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Aktivitetsskalendar

Hva skjer når og hvor?

Juli 2006

- 1–5 **GraphiCon 2006:** Sixteenth International Conference on Computer Graphics and Applications, Novosibirsk Akademgorodok, Russland. <http://ccfit.nsu.ru/graphicon2006/>.
- 30–(3) **SIGGRAPH 2006:** 33rd Int'l Conf. on Computer Graphics and Interactive Techniques, Boston, USA. <http://www.siggraph.org/s2006/>.

September 2006

- 2–4 **SCA 2006:** ACM SIGGRAPH / Eurographics Symposium on Computer Animation, Wien, Østerrike. <http://isg.cs.tcd.ie/SCA06/>.
- 3–4 **SBIM 2006:** 3rd Eurographics Workshop on Sketch-Based Interfaces and Modeling, Wien, Østerrike. <http://www.eg.org/sbm/>.
- 4–8 **EG 2006:** 28th annual conf. of the European Association for Computer Graphics (EUROGRAPHICS), Wien, Østerrike. <http://www.cg.tuwien.ac.at/events/EG06/>.

Oktober 2006

- 30–(4) **VAST 2006:** International Symposium on Virtual Reality, Archaeology and Cultural Heritage, Cyprus. <http://www.vast2006.org/>.

Januar 2007

- 29–(2) **WSCG 2007:** 15-th International Conference in Central Europe on Computer Graphics, Visualization and Computer Vision 2007, Plzen, Tsjekkia. <http://wscg.zcu.cz/>.

Web-Kalender

Helwig's Conference Calender: <http://www.vrvis.at/ConfCal/>

Eurographics Events: <http://www.eg.org/events>



Om forsiden

ShelfAware: Bildet viser hjørnet med drikkevarer av en virtuell butikk som er implementert med spillteknologi. Teknologien bak den virtuelle butikk-simulator er beskrevet i artikkelen fra side 4.

Hilsen fra styret

Kjære medlemmer,

Det er nå et år siden siste utgave av NORSIGD Info. Grunnen til denne lange pausen er ikke at det er mangel på spennende utfordringer i vårt fagfelt, men det at vi som jobber innen forskning for tiden må bruke mye av vår tid til å skrive prosjektforslag og søknader til de som forvalter midler til ny og spennende forskning. Slike søknader er noen ganger nesten som prosjekter, med det unntaket av at leveransen ikke er en prototyp, men noen sider med papir som beskriver nye idéer.

Det er i ulike sammenhenger man treffer NORSIGD medlemmer. På konferansen **EuroPACS 2006** hadde jeg en hyggelig prat med Erik M. Hansen, som tidligere var redaktør i NORSIGD Info, og som nå er IKT-direktør i Helse Vest. For de som lurer hva PACS er så kan det avsløres dette er databaser for medisinske bilder og data. Innen medisin er det forresten mange utfordringer, spesielt innen visualisering som kan være av interesse for grafikk-miljøet.

Styret i NORSIGD ønsker alle lesere en Riktig God Sommer!

Hilsen,

Wolfgang Leister



NORSIGD Info

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Utgitt av: NORSIGD
 Ansvarlig: Wolfgang Leister
 Norsk Regnesentral
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ShelfAware — Market Research using a virtual Grocery Store Implemented on Gaming Technology

Wolfgang Leister, Ingvar Tjøstheim, Joachim Lous, Norsk Regnesentral

We present the market research tool *ShelfAware* which implements a virtual grocery store using gaming technology available on PCs. The purpose of the tool, the virtual store, is to study user behavior including choice studies of grocery shoppers in a virtual environment, and hence give evidence on how customers would behave in a real store. Gaming technology is used for implementing a (realistic looking) replica of real-world grocery store. Modelling aspects when designing or modifying virtual stores are addressed. We present results from usability studies of *ShelfAware*. Two issues are of special interest: (1) Are novice users capable of operating the tool, and (2) how does the behavior in a real store and the behavior in a virtual store compare. A real world user study with about 600 grocery shoppers of a selected grocery store was performed.

Playing games has been a very human activity and has its function in learning and entertainment and leisure. With the advent of computer technology and its increased possibilities to design and implement games, more immersively than ever, an entire industry develops hardware, software and content for games. Games are available on standard PCs and game consoles, which are affordable to many.

The development of the computer game industry has developed fast, and just some years ago games which deliver realistic images in real-time have not been possible.

It is well known that kids, young adults and even some adults are spending a lot of time playing games [1]. Even game-playing children realize that the driving force in these immersive environments are the users' experience. Computer games are engaging because they provide increasingly realistic and lifelike 3D visual environments, thus driving demand for home 3D entertainment. Immersion is one of the most important characteristics of computer games [2, 3] in VR technologies [4].

According to the Entertainment & Leisure Software Publishers Association (www.elspa.com) computer games are a \$18.5 billion business worldwide.

The gaming technology can also be used to build non-game applications. Examples are simulators, educational or training tools, cultural heritage applications such as virtual museums [5, 6, 7, 8], and market research (MR) tools such as *ShelfAware*. *ShelfAware* is a non-game application for market research studies or consumer behaviour studies. In MR or consumer studies the aim is to collect information of behaviour in the real world, to predict how consumers behave, for instance what they choose when shopping. Personal interviews, paper based or electronic questionnaires and focus groups are examples of MR techniques.

This paper discusses the technical foundation of *ShelfAware* developed in a marketing research

projects [9, 10]. One of the most important features of the *ShelfAware* tool is its ability to replicate a shopping environment in a realistic and lifelike manner. Pictures from the physical store are used in to make (or replicate) the VR store. The *ShelfAware* tool can for instance be used to test new products, to study the content of shopping baskets, and "hot spots" in the store (Figure 2).

The paper is organised as follows: The first section presents how market analysis techniques and VR relate to each other. Then the technical implementation of *ShelfAware* and aspects of modelling the VR stores are described. Key findings from the evaluation and validation of the tool are presented before concluding.

Market Analysis and VR

In this kind of market analysis we study customer behaviour in a shop, e.g., with respect to placement of groceries, design of the shop, etc. Instead of rearranging a real store in order to perform analysis (rearranging a real store is rather costly and time consuming) it is preferable to model the shop in a VR application, and let the customers test the shop using a computer and immersive technologies.

