Food Quality project which is funded by the Danish Council for Strategic Research (contract no 09-067039) within the Programme Commission on Health, Food and Welfare. This work was also in part financed by the Digital Prototypes project funded by the Danish Council for Technology and Innovation (Resultatkontrakt).

General information
State: Published
Organisations: Image Analysis and Computer Graphics, Department of Informatics and Mathematical Modeling
Pages: P53
Publication date: 2012

Host publication information
Title of host publication: Proceedings of the 14th Food Colloids Conference 2012
Publisher: University of Copenhagen
Main Research Area: Technical/natural sciences
Conference: Food Colloids 2012, Copenhagen, Denmark, 16/04/2012 - 16/04/2012
Electronic versions:
DigiProMilk_abstract_FC2012.pdf
DigiProMilk_poster_FC2012.pdf

Bibliographical note
Poster included.
Source: dtu
Source-ID: u::3796
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2012

Monitoring structure development in milk acidification using diffuse reflectance profiles
The structure of dairy products is important for the consumer, and milk acidification plays a central role for structural development. To ensure the best possible consumer experience, it is important that a product’s structural properties are stable. Therefore process and quality control tools are needed so that the production can be carried out consistently, regardless of day-to-day variations in the raw materials.

Casein micelles aggregate during milk acidification, which leads to formation of a gel network. This change of structure is important for the development of a range of dairy products. It is therefore essential to monitor these structural changes and a variety of methods have been proposed to continuously follow this coagulation of milk [1]. Especially non-invasive methods for in situ production line application have been of interest.

We propose a method for analyzing structural changes in milk based on hyper-spectral light scattering. Our approach is motivated by Carstensen and Møller [2]. They demonstrated the correlation between diffuse reflectance profiles and rheology of a milk sample during acidification. In this work we employ a super-continuum laser light source coupled with an acousto-optical tuneable filter to illuminate the sample. The generated beam is spectrally narrow and can be tuned in the spectral range from 450-1050 nm. This system is described in detail in [3]. It is a research platform, which is constantly developed and adjusted according to research needs. Besides providing a non-invasive method, the system also has potential as a design platform for creating specialized and cost-efficient vision systems.

Our preliminary results are highly encouraging and show a clear relation between rheology and diffuse reflectance. A factorial experiment studying the effects of the content of fat, protein, and temperature in the acidification process is conducted. The purpose of the experiment is to investigate how the change of these parameters affects the diffuse...
reflectance properties as well as to demonstrate the relation between the optical parameters and structure formation in milk acidification. These measurements are compared to conventional methods such as pH, oscillatory rheology, confocal laser scanning microscopy, and sensory data.

**General information**

**State:** Published

**Organisations:** Department of Informatics and Mathematical Modeling, Image Analysis and Computer Graphics, Arla Foods, Danisco AS

**Authors:** Skytte, J. L. (Intern), Andersen, U. (Ekstern), Møller, F. (Ekstern), Nielsen, O. H. A. (Intern), Carstensen, J. M. (Intern), Dahl, A. L. (Intern), Larsen, R. (Intern)

**Publication date:** 2012

**Host publication information**

**Title of host publication:** Proceedings of the 14th Food Colloids Conference 2012

**Publisher:** University of Copenhagen

**Main Research Area:** Technical/natural sciences

**Conference:** Food Colloids 2012, Copenhagen, Denmark, 16/04/2012 - 16/04/2012

**Electronic versions:** A8676d01.pdf

**Publication:** Research - peer-review › Conference abstract in proceedings – Annual report year: 2012

---

**Regression and Sparse Regression Methods for Viscosity Estimation of Acid Milk From it’s Sls Features**

Statistical solutions find widespread use in food and medicine quality control. We investigate the effect of different regression and sparse regression methods for a viscosity estimation problem using the spectro-temporal features from a new Sub-Surface Laser Scattering (SLS) vision system. From this investigation, we propose the optimal solution for regression estimation in case of noisy and inconsistent optical measurements, which is the case in many practical measurement systems. The principal component regression (PLS), partial least squares (PCR) and least angle regression (LAR) methods are compared with sparse LAR, lasso and Elastic Net (EN) sparse regression methods. Due to the inconsistent measurement condition, Locally Weighted Scatter plot Smoothing (Loess) has been employed to alleviate the undesired variation in the estimated viscosity. The experimental results of applying different methods show that, the sparse regression lasso outperforms other methods. In addition, the use of local smoothing has improved the results considerably for all regression methods.

