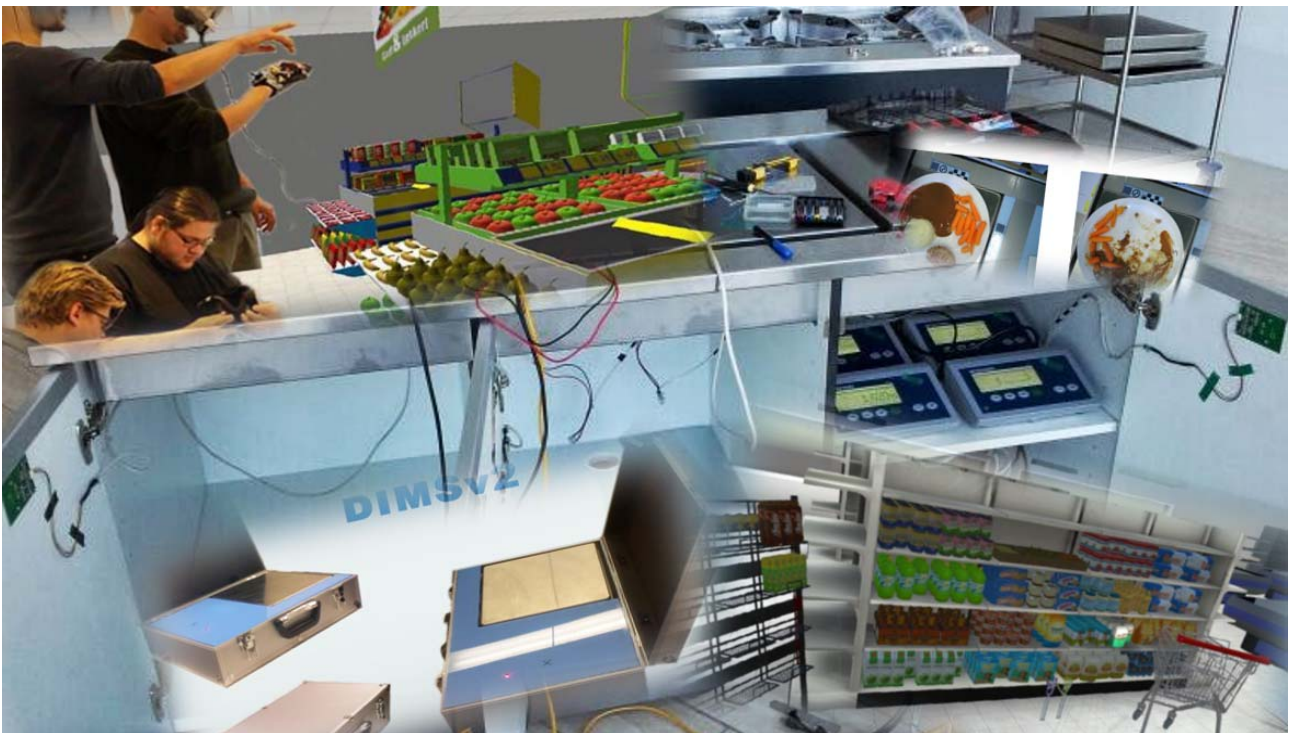




dVices4Food

Final report

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Captive Foodscape Studies, AAU January 2017



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Preface

Measuring food choice and consumption behaviour the intelligent way has attracted substantial interest over the past decade among diverse research groups across the world. The *dVices4Food* sets out to create cooperation in two important fields: to automate dietary intake assessment studies and thereby allow for easy2use estimation of the nutritional as well as the food waste and climate impact of food consumption, and to simulate food environments such as supermarkets and buffets that can be used in the study of food choice and behavioural nutrition.

Thanks to a network grant, the network has been operating from 2015 to mid-2016 and presents some of the important achievements in this report. The network members are proud to present the findings and results including a substantial media attention (see appendix 2), an open conference, several symposia and workshops, scientific papers, and research exchange stays.