In a market research context it is common to distinguish between stated preferences and revealed preferences [11]. According to [12] Stated preference (SP) methods are ways of eliciting individual's preferences for goods, courses of action or more general "alternatives" based on individual's preference opinions or "intentions" expressed in surveys or hypothetical, constructed markets, not real markets. Thus, this class of methods for preference elicitation differs from more traditional economic approaches based on individual's actual behaviour, or revealed preferences (RP) primarily as SP methods typically do not ask individuals to commit resources in making choices.

A number of survey-techniques and methodologies are used to study purchase intents. However, an important disadvantage of purchase intents is its potentially limited predictive validity, as individual-level observed behaviour can differ from planned behaviour [13, 14, 15].

The VR-store ShelfAware can be classified as a stated preference (SP) method, where respondents make choices of complete products in a replicated shopping environment. The fact that the choices (products) are presented in a replicated shopping environment distinguishes our method from other choice experiment methods.

To create VR stores and computer based shopping environments for the purpose of doing market research is not a new idea. At least four papers about VR-stores or VR-store concepts have been presented at market research conferences lately [9]. In the literature we find the following statement on validation [16]: “While a number of authors have used computer simulations to generate purchase data, research on the validity of these outcomes is scarce . . .”



Figure 1: The VR store based on computer gaming technology. The contents of a shopping basket is shown.

While games on a PC usually are optimised to give the player a most exciting experience and joy factor, our application is measured differently. Our goal is to implement a tool where the behaviour in the VR shop is as similar as possible to behaviour in a real shop. Computer graphics and immersion are used as a means to achieve this goal.

The use of first person shooter (FPS) game engines related to other applications than “shooting games” are presented previously, e.g., a proof of concept prototype of Queenscliff, Australia [17]. There the authors claim that FPS still is at the forefront of computer graphics. The developers decided to use Crytek’s CryEngine Sandbox, a real-time multi-player environment and editing applica-

tion, which is also used of the game *Far Cry*.

ShelfAware

The ShelfAware package consists of an editor tool *ShopEdit* to design the VR shops, the simulator based gaming technology, and the path-tracker as an analysis tool beyond the statistical evaluations of items bought. The VR stores are presented on a PC, and the users (customers) do not need gloves, spectacles or similar equipment. However, using the game technology a 3-D experience and immersion is created.



Figure 2: Another view of the VR store. When looking at the product in the centre of the screen, the price tag and a larger image of the item appears.

The simulation software of ShelfAware is based on standard FPS engines. We used two different engines for the implementation: the Quake 2 game engine from ID software, and the Torque game engine from GarageGames. In both cases some modifications had to be done in order to improve the graphics and adapt the “game rules” to the new application.

In the final implementation we use the Torque engine, since the source code could be licensed to an acceptable fee, good editing tools were readily available. Although slightly dated, with some graphical improvements it delivers industrial-level performance in the areas we needed. In the commercial sector there are more advanced systems available that could be used, especially when it comes to lighting and other effects. However, from the perspective of MR these capabilities are not needed necessarily.

The geometry and textures of the VR stores are taken with a (non-professional) digital camera and used in order to replicate the VR stores. The model consists of photographic textures from the real shops wrapped onto quite simple geometric models. The result is highly dependent on the resolution of the texture images. Using standard digital cameras to take the pictures of the shelves in real shops we

achieve suitably good realism. The capacity of graphics cards to handle high-resolution textures is moving fast and as a consequence a better realism can be achieved.

The user interface is modelled as a typical action games (look around with the mouse, move forward/backward with keys, using both hands at once), rather than the mouse-only point-and-click interface of typical desktop applications, which many other non-game desktop VR applications have chosen.

This user interface offers a more immediate and direct control and it contributes significantly to the sense of immersion that such games do produce and is depend on for their effect. The gaming user interface offers also a better control to people initially unfamiliar to people without games experience. Since this interface paradigm is used in games with success we decided to apply it for the VR grocery store.

To be able to pick a product, the virtual customer must navigate close to the product before he or she can put the goods into the shopping basket by using mouse clicks.

Modelling

We wanted market-research practitioners who are not computer experts to be able to modify and author shop models and other contents with only light training. An important idea behind the whole project was that the current state of consumer hardware had made it possible to make high-quality VR applications *accessible* far outside the traditional arenas of high-end industrial VR and technical experts, and authoring should be in keeping with this.

This attitude strongly suggested creating custom modelling tools, specialised for exactly the small set of features needed for the application domain, and making them extremely simple to use. An added benefit of the custom tool (dubbed ShopEdit) is that its tailor-made nature with respect to the intended work-flow makes even experts more productive. Similar efforts for developing tools for other application areas can be found elsewhere [18].

The tool creation effort was focused on the part of the content pipeline that would be most difficult for users to master with third-party tools: 3D modelling and texturing. There are many excellent tools available, but all are significantly more complex to learn.

Shops in ShopEdit are built from “modules”, which are simple geometric shapes (so far only plain boxes) representing a shelf rack, refrigerator, or other object. The surfaces of the modules are texture-mapped, many with photo-textures taken

from real shop interiors. Some of the surfaces have associated “pickup points” from which the virtual shopper may examine and pick up a particular product (Figure 3).

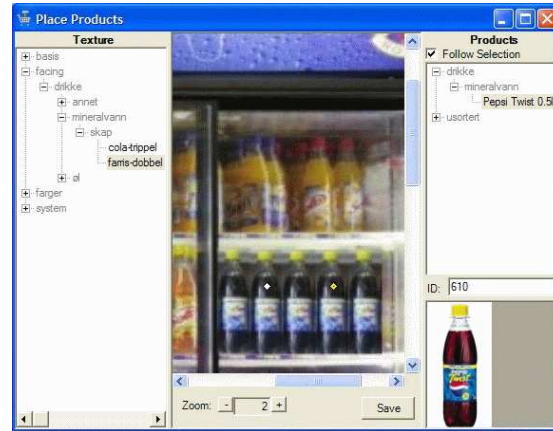


Figure 3: ShopEdit is used to organise images of shelves, and edit assets.

At the simplest level, editing a shop consists of arranging predefined modules from a library, as if they were literal building blocks. This is done in the “shop editor” tool (Figure 4), where modules may be placed, rotated, and stacked in the shop, all in a very direct WYSIWYG manner.