Due to the sparsity of lasso, this result would assist to design a simpler vision system with less spectral bands.

**General information**

**State:** Published

**Organisations:** Department of Informatics and Mathematical Modeling, DTU Data Analysis, Image Analysis and Computer Graphics

**Authors:** Sharifzadeh, S. (Intern), Skytte, J. L. (Intern), Nielsen, O. H. A. (Intern), Erbsbøll, B. K. (Intern), Clemmensen, L. K. H. (Intern)

**Pages:** 58-61

**Publication date:** 2012

**Host publication information**

**Title of host publication:** Proceedings : IWSSIP 2012, 11-13 April 2012, Vienna, Austria

**ISBN (Print):** 978-3-200-02588-2

**Main Research Area:** Technical/natural sciences

**Conference:** 19th International Conference on Systems, Signals and Image Processing (IWSSIP 2012), Vienna, Austria, 11/04/2012 - 11/04/2012

**Publication:** Research - peer-review › Article in proceedings – Annual report year: 2012

---

**Classification Methods for CT-Scanned Carcass Midsections: A Study of Noise Stability**

Computed tomography (CT) has successfully been applied in medical environments for decades. In recent years CT has also made its entry to the industrial environments, including the slaughterhouses. In this paper we investigate classification methods for an online CT system, in order to assist in the segmentation of the outer fat layer in the mid-section of CT-scanned pig carcasses. Prior information about the carcass composition can potentially be applied for a fully automated solution, in order to optimize the slaughter line. The methods comprise Markov Random Field and contextual Bayesian classification, and are adapted to use neighbourhood information in 2D and 3D. Articul Poisson noise is added to the provided dataset to determine how well each of the methods handles noise. Good noise handling will allow lower dose scanings. The investigated methods did not perform better than the reference model in terms of classification, but the MRF segmentation showed promising results in a case with extreme simulated noise.

**General information**

**State:** Published

**Organisations:** Image Analysis and Computer Graphics, Department of Informatics and Mathematical Modeling, Department of Photonics Engineering, DTU Data Analysis
Host publication information
Title of host publication: Scandinavian Workshop on Imaging Food Quality 2011 : Ystad, May 27, 2011 - Proceedings
Place of publication: Kgs. Lyngby, Denmark
Publisher: Technical University of Denmark (DTU)
Number: 15
Main Research Area: Technical/natural sciences
Workshop: Scandinavian Workshop on Imaging Food Quality 2011, Ystad, Sweden, 27/05/2011 - 27/05/2011
Electronic versions:
Pages from tr11_15-5.pdf
Links:
http://www2.imm.dtu.dk/projects/SWIFQ/
Source: orbit
Source-ID: 279482
Publication: Research - peer-review › Article in proceedings – Annual report year: 2011

Projects:

SLS based dairy process control systems
Department of Applied Mathematics and Computer Science
Period: 15/12/2010 → 29/08/2014
Number of participants: 6
Phd Student:
Skytte, Jacob Lercke (Intern)
Supervisor:
Dahl, Anders Bjorholm (Intern)
Main Supervisor:
Larsen, Rasmus (Intern)
Examiner:
Nielsen, Allan Aasbjerg (Intern)
Parkkinen, Jussi (Ekstern)
Åström, Kalle (Ekstern)

Financing sources
Source: Internal funding (public)
Name of research programme: Forskningsrådsfinansiering
Project: PhD