Let me take the opportunity to thank Casandra Diep, PhD, Thomas Baranowski, Professor, Wenyan Jia, PhD, Yuecheng Li, Mingui Sun, Professor, Mara L Cnop, PhD, Luana S Monteiro, Post Doc, Rosangela A Pereira, Assoc. Professor, Hua Xie. Post Doc, and Jianqin Sun, Professor, for their commitment to the network activities. Also warm thanks to Professor Edward Delp, Purdue University, and the students from Integrated Food Studies that participated in the network activities and to the Doctoral Schools at both Dept. of Planning & Development and Dept. of Clinical Medicine and the Nordic Fudan Centre in Shanghai. Last, but not least, thanks to the Danish Board of Science Technology and Innovation for supporting the network.

Bent Egberg Mikkelsen,
Professor
Network leader, PI
January 2017

Introduction

The *dVices4Food* is a network of research groups in Denmark, Brazil, USA, and China that has been working together 2015-2016 chaired by Professor Bent Mikkelsen of Aalborg University to strengthen the interdisciplinary cooperation around development of intelligent devices that can be used for behavioural, dietary assessment and consumer research studies. The network has worked together to explore the scientific potential offered by new device-technology by combining and sharing their insights. The network has explored the potential for transferring applications from existing to new areas. The network has worked to develop new research partnerships and to identify new potential for bilateral research cooperation.

The network has combined a multitude of disciplines from across continents and the scientific domains of public health, behavioral nutrition, behavioral science, foodscape studies (FSS), information & communication technology, pervasive computing as well as studies in GIS & health.

The purpose of the *dVices4Food* work has been to develop collaborative projects on devices that could:

1. Automate dietary intake assessment studies and thereby allow for easy2use estimation of the nutrients as well as the food waste and climate impact of food consumption, and
2. Simulate food environments such as supermarkets and buffets that can be used to study food choice and behavioural nutrition.

State of the art

There is a significant interest from multiple societal stakeholders in understanding and measuring food choice and consumption behaviour. The increased availability of big data access and smart sensor technology has fueled interest in using these new technologies to measure behaviour, consumption and food choice the smart way. An increasing number of research groups around the world are working on Informations and Communications Technology (ICT) based approaches to measure food choice and to assess dietary intake using real-time ICT technology in fully or semi assisted ways.

Nutrition related disorders are a significant societal problem caused by unhealthy eating patterns. Less than 20 % of the Danish population meet the recommendations for fruit and vegetable intakes. In settings such as hospitals, under-nutrition is also a problem with 23 to 38 % of patients in DK, CN and the US^(1,2). In BR⁽³⁾ up to 48 % of patients will experience a worsened nutritional status during their stay. The nutritional challenges at hospitals are illustrated through the fact that up to 40 % of the food served is wasted⁽⁴⁾. At the same time consumers are focused on eating patterns and health, thereby, creating a growing interest in methods to monitor food intake and a need for easy2use portable intelligent food-devices. Devices such as smartphones, touch pads, etc. are increasingly used by consumers for self-tracking of lifestyle and in research studies. The application of such devices is growing⁽⁵⁾.

One prominent example is devices that capture human behavior and allow for the analysis of monitoring physical activity, food intake as well as in-built food waste⁽⁶⁾. This has been addressed in both DK^(5,6,7) and the US^(8,9,10) and involves novel combinations of scales, smartphone technology, near field communication, and picture- and voice recognition. New wearable devices have been developed to objectively assess behaviors⁽¹¹⁻¹³⁾ which offers researchers new opportunities since they can be used in a reverse mode to track the behavior of individuals. GPS, mobile positioning, Wi-Fi and Bluetooth are examples of signals and protocols that offer such functionality. Along with the functionalities related to Geographical Information Systems (GIS), which offer simple representations of the physical environment including opportunities for physical activity and food, this offers new possibilities in the study of human dietary intake, health behavior and consumption patterns. In particular, the ICT assisted automated measurement of dietary behaviour has attracted interest from research groups across the world. This interest is not limited to the research community. At the consumer level the convenient and easy2use monitoring of food intake, and the idea of the quantifying self in which technology is used for data acquisition of food and physical activity, has fuelled an increased interest in exploring the potentials of ICT and wearable lifestyle computing. Lifelogging, self-tracking, auto-analytics, body hacking, self-quantifying and self-surveillance are all synonyms that are relying on smart behavioral self-tracking technology. The accessibility of new mobile technologies, including smartphones, personal digital assistants, touch pads and ultra-portable computers has increased. For instance, in the Nordic countries between 82 % and 92 % of the population use mobile ICT devices daily. This has made them more feasible for researchers doing behavioural research and even for health care service providers for monitoring health behavior of clients.