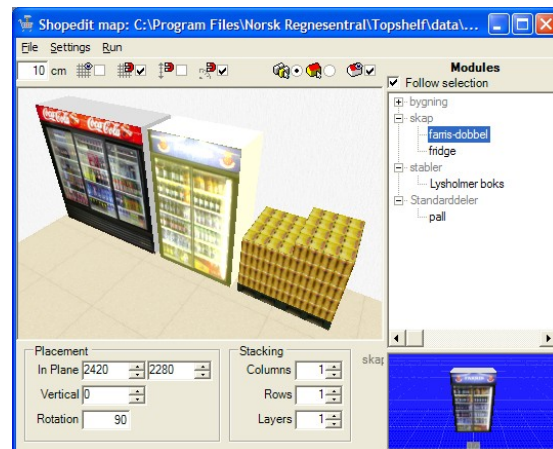


Figure 4: ShopEdit is used to organise images of shelves.

Modules themselves are created and managed in the module editor (Figure 5). Here one can create new modules, specify dimensions, apply textures from a texture library, and organise the library of modules, and alter existing modules.

The last component within ShopEdit is the product-placing tool. Here one can import and organise texture images, import and organise product close-up images, and place pickup points for a product on a texture. The pickup points automatically follow the texture and will appear in the simulator

wherever the texture is used.

Extracting textures from photos before importing them into ShopEdit is done with third-party software. A specialised and integrated solution would be simpler and more efficient, but using the right image editing software it is at least relatively easy for anyone to learn. Photos of real shop interiors are taken using at least a good consumer-level digital camera. Individual faces of shelves etc. are then perspective-corrected, cropped and scaled to a suitable resolution (Figure 6).

Also done in standard software so far is any manipulation of the textures, for example to change the product selection on a shelf. Image editing software has many features for this task.

Among the planned future enhancements to the tool are integrated texture extraction, and the ability to “build” composite textures from elementary product- and other images in a semi-automated and more user friendly way than general image-manipulation techniques.



Figure 5: Use ShopEdit to model 3D models for shelves.

There is also a custom tool at the other end of the pipeline: The movements of the customer in the VR store are logged during simulation, along with all purchases and products inspected. Pure sales figures etc. lend themselves to standard spreadsheets and statistics packages, but the logs contain a lot of other information that is best presented and analysed in a more visual manner. This is done in the path-tracker application, shown in Figure 7. The path-tracker can load any number of logs and visualise them in a map of the shop. The illustration shows the basic path mode, which is good for identifying where most of the traffic flows. Other display modes highlight time spent in different areas as a scalar field (identifying traffic bottlenecks and hot-spots of attention), movement vectors, mean gaze direction, and several oth-

ers. This is also a component that may benefit from being integrated into ShopEdit, enabling things like visiting interesting places on the map, first-person playback of individual trips, and identifying attention hot-spots more precisely on individual surfaces based on 3D gaze direction.



Figure 7: A path tracker tool

Evaluation

In order to find out whether the customer behaviour using ShelfAware is related to the customer behaviour in a real grocery store we conducted evaluations in two grocery stores in Oslo. At the entrance of the shops we installed PCs with ShelfAware and asked customers to do a virtual shopping tour of what they intended to buy, and then do their shopping in the real grocery store. The respondents also answered a set of questionnaires regarding ShelfAware and their shopping trip. The log file of the VR store contained information of the choices in the VR store and the receipts contained information about the choices in the physical store. The VR store did not contain all products available in the physical store but all products of the category of the client in the project and some additional products, all in all 450 products.

Since the respondents were intercepted at the entrance of the stores, it was possible to invite them to first shop (e.g., choose products) in the VR-store before shopping in the grocery store. The respondents were given a demonstration by the interviewer, then he or she tried the program, and finally s/he were asked “to shop as you are going to do in the grocery store in a few minutes.”

In this section we concentrate on the feedback the users gave on the VR store, navigation, and questions such as whether it was easy or difficult to do

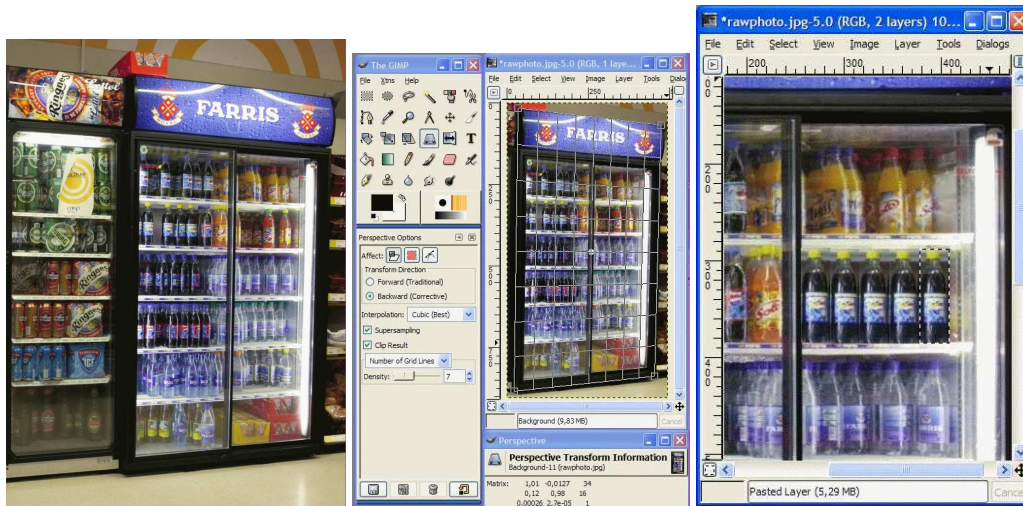


Figure 6: Preparation of the images. The photographs from a digital camera are normalised in the perspective, scaled, clipped, and edited using an imaging program.

the shopping task in the VR store, etc. Additional results from the evaluation can be found elsewhere [9, 10].

Design of a Validation Study

Generally there are three alternatives to perform this kind of market research studies: (1) a lab-setting with PC's, (2) PC's installed outside or adjacent to the store, and (3) the use on a home computer. Even though grocery shopping is a very common shopping activity this does not mean that a respondent always is in a shopping mode. However, intercepting customers being in or just outside a store implies that the person already is in a shopping mode.

Customers were intercepted and invited as participants if he or she was going to buy at least one beverage products, the category of the client in the MR project. 603 customers participated in the study. All respondents were customers of the to stores and in a shopping situation/mode when participating in the study.