The Network has engaged in 10 collaborative activities:

Network activities

Activity no.	Location	Hosted by	Timing	Network members involved	Type of activity
1	Rio de Janeiro	UFRJ	May 2015	RP, BEMI	Workshop
2	Montclair, NJ	ICCAS15	June 2016	BEMI, KTO	Workshop
3	Pittsburgh, PA	Pittsburgh University	July 2016	KTO, WJ, MS	Research stay
4	Houston, TX	Baylor College	July 2016	TB, KTO	Research stay
5	Copenhagen	AAU	August 2015	BEMI, KTO, TB, WJ	PhD training
6	Copenhagen	AAU	August 2015	BEMI, KTO, TB, WJ, JS	Open conference
7	Shanghai	Fudan University	November 2015	JS, BEMI	PhD training
8	Dublin	Measuring Behaviour	May 2016	BEMI, KTO, TB	3 Symposium/de moes
9	Capetown	ISBNPA17	June 2016	MS, BEMI	Symposium
10	West Lafayette, IN	Purdue University	July 2016	KTO	Research stay

Outcomes

The outcome of the *dVice4Food* project has been the establishment of a strong international network. Starting from a group of Danish, American, Chinese, and Brazilian researchers it has facilitated mobility between research groups, developed strategic plans for future R&D projects, published several papers and developed two joint PhD courses in novel ICT assisted methods for measuring behavior. In addition, it has arranged three sessions at the Measuring Behavior annual conference 2016 in Dublin as well as one symposium at the ISBNPA Capetown 2016 conference. In cooperation with US partners, AAU has arranged workshops at the universities of Montclair State and Pittsburgh.

The participating research groups have benefitted from the multidisciplinary that the network members have brought into the cooperation. The Danish partner gained an increased insight in the analytical part of automated assessment of children's dietary intake and has in particular learnt from automated imaging technology used in the US. AAU has been testing the eButton and has brought back valuable insight that is currently being used in the DIMS 3.0 program. AAU researchers have participated in research exchange on two occasions at Purdue and Pittsburg Universities. AAU researchers have participated in research mobility at the University Of Rio De Janerio and at Fudan University. AAU has as an outcome along with the US partners at Baylor College, and Pittsburg University arranged a symposium entitled "Man or machine? How far are we in the field of smart devices for dietary data collection" for the ISBNPA 2017 annual conference. In addition to the planned outcomes, AAU has increased its network to cover important partners at University of Newcastle in New South Wales, Australia, Wageningen Restaurant of the future as well as Jožef Stefan Institute in Slovenia that are particularly strong in mathematical modelling and algorithms for imaging analytics. AAU and the Brazilian partner has conducted a review on Realtime technologies for dietary data collection. The insight from the network is currently informing the Richfields EU H2020 big food data program where AAU participates as the Danish partner.

Publishing

1. Ofei, K. T., Holst, M., Rasmussen, H. H. & Mikkelsen, B.E. Effect of meal portion size choice on plate waste generation among patients with different nutritional status – An investigation using Dietary Intake Monitoring System (DIMS). *Appetite*, 2015
2. Andersen, MR; Brisson, P; Hald, PL; Godtfredsen, D Serafin, S & Mikkelsen BE. Validation of a Virtual Reality Tool to Test Consumer Response in Supermarket Settings. *Proceedings of Measuring Behavior 2014*, Wageningen, The Netherlands, August 27-29, 2014. Editors: A.J. Spink, L.W.S. Loijens, M. Woloszynowska-Fraser & L.P.J.J. Noldus. www.measuringbehavior.org

3. Ofei, K & Mikkelsen, BE: Using DIMS for Real-Time Monitoring of Patients Dietary Intake and Plate Waste: A Pilot Study at Herlev Hospital. Proceedings of Measuring Behavior, MB2016. Dublin May
4. Mikkelsen, BE; Bucher, T; Hieke, S; Verain, MCD & van den Puttelaar, J. Measuring food choice and consumption behaviour with real, fake or virtual food realities – a comparative approach from the RICHFIELDS program. Proceedings of Measuring Behavior, MB2016. Dublin, May
5. Mikkelsen, BE; Høeg, ER; Mangano, L; Serafin, S: The Virtual Foodscape Simulator – gaming, designing and measuring food behavior in created food realities, Proceedings of Measuring Behavior, MB2016. Dublin May
6. Mikkelsen, BE; Dobroczyński, M; Gade, R; Ofei, KO; Pawlowski, KD & Serafin, S. (2015). Forskere vil tracke forbrugernes adfærd [in Danish]. Researchers track consumer behaviour. Downloadable from www.videnskab.dk
7. Mikkelsen, BE; Dobroczyński, M; Gade, R; Serafin, S & Pawlowski, KD (2015). Små dimser med store potentialer - AAU's fødevarer- og medieteknologiforskere vil flytte forbrugeradfærd og dokumentere det på den intelligente måde [in Danish]. Small devices with great potentials - AAU's food and media technology researchers will change consumer behavior and document intelligently. *Levnedsmiddelbladet*, nr 9. Danish Food Journal

Conclusion

The *dVices4Food* network set out to establish a unique Danish American Chinese Brazilian cooperative that could facilitate mobility between research groups, develop strategic plans for future funding of common R&D projects, publish a state of the art paper and developed a joint PhD course in novel ICT assisted methods for measuring behavior as well as a symposium for the Measuring Behavior annual conference. The network has been operating from 2015 to mid-2016 and concludes that the findings and results are as expected by the network members and the results included substantial media attention (see appendix 2), an open conference, several symposia and workshops, scientific papers and research exchange stays.

Appendix 1. Network participants

The network has involved experts from diverse fields of the research community with different research traditions and methodologies giving a good potential for exploring and developing this area. An important feature of the network was that it brought together an academic level early mover research group that developed and tested cutting edge technology with innovative researchers at the user level that were exploring new avenues for using intelligent devices for improving their research protocols. The network was also unique in the sense that it brought together researchers from well-established economies with developing ones.

Senior Scientists

Prof. Bent Egberg Mikkelsen, AAU, holds a M.Sc. in Food Sci. & a PhD in Social Sci. He is a leading researcher in foodscape studies and responsible for developing the FoodScape lab. He has a long record of working in the government domain of food risk assessment and risk management in the nutrition area as well as a long record of working in the “evidence informs policy” area in a national, Nordic and European context. Strong international network in both science and policy making in health promotion and public health nutrition. PI on several research projects and engaged in several int’l projects. Several assignments on nutrition at schools and hospitals for the Council of Europe, food and nutrition at work for the Nordic Council of Ministers, healthy eating at school for the European WHO regional office and the EU platform for Health, Diet and Physical activity. Chair of EU expert committee for the school fruit scheme (SFS). Member of advisory boards of ProMeal and VeggieEat projects. Member of scientific panel in the Sapere Taste Education network and the EU FoodLinks project. He is the Member of the Management committee COST action IS1210 and the vice president in the Food & Nutrition section in EUPHA Research output (2009-2014): 35 peer reviewed papers and 10 contributions to books etc.

Prof. Tom Baranowski holds a bachelor’s degree from Princeton U and a PhD from the University of Kansas. He is the senior behavioral nutritionist with the Children’s Nutrition Research Center in the Dept. of Pediatrics.

Prof. Mingui Sun, University Pittsburgh holds a M.S. & Ph.D. in Electrical Engineering. He is developing electronic sensors and devices for medical applications and computational algorithms for medical signals and images.

Assoc. prof. Rosangele Pereira is at Dept. of Social & Applied Nutrition, Fed. U, Rio de Janeiro. She holds a bachelor’s degree in Nutrition and a dr. degree in Public Health. She is a leading researcher on food consumption and was a part of the team coordinating the first BR nationwide dietary survey.