ShelfAware is intended for the average PC user and the evaluation contained questions regarding usability. An example is navigation and perceived ease of use. The respondents that do not use (or use very seldom) computer games (74%) answered that it was somewhat or very easy to navigate in the VR-store. The outcome of whether the VR tool is suitable for MR purposes is not only dependent on the technical issues such as immersion and user interface, but also on the context in which the study is performed.

Besides being used close to a shop ShelfAware

can also be used in a home-setting, where the user downloads and installs the tool in a PC. For certain MR studies this might be an alternative.

How significant is the validation?

When recruiting respondents the interviewers explained that the VR store resembles an Internet grocery store. Moreover, they were asked to give feedback, to give their opinion of the VR store and if it was easy or difficult to navigate in the VR store. Besides giving evidence on the technology used in the study, these questions also avoid a focus on the comparison of the behaviour (choices) between the VR setting and the real store. It is worth mentioning that some of the respondents commented that this would be a very nice Internet grocery store and that they enjoyed using the VR program.

Table 1 shows that 43% of the participants were less than 30 years old, which makes the average age lower than we would expect. the use of computer games. The majority, 67%, had not used computer games or had only played computer games a few times. As many as 69% answered that they are using computers daily, while the average in the Norwegian population is between 50% and 60%. Since the interviewers invited consumers to test a program on a computer, a higher percentage than the national average was expected.

The respondents were asked to test "a virtual store on a PC, something similar to an e-shop." Since the respondents are customers of the replicated store most of them should therefore be able to recognise that they testing a replicated store. In Ta-

ble 2 the answers of the respondents are presented, also showing the answers of the four categories of PC game users. Of the frequent users of computer games 84% answered daily and this numbered drops to 52% for those that had never tried a computer game. This is an expected result, it indicates that the frequent users of computer games are more skilled users than the non-users of computer games.

Table 1: The profile of the respondents

Age		
18–19	7%	(42)
20–29	36%	(218)
30–39	23%	(139)
40–49	17%	(100)
50–59	12%	(71)
60+	6%	(33)
The use of PC		
Daily	69%	(417)
Weekly	19%	(194)
Monthly	4%	(26)
More seldom	7%	(43)
The use of Computer Games		
Once a week +	14%	(82)
Once a month +	20%	(118)
Only a few times	56%	(339)
Never used	11%	(64)
	N=603	

Approximately 80% answered that they recognised the store. However, it is interesting to notice that there seems to be no significant differences between the members of the four categories of PC users. This is also the case for the feeling of presence with one exception. The VR store did create a feeling of presence for the majority (ca. 80%) and the figure only drops for the customers that have not used a computer game at all before. The purpose of the VR store (the market research tool) is to present a realistic shopping environment to the respondent and to study consumer behaviour (of the respondents) in this virtual environment. Therefore it is important that a feeling of presence in the shop is created to get the shopper into a shopping mode.

There are significant differences between the user segments when it comes to navigation and finding products in the VR store; the frequent game users typically answer “very easy”, while the non/seldom users more often answer “somewhat easy.” Perceived easy of use is important, however the tools ability to predict real life choices and behaviour comprises more. After the participants had shopped in the VR store and the physical store they were asked about the task, the choices they made in the VR-store. The test participants did not have to pay for the goods in the VR shopping basket. Table 3 represents the results; the majority reported

that they tried to do what they were asked to do. It should be commented that it is easy to answer “yes, I did what you asked me to do”.

The actual comparison of the content of the VR shopping basket vs. the real shopping basket of the customer is important for our study. For statistical testing shopping baskets from 603 customers is not a high number since these tests must focus on unique products. In order to test whether a market share of a product is similar to the market share of the physical store the same product must be chosen a number of occurrences according to the statistical criteria. The statistical test was performed in 36 occurrences on this data. For 23 of the tests no significant difference between the VR store and the physical store were detected. However, significant differences were observed in 13 occurrences [9, 10]. For instance 11% answered that they did not do what we asked them to do when shopping in the VR store. Table 3 which might partly explain the deviation from our expectations.

Concluding remark

The VR-store ShelfAware and the editing tools in ShopEdit are targeted for the use of ordinary users of PCs. The user of the VR-store tool is supposed to be able to navigate in the VR store, choose product and (best case) get an impression of being in the store, in order to get a result for the MR task that is as close as possible to the results from a real store. The use of gaming technology, especially the use of FPS games is our approach to create the tool that can be available at reasonable cost giving good results.

We performed an analysis of the usability and the immersiveness of our tool based on questionnaires and logged data from the experiments, in order to get feedback whether gaming technology is suitable for MR applications. While the VR tool did not always predict the market share precisely, the use of this tool predicted well most of the times when used in practice.

When performing the tests, 11% indicated that they did not take the shopping task on the computer very seriously. For the MR study the answers for those not taking the task in the VR store seriously should be considered invalid.

Technically several parts could be considered for improvement. The graphical layout, the complexity of models, the resolution of images and textures could be improved. However, the study shows that the users experience a sufficient degree of immersion. While we focused on hard- and software available in the consumer range, we have to find a trade-off regarding the quality of the images, etc.

Table 2: The feedback from the respondents.

	All	Use of Computer games			
		weekly+	monthly+	Occasionally	Never
Did you recognise the store?					
To a low extent	4% (23)	5% (4)	3% (4)	4% (12)	5% (3)
To a medium extent	14% (84)	9% (7)	19% (23)	12% (42)	19% (12)
To a high extent	82% (492)	87% (71)	77% (91)	83% (281)	77% (49)
First time in shop	1% (4)	0% (0)	0% (0)	1% (4)	0% (0)
Did you get the feeling of being in the store?					
Yes, I got a feeling of presence	80% (484)	85% (70)	78% (92)	83% (281)	64% (41)
In your opinion, how easy or difficult was it to move around in the VR-store?					
Very difficult	3% (19)	1% (1)	2% (2)	3% (11)	8% (5)
Somewhat difficult	18% (107)	5% (4)	11% (13)	21% (70)	31% (20)
Somewhat easy	37% (223)	24% (20)	35% (41)	40% (134)	44% (28)
Very easy	42% (254)	70% (57)	53% (62)	37% (124)	17% (11)
In your opinion, how easy or difficult was it to find the products you were looking for?					
Very difficult	3% (19)	1% (1)	3% (4)	4% (12)	3% (2)
Somewhat difficult	13% (78)	13% (11)	10% (12)	12% (42)	20% (13)
Somewhat easy	38% (226)	27% (22)	38% (45)	39% (132)	42% (27)
Very easy	46% (280)	59% (48)	48% (57)	45% (153)	34% (22)
	603	82	118	339	64

Table 3: The role as a test participant.