Prof. Jianqin Sun, Fudan University, Director of Clinical Nutrition Center in Huadong Hospital has a MD from Guiyang Medical College, MPS in Food & Nutrition Planning from University of the Philippines, and visiting prof. at the George Washington University. Leading researcher on nutrition risk assessment for the elderly & hospitalized patients in CN.

Institutions

Aalborg University has a long tradition of studying food behavior experimentally in out of home eating. The Dietary Intake Monitoring System (DIMS), the intelligent buffet (IB) and the virtual buffet have recently been developed. Aalborg University has involved Post doc Kwabena Ofei, PhD, (Automated dietary, food waste assessment) and Bent E. Mikkelsen, prof., (nutrition interventions, ICT assisted measurement).

Baylor College of Medicine, Houston, and Children’s Nutrition Research Center (CNRC) is funded through the USDA and National Institutes of Health (NIH). The mission is to investigate the nutritional needs of children from infancy through adolescence. Research on innovative methods in dietary assessment has existed at the CNRC since its founding. The university has involved Casandra Diep, PhD (Computerized dietary assessment in Asian American populations) and Tom Baranowski, professor, (Intelligent dietary assessment).

University of Pittsburgh is a leading research institution in the US. Its annual medical research expenditure as measured by grants from NIH is among top 10 in the U.S. It has a well-established research program in food, nutrition, obesity and related chronic diseases. The research team has been investigating electronic technologies for dietary assessment for years supported by NIH. The university has involved Wenyan Jia, PhD Software design for objective dietary evaluation, Yuecheng Li, (Electronic devices design for dietary studies) and Mingui Sun, Prof., (wearable computing for lifestyle quantification).

Universidade Federal of Rio de Janeiro has an extensive experience on the evaluation of food consumption and nutritional status. The Dept. participated in the coordination of the first national dietary survey carried out in BR (2008-2009) and has been collaborating in intervention studies on adolescents’ dietary habits. The university has involved Mara L. Cnop, PhD (Choices architecture, promotion of healthy eating) and Luana S. Monteiro, Post doc, (Dietary assessment methods, food consumption, dietary patterns of adolescents) and Rosangela A. Pereira; assoc. prof., dietary assessment in nutrition interventions, choice architecting.

Clinical Nutrition Center, Huadong Hospital, Fudan University is a leading institution in clinical nutrition, nutrition and aging in China. The main research areas are nutrition interventions for diabetes and metabolic syndrome, food & nutrition assessment for elderly & hospital patients. Fudan University has been involving: Hua Xie. Post Doc (Nutrition interventions, diet assessment for the elderly & hospital patients) and Jianqin Sun, Prof., (clinical nutrition, nutrition and aging, nutrition interventions)

Appendix 2: Outreach

Weblinks from DVICE4FOOD – NEWS

Date	Titel	Link
21.04.2015	Hvordan designer fødevarerfolk det sunde valg og det kærlige skub på den nemme måde?	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/hvordan-designer-foedevarefolk-det-sunde-valg-og-det-kaerlige-skub-paa-den-nemme-maade.cid171248
21.04.2015	Forskningens døgn i spinderiet byder på chili-ansigtslæsning, virtual reality og kamerateknologi	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/forskningens-doegn-i-spinderiet-byder-paa-chili-ansigtslaesning-virtual-reality-og-kamerateknologi.cid171437
21.04.2015	Varmefølsomme kameraer analyserer vores valg i kantinen	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/varmefoelsomme-kameraer-analyserer-vores-valg-i-kantinen.cid171450
22.04.2015	Can we nudge you to the healthy food choice in 3D virtual reality?	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/can-we-nudge-you-to-the-healthy-food-choice-in-3d-virtual-reality.cid171807
22.04.2015	The heat-map camera tracks food choice dynamics in the cafeteria	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/the-heat-map-camera-tracks-food-choice-dynamics-in-the-cafeteria.cid171806
23.04.2015	Kan en buffet tænke selv?	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/kan-en-buffet-taenke-selv-.cid171808
04.06.2015	AAU researchers exhibits devices for food in shopping mall	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/huge-interest-for-devices-when-aau-went-on-tour-at-researchers-festival.cid177997
01.06.2015	First DVICES4FOOD meeting in Rio de Janeiro	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/danish-an-brasilian-researchers-meet-at-federal-university-ufrij.cid176964
11.06.2015	AAU researchers explains the idea of devices for food	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/want-to-know-the-secret-behind-the-the-foodscape-tracker-the-virtual-food-choice-simulator-the-intelligent-buffet-and-the-the-foodscape-heatmapper.cid178709
20.06.2015	DVICES4FOOD workshop hosted at university of Pittsburgh	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/danish-food-devices-meets-best-american-technology.cid179707
20.06.2015	Monclair State University host ICCAS workshop for AAU researchers	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/danish-students-and-researchers-display-and-demonstrates-ict-based-devices-for-food.cid179706

10.07.2015	Researcher from Nordic universities hosts meeting at Montclair State University	http://www.capfoods.aau.dk/technical/dvices4food/newslst/show/research-based-education-for-future-foodcapes.cid182521
28.08.2015	DVICES4FOOD ugen og de nye teknologier som kan hjælpe med sund ernæring og begrænset madspild i nyhederne fra AAU	http://www.capfoods.aau.dk/technical/dvices4food/newslst/show/dvices4food-ugen-og-de-nye-teknologier-som-kan-hjaelpe-med-sund-ernaering-og-begraenset-madspild-i-nyhederne-fra-aau.cid256835
14.09.2015	Top researchers, doctoral students and practitioners meet for food & devices summit at AAU in Copenhagen	http://www.capfoods.aau.dk/technical/dvices4food/newslst/show/top-researchers-doctoral-students-and-practitioners-meet-for-food-devices-summit-at-aau-in-copenhagen.cid189987
19.09.2015	Conference presentations from small devices – big potentials at Aalborg University august 23 now available	http://www.capfoods.aau.dk/technical/dvices4food/newslst/show/conference-presentations-from-small-devices-big-potentials-at-aalborg-university-august-28-now-available.cid190673
19.09.2015	FOOD4GROWTH netværket mødes til intensiv arbejdsuge omhandlende dimsteknologien	http://www.capfoods.aau.dk/technical/dvices4food/newslst/show/food4growth-netvaerket-moedes-til-intensiv-arbejdsuge-omhandlende-dimsteknologien.cid190670
19.09.2015	Ph.D. Course: Qualitative methods for user and consumer research in science, engineering and medicine	http://www.capfoods.aau.dk/technical/dvices4food/newslst/show/phd-course-qualitative-methods-for-user-and-consumer-research-in-science-engineering-and-medicine.cid190672
29.09.2015	The DR News program “Spild af dine penge” is focusing on food waste	http://www.capfoods.aau.dk/technical/dvices4food/newslst/show/the-dr-news-program-spild-af-dine-penge-is-focusing-on-food-waste.cid191945
14.10.2015	DR radioprogrammet Harddisken på P1 om dims'en	http://www.capfoods.aau.dk/technical/dvices4food/newslst/show/dr-radioprogrammet-harddisken-paa-p1-om-dims-en.cid196213
15.10.2015	Levnedsmiddelbladet bringer artikler om AAU's arbejde med de intelligente fødevareteknologier	http://www.capfoods.aau.dk/technical/dvices4food/newslst/show/levnedsmiddelbladet-bringer-artikel-om-aau-s-arbejde-med-de-intelligente-foedevareteknologier.cid196217
02.11.2015	DVICES4FOOD presents at European nutrition conference in Berlin	http://www.capfoods.aau.dk/technical/dvices4food/newslst/show/dvices4food-presents-at-european-nutrition-conference-in-berlin.cid199008
02.11.2015	The DIVCES4FOOD team represented at EFA conference in Amsterdam	http://www.capfoods.aau.dk/technical/dvices4food/newslst/show/the-divces4food-team-represented-at-efa-conference-in-amsterdam.cid199010
04.11.2015	AAU researchers is explaining why food waste is a problem at hospitals	http://www.capfoods.aau.dk/technical/dvices4food/newslst/show/aau-researchers-is-explaining-why-food-waste-is-a-problem-at-hospitals.cid199212