	All	Use of Computer games			
		weekly+	monthly+	Occasionally	Never
..., to what extent do you think that your choices were influenced by the fact that you did not have to pay for these products?					
I did not pay much attention since I did not have to pay for these goods	11% (67)	12% (10)	9% (11)	12% (41)	8% (5)
I tried to choose the goods I was going to buy in the store	83% (498)	78% (64)	88% (104)	80% (272)	91% (58)
Don't know	6% (38)	10% (8)	3% (3)	8% (26)	2% (1)
	603	82	118	339	64

We are currently working on improving the editing tools, both regarding the integration of tools into one user interface, and to extend the grocery shop to other market segments. It is important that the editing tool is easy to use for the market analysts when experimenting with several layouts of shops.

In our study we experienced that the use of gaming technology for MR purposes is promising.

ShelfAware can be downloaded from the Internet from the following address: <http://www.nr.no/~joachim/hemli634858/ShelfAware.msi>

References

- [1] A. Rosenbloom. A Game Experience in Every Application. *CACM*, 46(7):28–31, 2003.
- [2] A. Rosenbloom. Interactive Immersion in 3D Computer Graphics. *CACM*, 47(8):28–31, 2004.
- [3] D. Reid. Comment in the program clock online, 30th october 2003, 2003.
- [4] J. Steuer. Defining Virtual Reality: Dimensions Determining Telepresence. *Journal of Communication*, 42(4):73–93, 1992.
- [5] I. Tjøstheim and J. Lous. A game experience in every travel web site? *Game tech-*

- nology is next. In *proc. ENTER 2005, Information and Communication Technologies in Travel and Tourism*, 2005.
- [6] I. Tjøstheim and Joachim Lous. Attracting visitors using computer games technology to build a VR-museum. In *IFITT's Global Travel and Tourism Technology and eBusiness Forum, Lausanne, Switzerland, 18-20. january*, 2006.
- [7] Erik Malcolm Champion. Applying Game Design Theory to Virtual Heritage Environments. In *proc. Graphite03*, pages 273–274. ACM Press, New York, 2003.
- [8] Erik Malcolm Champion. Heritage Role Playing - History as an Interactive Digital Game. In Y. Pisan, editor, *Interactive Entertainment Workshop*, 2004.
- [9] I. Tjøstheim and H. Sæther-Larsen. How to validate a new MR tool? A case study in FMCG. In *proc. ESOMAR, Paris, 27.feb-1.march*, 2005.
- [10] I. Tjøstheim and B. Haugland. Impulse buying in grocery stores: The challenge for market research. In *proc. ESOMAR, Budapest, 19-21 april*, 2005.
- [11] Anna Merino-Castello. *Eliciting Consumers Preferences Using Stated Preference Discrete Choice Models: Contingent Ranking versus Choice Experiment*. PhD Thesis, Departament d'Economia i Empresa. Universitat Pompeu Fabra, Barcelona, 2003.
- [12] J. Louviere. Why stated preference discrete choice modelling is not conjoint analysis (and what spdcn is), 2000.
- [13] A.C. Bemmaor. Predicting behaviour from intention-to-buy measures: the parametric case. *Journal of Marketing Research*, 32(2):176–191, 2000.
- [14] Vicki G. Morwitz, Joel H. Steckel, and Alok Gupta. When do purchase intentions predict sales?, 1997.
- [15] P.C. Verhoef and P.H. Franses. Why stated preference discrete choice modelling is not conjoint analysis (and what spdcn is), 2002.
- [16] Katia Campo, Els Gijsbrechts, and Fabienne Guerra. Computer Simulated Shopping Experiments for Analyzing Dynamic Purchasing Patterns: Validation and Guidelines. *Journal of Empirical Generalizations in Marketing Science*, 4:22–61, 1999.
- [17] T.A. Germanachis, W. Cartwright, and C. Pettit. Using computer gaming technology to explore human wayfinding and navigation abilities within the built environment. In *Proc. XXII International Cartographic Conference*, Society for Computer Simulation International, A Coruña, 11-16 July, Global Congressos., 2005.
- [18] Björn Gerth, René Berndt, Sven Havemann, and Dieter W. Fellner. 3d modeling for non-expert users with the castle construction kit v0.5. In *Proc. The 6th International Symposium on Virtual Reality, Archeology and Cultural Heritage, VAST 2005*, 2005.

Eurographics 2005

Wolfgang Leister, Norsk Regnesentral

NORSIGDs fagansvarlige har besøkt konferansen “Eurographics 2005” i Dublin. Her gjengis det noen inntrykk fra konferansen som hadde mye å by på, både faglig og kulturelt.



Eurographics-konferansen 2005 fant sted på Trinity College i Dublin i Irland. Deltagerne fikk et tettepakket og interessant program med forelesninger og foredrag rundt forskjellige temaer innen datagrafikk og anvendelser. De første to dagene av konferansen var forbeholdt tutorials, etterfulgt

av tre dager med presentasjoner.

Konferanser i utlandet pleier å begynne med en flytur, og Dublin kan nåes lett via København. Fra flyet kunne man allerede se den spennende strandlinjen på østsiden av Irland, som har et nokså karakteristisk preg. Flyplassen i Dublin, eller *Baile Átha Cliath* på lokalspråket, er ganske oversiktlig, og med dobbeldekkerbuss kommer man lett til

byens sentrum. Så ble det en liten spaseretur for å finne Trinity College.

Jeg hadde valgt overnatting på campus, selv om jeg var litt skeptisk etter heller negative erfaringer med en slik overnatting i Manchester for noen år tilbake. Men jeg ble positivt overrasket. Etter et kort besøk i Accomodation Office fikk jeg et stille rom i en av studenthyblene på Campus.

EG Konferansen

Konferansedelen av EG 2005 varte i tre dager, fra onsdag til fredag. Hver dag inneholdt et invitert foredrag med aktuelle temaer, og opp til fire parallelle avdelinger med presentasjon (full papers, short papers, industriseminar, state-of-the-art rapport, osv.).