11.11.2015	New AAU research give less food waste and improve the nutrition of the patients	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/new-aau-research-give-less-food-waste-and-improve-the-nutrition-of-the-patients.cid200127
11.11.2015	Politiken is presenting the opportunities of the dims project in a online article	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/politiken-is-presenting-the-opportunities-of-the-dims-project-in-a-online-article.cid200177
17.11.2015	AAU's dims teknologi i fornemt selskab på Dakofas konference om madspild den 26.11 på Kosmopol	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/aau-s-dims-teknologi-i-fornemt-selskab-paa-dakofas-konference-om-madspild-den-26.11-paa-kosmopol.cid200727
17.11.2015	Magasinet Forskerzonen på Videnskab.dk bragte d. 14 november artiklen "Forskere vil tracke forbrugernes adfærd"	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/magasinet-forskerzonen-paa-videnskab.dk-bragte-d.-14.-november-artiklen-forskere-vil-tracke-forbrugernes-adfaerd.cid200728
17.11.2015	AAU lecturers attended the appearance matters training school in Malta	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/aau-lecturers-attended-the-appearance-matters-training-school-in-malta.cid200729
21.12.2015	Dims developers at nordic meeting on food waste	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/food-waste-experts-took-a-closer-look-at-the-dims-2.1.cid232691
21.12.2015	Measuring dietary behavior the intelligent way	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/training-course-at-fudan-university-completed.cid232692
24.01.2016	Ny dims til kostberegning	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/kost-og-ernaeringsforbundet-skriver-om-dims.cid239782
21.03.2016	Stor artikel om dims'en i fagbladet sygeplejersken	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/kan-dims-en-staa-distancen-i-en-travl-sygehushverdag.cid250691
03.06.2016	And the nominees are...	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/and-the-nominees-are....cid262749
21.03.2016	Søndagsavisen: potentialet af minikamera for at lette målingen af kalorieindtag	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/soendagsavisen-potentialet-af-minikamera-for-at-lette-maalingen-af-kalorieintag.cid250692
27.05.2016	Aalborg University contributes significantly to the measuring behaviour conference	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/aalborg-university-contributes-significantly-to-the-measuring-behaviour-conference.cid262751
11.06.2016	Final report about the DVICES4FOOD course held in Shangai now published	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/final-report-about-the

		dvices4food-course-held-in-shangai-now-published.cid265265
13.06.2016	ISBNPA symposium on recent developments in ICT assisted collection of dietary data	http://www.capfoods.aau.dk/technical/dvices4food/newslist/show/-researchers-from-3-continents-meet-at-annual-isbnpa-meeting-in-capetown-to-discuss-smarter-dietary-assessment.cid265510

Other web links

Titel	Publisher	Link
Nyheder fra det sundhedsvidenskabelige fakultet	AAU	http://www.sundhedsvidenskab.aau.dk/nyheder/vis/moderne-teknologi-holder-oeje-med-hvad-vi-spiser.cid186257
Bevillinger fra Internationalt Netværksprogram 2014	Uddannelses og forskningsministeriet	http://ufm.dk/forskning-og-innovation/tilskud-til-forskning-og-innovation/hvem-har-modtaget-tilskud/2014/bevillinger-fra-internationalt-netvaerksprogram-2014
Små dimser med store potentialer	Levnedsmiddelbladet	http://ipaper.ipapercms.dk/TechMedia/LevnedsmiddelBladet/2015/9/?Page=76
Ny forskning skal udvikle teknologier, der begrænser madspild og sikrer god ernæring på sygehuset	Diætisten	http://www.diaetist.dk/media/289880/di_tisten_fuld_version.pdf
Mad og måltider som tema og genvej i science undervisningen?	Folkeskolen.dk	https://www.folkeskolen.dk/570922/mad-og-maaltider-som-tema-og-genvej-i-science-undervisningen