For at man skulle få en oversikt over temaene, ble hvert paper presentert i en "fast forward", der alle foredragsholdere kunne si noen ord om sitt bidrag.

Selv om alle de grunnleggende temaene (rendering, tekstur, interaction, geometri, modellering, osv.) ble adressert under konferansen, ser jeg i 2005 en orientering mot spill og hardware. Istedenfor å vektlegge enkelt-problemstillinger som tidligere, ble ofte meget sammensatte problemstillinger diskutert slik de opptrer i f.eks. spill. Dette ble også synlig i temaene for de inviterte foredragene: Rob Cook presenterte "Movie Making at Pixar: A Collaboration of Art and Technology", Steve Collins foreleste om "Kinematics, Dynamics, Biomechanics: Evolution of Autonomy in Game Animation", og Pat Hanrahan avsluttet konferansen med "Realism or Abstraction: The Future of Computer Graphics".

I en av industri-sesjonene ble det presentert noe av aktuell utviklingsarbeid innen modellering, og spesielt innen modellering med fysikalske prinsipper i spillemotoren og i hardware. Her ble foredragsholderen nokså ivrig i å vise til publikum hvor blodig realistisk moderne spill kan bli. I ren 24-stil ble det vist hvordan spillemotoren automatisk håndterer skyting med pistol, inkludert de realistisk presenterte skadene på personer og omgivelse. I presentasjonen ble det ikke spart på virtuelle kuler

og virtuelt blod. Ikke nok med det, deretter ble de døde kroppene virtuelt maltraktert og påtent. Rent faglig sett kunne man se at dette er et steg fremover teknologisk. Men jeg har mine tvil om dette er innholdet som vi ønsker å ha mest av i spillene som utvikles i fremtiden.

Konferansen hadde også mye faglig å by på for mine kolleger i SINTEF som arbeider med GPGU prosjektet. GPGU prosjektet har også denne gangen sendt ut en større delegasjon. Også NORSIGD-medlem Sverre Frogner deltok på konferansen.

Det sosiale programmet

Det sosiale programmet til konferansen hadde en offisiell del med mottakelse i byens rådhus, en pub quiz, og en irish night på "dining hall" i Trinity College. Her ble det en stor buffet med irsk underholdning, og mange av gjestene prøvde seg med en svingom på irsk vis. Ellers var det mange muligheter i byens puber, og Temple Bar var ikke langt unna, slik at man kunne studere irske spesialiteter på sene kveldstimer . . .

På Trinity College finnes det også en utstilling av gamle irske bøker i biblioteket. *The Book of Kells* er det mest kjente utstillingsobjektet, men biblioteket stiller også ut originalversjoner av andre kjente forfattere. Bare det å være i dette biblioteksrommet har sin egen sjarm.

Etter at konferansen var slutt på fredag ettermiddag, var det litt tid til en utflukt med lokaltoget til Bray, som er et gammelt sjøbad. Flere av konferansedeltagere var med på denne turen, som ble til en to-timers tur langs kysten til Graystones. Dette er en meget interessant og avslappende tur rundt et lite fjell og langs en sandstrand der man tydelig kan se naturkreftene.

Konferansen var vellykket og interessant, både faglig og kulturelt. For de som er faglig interessert i konferansebidragene så henvises det til Eurographics Web-sider på www.eg.org. Neste konferanse finner sted i Wien i Østerrike fra 4.-8. September 2006.



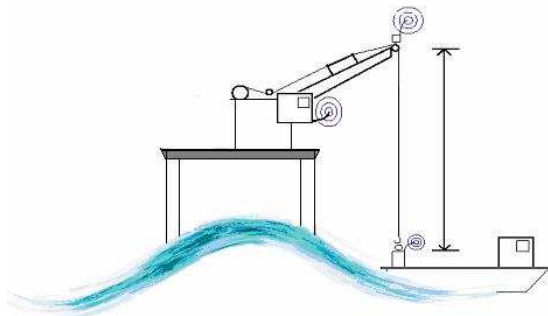
Visualisering av trygg lastning mellom skip og rigg

Hans Birger Drange og Harald Soleim, Høgskolen i Bergen

Studentene i kurset SOD165 Grafiske metoder ved dataingeniørutdanningen, Høgskolen i Bergen, visualiserte trygg lastning mellom skip og rigg i sin siste obligatoriske øving.

Hvert år skjer det alvorlige ulykker i forbindelse med lastning mellom skip og rigg, slik det er beskrevet i Petroleumsilsynets rapport "Analyse av uønskede hendelser ved løfteoperasjoner offshore", utgitt i 2006. I forbindelse med opplæring av kranførere vil en avansert simulator være av stor betydning.

Egil Bru Overaa som arbeidet ved inkubator ved HiB, tok kontakt med oss der han ønsket en visualisering av en slik trygg lastning. Vi gjennomførte oppgaven som en øving i faget. Egil Bru Overaa tok resultatet med seg i en oppfinnerekonkurranse arrangert av Hordaland fylke der han vant 1.premie for sin utredning av problemstillingen knyttet til dette temaet.



Problembeskrivelse

Det skal lages en simulator for å simulere lastning mellom skip og rigg. Vi kan anta at riggen ligger i ro, mens armen på kranen kan beveges vertikalt i forhold til styrehuset og styrehuset skal kunne rotere. Kranens bevegelser skal kunne styres av programmet. Båtens bevegelse kan gjengis ved rotasjoner om et punkt i båten. Aktuelle bevegelser om dette punktet blir derfor kombinasjoner av rull (roll), stamp (pitch) og giring (yaw).

Bevegelsen av båten er i stor grad styrt av bølgebevegelsen. Men som erstatning for dette kan vi generere data for båtbevegelsen direkte. Hvis vi lar $a(t)$, $b(t)$, $c(t)$ og $d(t)$ være funksjoner (med t som tid) som gir data for henholdsvis rulling, helling, giring og hiv, så kan vi simulere båtbevegelsen ved å velge funksjonene a , b , c , og d på passende måte. Hiv betyr at båten heves eller senkes. Tiden simuleres ved å velge diskrete verdier for t med lik avstand mellom verdiene.

De kritiske situasjonene er lossing og lastning av

båten. Her må det tas stilling til når det er best å initiere løftet eller avslutte nedsenkingen i forhold til bevegelsen til skipet. Dersom skipet for eksempel slår opp i lasten er dette å betrakte som en uønsket og farlig hendelse. Altså det må finnes ut av når en skal starte lossing og avslutte lastning og så lage nødvendige tester for dette.

Belastningen på wiren er også en sak som må vurderes med tanke på brudd. Belastningen bestemmes ikke bare av tyngden av lasten, men også av lastens akselerasjon. Dette må tas hensyn til både under laste- og løfteoperasjonen. DNV (Det Norske Veritas) stiller krav til belastningen av wiren. For sammenhengen mellom wirekraft og akselerasjon gjelder følgende ligning: $F_t = ma + G$, hvor F_t er trekkraften i wiren, m massen av lasten, G tyngden til lasten og a lastens akselerasjon.

Akselerasjonen må beregnes numerisk ut fra $h(t)$ som er lik høyden til lasten (i forhold til et valgt nullnivå) ved tiden t . Vi har at $a(t) = v'(t) = h''(t)$. Her regner vi at G er positiv som følge av at vi regner positiv retning oppover. Origo (dvs nullnivå for høyden) kan f.eks. velges i nivå med plattformen. Hvis F_t er for stor må du slakke på farten.

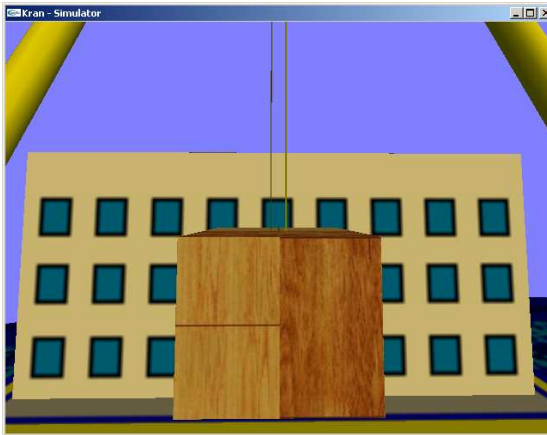
Riggen og båten kan være utstyrt med lys. I tillegg kan vi legge inn atmosfæriske effekter som tåke (fog). Bølgen kan modelleres ved bézierflater/kurver med tekstur. Det er ønskelig å kunne se situasjonen fra kranførerens synspunkt.

For konstruksjon av bølgebevegelsen kan vi merke oss disse punktene:

1. Lage bezierkurve ut i fra kontrollpunkter gitt av en sinusfunksjon som ser slik ut: $A \sin kx$, der A er amplituden og k bølgetallet. Amplituden styres av tiden.
2. Utvider fra 1) ved at bølgen beveger seg i x -retning. Da erstatter vi x med $x + c \cdot t$, hvor c er en konstant som beskriver bølgefarten. Dersom x -aksen er orientert mot høyre vil bølgen gå mot høyre når $c < 0$.
3. Mulig utvidelse med pendelbevegelse av lasten og bevegelse i rigg.

Opgaven ble løst ved bruk av OpenGL.

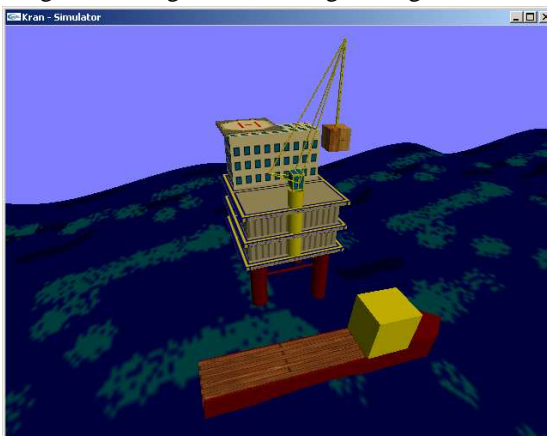
To løsningsforslag



Løsningsforslag fra studentene John Arne Lillestøl og Rune Waage

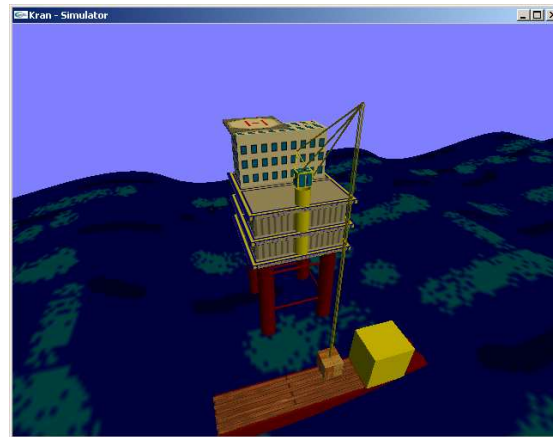
I det første løsningsforslaget er kranen styrbar i sanntid og lasten og kranen følger bevegelsen i sine ellers dynamiske omgivelser. (Altså plattformen tillates her å bevege seg). Man kan se lastingen fra kranførerens synspunkt.

Båtens bevegelser er beskrevet ut fra et bestemt punkt i båten, men bevegelsen om dette punktet ble begrenset til stamp, da supply-båter legger seg med baugen mot bølgen ved lasting/lossing.



Bølgen er visualisert ved bezierflater/kurver med tekstur. Endringer av kontrollpunkter og amplitude sørger for bølgebevegelse lang x -retning.

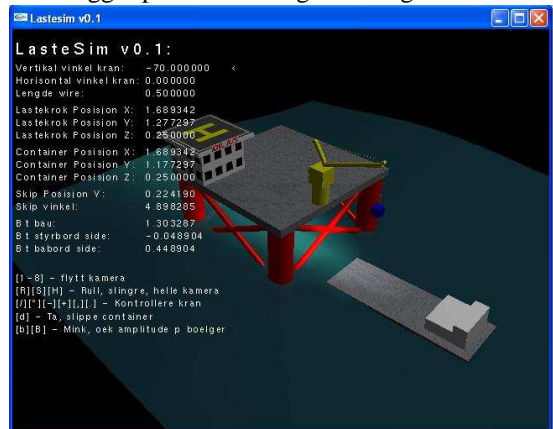
Det er ikke mulig å sette last på båten når båten beveger seg oppover. Videre er det ikke mulig å heve lasten fra båten når båten beveger seg nedover. Det er normalt ønskelig å løfte av når båten begynner å bevege seg nedover. Programmet informerer til enhver tid om båten beveger seg oppover eller nedover og hvor mye.