Appendix 3: Report on Purdue Exchange stay

Introduction

The development of dietary intake system (DIMS) has benefitted tremendously from device4Food network supports. Throughout the DIMS development, from the first prototype to its current stage the device4Food network has provided the support to share information and discussion lessons learnt with scientists, researchers and students from various parts of the world. One of such activities recently took place at Purdue University, Indiana, USA from 14th to 29th July, 2006. The research group at Purdue University is headed by Professor Edward Delp, a leading authority in photo/image recognition analysis. The most current project is TADA, using state of art image analysis technique to estimate food intake from captured food images. It was on this basis that the AAU/DIMS group made formal request to Delp group to host a Postdoc fellow, Kwabena Titi Ofei working on the DIMS, for a short research stay, in order to familiarize with the group's work and identify potential collaboration opportunity that could benefit the two groups.

Activities

At Purdue, Kwabena was introduced to several research projects, past and on ongoing using the image analysis technique. The TADA project, most interesting for our DIMS, remained the main focus throughout the stay. Detailed information on algorithm development, validation, testing and application for research was provided. Kwabena gained hands-on experience on how to use the system in the laboratory setting to estimate food intake. Kwabena presented the current state of the DIMS to Delp's team, emphasizing on the current drawbacks which needs to be addressed. This became the theme for discussion and inspirations were drawn from both groups' prior experiences as to how to approach and address the challenges identified. The complex nature of the identified challenges convinced both group of the need to adopt collaborative research approach. Against this background we proposed a joint collaboration between AAU and Edward Delph's research group at Purdue to address the challenges of developing an algorithm system which could automatically analysis food image data captured from the DIMS.

Outcome

Through the network the two research group have identify common grounds for collaboration. A formal collaboration initiative request has been made by AAU to Purdue, which is under consideration. The AAU's role in the collaboration will focus on developing the data acquisition part and whilst Purdue focuses on the development of the analytical part, the algorithm. This collaboration, when finalized it is expected to provide opportunities for the two research groups to solidify their common interest and maintain their respective position as knowledge leaders in their field of expertise while at the same time providing state of the art solution in nutrition research. The benefits will not only be a new automatic dietary assessments system, it will improve the accuracy of food intake assessment, save time and cost related to dietary assessment.

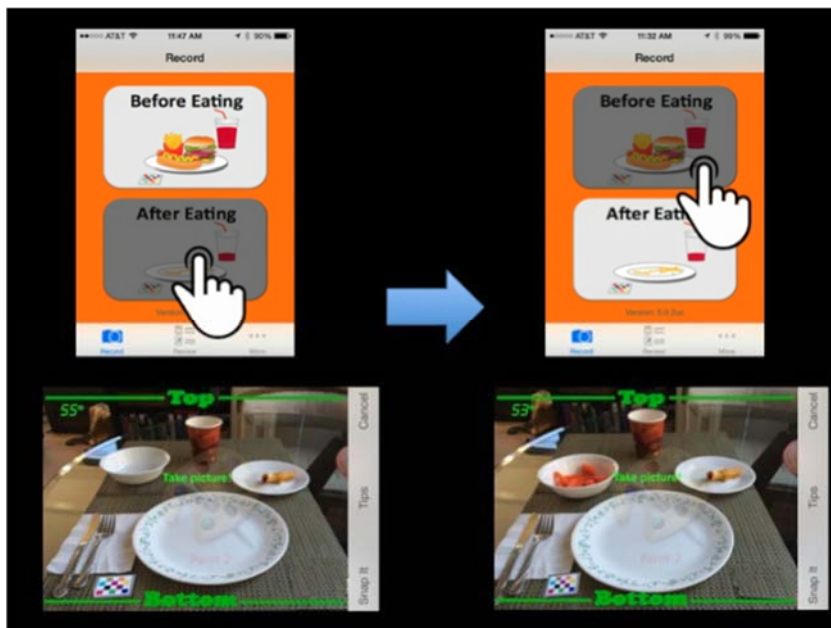
Pictures from Purdue Visit



Kwabena at Purdue University, Indiana



Fake foods for analysis



TADA system for capturing food intake

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