For å kunne sette kassen på plattformdekk, eller hente kassen fra plattformdekket testes det om (a) kranens posisjon er korrekt, både vertikalt og horisontalt, (b) lengden på wren er passende.

For å kunne sette kassen på båtdekk gjøres samme tester som for plattformdekk, men i tillegg utføres test på om man er inne i en såkalt "sikker periode" for lasting/lossing, altså test på om båten ikke beveger seg nedover når lossing skal skje og test på om båten ikke beveger seg oppover når lasting skal skje. Hvis man laster/losser i "ikke-sikre perioder" vil det bli skrevet ut en feilmelding i kommandovinduet.

I et annet løsningsforslag (se figur under) ble det brukt NURBS for å lage bølgeflater, og retningen av båten ligger på tvers av bølgens bevegelse.



Løsningsforslag fra studentene Anthony The Uy Dinh, George Gooding og Morten Vik

Vi kommenterer kort til slutt at i stedet for eller i tillegg til å utnytte informasjonen fra programmet på stedet, så kunne bevegelsesdata og kranbevegelsene overføres i sanntid til land og der presentere en visualisering av virkelighetsbildet.

Hva er NORSIGD?

NORSIGD – Norsk samarbeid innen grafisk databehandling – ble stiftet 10. januar 1974. NORSIGD er en ikke-kommersiell forening med formål å fremme bruken av, øke interessen for, og øke kunnskapen om grafisk databehandling i Norge.

Foreningen er åpen for alle enkeltpersoner, bedrifter og institusjoner som har interesse for grafisk datbehandling. NORSIGD har per januar 2006 25 institusjons-, 37 personlige og 5 EG-medlemmer. Medlemskontingenten er 1.000 kr per år for institusjoner. Institusjonsmedlemmene er stemmeberettiget på foreningens årsmøte, og kan derigjennom påvirke bruken av foreningens midler.

Personlig medlemskap koster 250 kr per år. Personlige medlemmer får tilsendt medlemsbladet *NORSIGD Info*. Kontingenten er redusert til 150 kr ved samtidig medlemskap i vår europeiske samarbeidsorganisasjon *Eurographics*.

Alle medlemmer får tilsendt medlemsbladet *NORSIGD Info* 2–4 ganger per år. NORSIGD har tilrettelagt informasjon om foreningen på Internett på adressen <http://www.norsigd.no>. Der finnes det også informasjon om GPGS, samt tidligere utgaver av *NORSIGD Info*.

Interesseområder

NORSIGD er et forum for alle som er opptatt av grafiske bruker-grensesnitt og grafisk presentasjon, uavhengig av om basisen er *The X window System*, *Microsoft Windows* eller andre systemer. NORSIGD arrangerer møter og seminarer, formidler informasjon fra internasjonale fora og distribuerer fritt tilgjengelig programvare. I tillegg formidles kontakt mellom brukere og kommersielle programvareleverandører.

NORSIGD har lang tradisjon for å støtte opp om bruk av datagrafikk. Foreningen bidrar til spredning av informasjon ved å arrangere møter, seminarer og kurs for brukere og systemutviklere.

GPGS

GPGS er en 2D- og 3D grafisk subrutinepakke. GPGS er maskin- og utstyrsuavhengig. Det vil si at et program utviklet for et operativsystem med f.eks. bruk av plotter, kan flyttes til en annen maskin hvor plotteren er erstattet av en grafisk skjerm uten endringer i de grafiske rutinekallene. Det er definert grensesnitt for bruk av GPGS fra FORTRAN og C.

Det finnes versjoner av GPGS for en rekke forskjellige maskinplattformer, fra stormaskiner til Unix arbeidsstasjoner og PC. GPGS har drivere for over femti forskjellige typer utsyr (plottere, skjermer o.l.). GPGS støtter mange grafikkstandarder slik som Postscript, HPGL/2 og CGM. GPGS er fortsatt under utvikling og støtter stadig nye standarder.

GPGS eies av NORSIGD, og leies ut til foreningens medlemmer.

Eurographics

NORSIGD samarbeider med Eurographics. Personlige medlemmer i NORSIGD får 20 SFr rabatt på medlemskap i Eurographics, og vi formidler informasjon om aktuelle aktiviteter og arrangementer som avholdes i Eurographics-regi. Tilsvarende får Eurographics medlemmer kr 100 i rabatt på medlemskap i NORSIGD.

Eurographics ble grunnlagt i 1981 og har medlemmer over hele verden. Organisasjonen utgir et av verdens fremste fagtidsskrifter innen grafisk databehandling, *Computer Graphics Forum*. Forum sendes medlemmene annen hver måned. Eurographics konferansen arrangeres årlig med seminarer, utstilling, kurs og arbeidgrupper.

NORSIGD
v/ Reidar Rekdal
Postboks 290
1301 Sandvika

Returadresse:
 NORSIGD v/ Reidar Rekdal
 Postboks 290
 1301 Sandvika

Styret i NORSIGD 2006

Funksjon	Adresse	Telefon	email
Leder	Ketil Aamnes DNV Software Veritasveien 1 1322 Høvik		Ketil.Aamnes @dnv.com
Fagansvarlig	Wolfgang Leister Norsk Regnesentral Postboks 114 Blindern 0314 OSLO	22 85 25 78 (direkte) 22 85 25 00 (sentralbord) 22 69 76 60 (fax)	leister@online.no
Sekretær	Reidar Rekdal Norsigd Postboks 290 1301 Sandvika	67 57 73 18 (direkte) 67 57 72 50 (sentralbord) 67 57 72 72 (fax)	reidar.rekdal @dnv.com
Styremedlem	Tor Dokken SINTEF IKT Postboks 124 Blindern 0314 OSLO	22 06 76 61 (direkte) 22 06 73 50 (fax)	Tor.Dokken @sintef.no
Varamedlem	Magnar Granhaug ProxyCom AS Klæbuavn. 194 7037 Trondheim	73 95 25 00 97 72 76 98 (mobil) 73 95 25 09 (fax)	Magnar.Granhaug @proxycom.no

Svarkupong

- Innmelding – institusjonsmedlem
(Kr 1000)
- Innmelding – personlig medlem
(Kr 250)
- Innmelding – Eurographics medlem
(Kr 150)
- Ny kontaktperson
- Adresseforandring

Navn:
 Firma:
 Gateadresse:

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 Telefon:
 Telefaks:
 email: