

UNIVERSITY OF OSLO
Department of Informatics

**Midterm report -
Context sensitive
notebooks**

INF5261

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1 Introduction

Netbook is a collective term, most likely coined by Psion in 1999[1], representing relatively inexpensive small notebooks designed for wireless communication and Internet access. Over the time, netbooks have become an interesting tool for several reasons. Due to their small size, netbooks can potentially be used in a wide range of contexts. In general the hardware in and software on netbooks is not restricted in the same way as on most cellphones, hence 3rd party developers aren't limited to the producers visions. However, due to size, netbooks aren't optimal for handheld operation. We are interested in looking into ways of circumventing this limitation by extending the features of handheld devices through interaction with netbooks, and vice versa, in a context sensitive manner. We will look at existing hardware and software and suggest new features and possibilities based on our findings. As one of our goals, we will conduct a survey that points out what types of services people would be interested in, how they would like to have their cellphones and netbooks interact and their concerns regarding privacy issues.

2 Methods

Two main methods were proposed regarding methods for our user survey. Our original idea was to use our research to develop an idea for context sensitive software running on a netbook and a cellphone¹, and if time allowed, develop a prototype. The user survey would then be used to survey peoples reactions to context sensitive interaction between netbooks and cellphones, security issues regarding such services, and similar questions in general, and our suggested software specifically.

Further on in the process a different approach was proposed. Instead of developing a specific idea, we could use brainstorming to come up with larger amount of proposed uses and software types. The user survey could then evolve around a larger number of ideas. Which, if any types of software would people actually use? How should the software be created to en certain that people actually would use the software? What types of services are people interested in? How important is the aspect of security and privacy for the general netbook user?

There are several reasons why the second proposal is a more interesting approach to our work. First and foremost we will gather more interesting data regarding specific uses. The first method relies on our ability to, on ourselves, settle on the most interesting use for context sensitivity between

¹ Although we mainly use the term cellphone in this text, this might also include other devices like PDAs, headsets, GPS units, etc. These will however be treated as useful secondary devices, as we are mainly interested in the interaction with cellphones.

netbooks and cellphones, whereas the second method only relies on our ability to suggest interesting uses. There is also a time aspect involved. This project has a very limited time frame. Developing a working prototype in this period of time would grossly limit the time left for actual survey and research.

We will concentrate on netbooks in a university setting when conducting our survey and tests. Students represent a uniform group of users, and the university represents a well defined institution that is easily available for studies. Students in general also use a lot of technology throughout their day, and represent a very good example of context not being defined by location alone, but also activities. Dinner in the cafeteria might represent a meal, a meeting, desperately cramming for an exam or just being social. It's quite easy to imagine context sensitive services that students could benefit from.

[2] might present some interesting ideas for our survey.

3 History, emerging trends and the future

The Asus EeePC can be regarded as the first modern netbook. The EeePC was launched in 2007 as a response to the One Laptop Per Child project (OLPC)

The rest of this section is a rough draft and a brainstorm for the market research we wish to do as part of our paper. This text has not been proofread and not all of the numbers and facts have been checked or confirmed.

In the late 2008, netbooks started to take some market share away from laptops, selling an average of 30 times more netbooks than in the early 2008, estimated in 11.4 million netbooks, were 70% of them were sold in Europe[3] and 14 million globally[4], while in 2007 were only sold 400,000[5]. In the meantime it will be sold around 30 million netbooks during 2009[6][7] and an estimated 139 million in 2013[8][9].

The use trend of netbooks is reinforced by the rise of web based applications and mobile networks, were within time, they will evolve as super portable laptops for professionals.

It exist several actors in this industry, all of them trying to get a piece on the market and several competitors in them. At the same time, all of these manufacturares have more than one model present in the market and is close to saturation. Close to saturation with an estimated growth of 140% per anual? -Deadcylo
3/13/09 4:03 PM Some examples would be: One, Medion, Acer Inc, In-

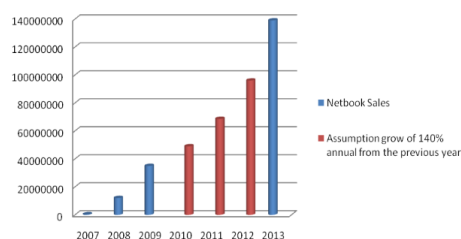


Figure 1: Market overview

tel, Everex, NTT System, Asus, Raon Digital, Sylvania computers, Toshiba, Lenovo, Datacask, Gigabyte technology, Zellybron, Dell, HP, Samsung, E-Lead, Impulse (from E-Lead), Impulse (from Carapelli Computers Limited), Quanta Computer, Sony, Axioo, Skytone/3K, Inventec, Maxdata Belinea, Inventec, Sinomatic, LG, MSI and PCWorld. What it differentiate between eachother are the type of processor, weight, display size, speed, video chipset, storage, RAM, Battery life and the size of the keyboard. After this distinction, the products of these companies position in the market attacking the high end, low end or regular netbook users, including the low end laptop users and high end smartphone users.

The creator of this market was Asus, however it has been lost a significant market share to Acer, which is now the leader in the netbook segment, capturing a market share of 38.3%, compared to Asus 30.3%. In round numbers, these means that Acer has sold 2.15 million netbooks on the third quarter of 2008 while Asus only sold 1.7 million[10]

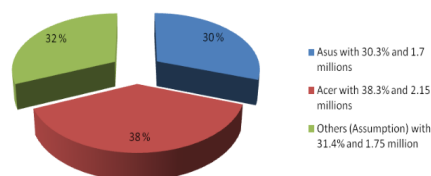


Figure 2: Market percentage

After this table we can see that the companies that their strategy is to sell volume, they grew year-over-year while others are left behind. Also, another curious data from this table is the fact that some may think that Apple is losing money for not enter the netbook market, we need to remember that Apple operates in high market segments where it's easy to score \$1,000.00 to \$2,000.00 earnings, in other words, Apple makes more money by selling one MacBook than Acer selling a One, however, it has been estimated that the shipment costs per unit correspond 34% of the final price[10], and this percentages escalates year-over-year, so; the question again rises: is Apple still making money for its MacBook?.

Brand	Third Quarter 2007 Share	Third Quarter 2008 Share	Year by Year volume change
HP	21.3%	19.7%	29%
Acer Gateway Packard Bell	14.4%	17.1%	65%
Dell	13.7%	13.0%	32%
Toshiba	9.0%	8.6%	28%
Asustek	4.1%	8.6%	189%
Lenovo	8.8%	6.7%	7%
Apple	4.6%	4.1%	24%
Sony	5.6%	4.1%	2%
Fujitsu and Fujitsu-Siemens	4.7%	3.1%	(8%)
All others	13.7%	14.9%	52%
Total	100.0%	100.0%	39%

Figure 3: Worldwide combined netbook PC market share by brand (Third Quarter 2008)[11]

We have to believe that the netbook market is more than just a fast trend like it had happened with other trends, however sometimes in the electronics and informatics industry you cannot predict what will be the market standard and for how long[12].

Netbooks have been positioning between the costumers as a hot consumer product, on the other hand, the market indexes question itself as the fact if

laptops could cannibalize the sales of more expensive laptops while others target the netbooks as a cheap alternative for children[13] while the industry is trying to position them as complements and not replacements in the PC industry[14].

1,545 US Adults were surveyed online in early January 2009. This survey indicates the following:

- 1 in 10 consumers has purchased a netbook
- The netbook complements the laptop and the desktop, they are aware that is not a replacement however they don't consider that the netbooks are a replace of smartphones.
- From the netbook owners, 91% of them own a laptop while 87% own a desktop.
- Users are spread across all consumer age segments of 18 years and older.
- Finally, 54% of them would consider purchasing a netbook with a solid state drive at the cost of \$6.12 USD per GB instead of a cost efficient based hard disk drive netbook of \$0.08 USD per GB[15].

It is worth to mention that even though the computer industry is going through a tough period because of the world wide economic crisis, the netbook segment has increased its popularity. A growth of over 160% quarter-over-quarter[10].

3.1 Netbooks Strategy: Penetrate several distinctive markets

While performing this research document we found that there is a strong tendency on the market the usage of netbooks for educational purposes.

Lenovo has introduced its "e" IdeaPad S10e marketed totally towards education. This netbook is designed for one-to-one computing in grades K-12 as well as those in higher education. These new netbooks combine the advantages of being portable, lighter and smaller PC device at an affordable price[15]. Also the financial risks districts take in assigning laptops to all students and teachers can drop when the price is \$500 USD or less, rather than the \$1,000.00 a piece that school districts have typically paid for notebook computers. Also second followers have been introduced into this market like the HP mini-note, Intel with Classmate PC (intended for primary school students in emerging markets overseas), Asus with Eee PC and Dell Mini Netbooks[9]

AT&T plans to expand an existing subsidy program that pairs an Acer or Dell netbook with a cellular data modem and a two year contract. The fees goes around \$60 - 90 USD (with a \$250 to \$350 USD subsidy) for unmetered service and a maximum of 5 GB of data usage each month. This alliance between AT&T services and netbooks will bring a big push in the market[7]. Besides, we also need to mention that AT&T has persued this strategy before as a technology pusher with the iPhone in the USA.

AMD is planning to enter the market within high end netbook during the first half of 2009 while the rest of the market is dominated by Intel's Atom chip. It's strategy is to penetrate through the high end follow up with Geneva and Ontario in 2010, expecting to enter the market netbook that will colst less than \$200.00 USD. Current customers of netbooks are demanding a more cost effective and higher performing solutions, qualities that AMD seems to bring[4].

3.2 Skepticism in the Netbook Market.

There has been some concern among enthusiasts that the suddenly emerging netbook market is nothing but a fad or a transition to a new or better technology, like it happened with the Beta VCR or the MiniDisc. Therefore Intel and AMD have been making sure and careful about the netbook market, however we can not underestimate that the sales over 2008 were explosive[10].

It is published on the net several articles, most of them with a lack of confiability, but are worth to mention; about the skepticism of the Netbook market. Netbooks are named as underpowered and underoutfitted, or like using a computer from 2003, some complain about the size: small is desirable however not midget sized, lack of battery life[16].

A year and a half ago, netbooks introduced Windows XP in its devices while in the beginning, they were running under Linux. Today, around 90% of the netbooks rund under Windows because consumers are more familiar with Windows and more likely to buy the machines. Some customers are willing to pay \$100 USD more for a netbook with Windows than for a Linux model. For some critiquers in the market, these detail has underpowered the costumer value of the netbooks.

Netbook vs Laptop vs Smartphones.

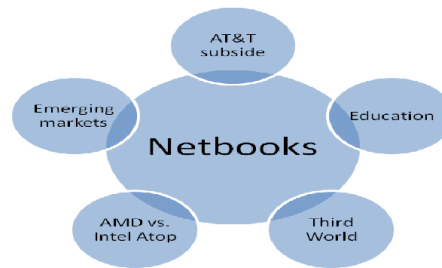


Figure 4: Netbook market places

4 Context awareness

Agre[17] discusses context awareness in computing and suggests a framework for analyzing the phenomenon. Agre describes a conceptual framework with three levels: architecture, practices and institutions. He goes deeper and shows how the new technology, like cellphones, is breaking the bonds between these levels. This trend continues today as we bring higher processor capacities and device capabilities with us in the form of netbooks. Though Agre has a positive attitude towards this trend, he also claims that it highly complicates context awareness. Breaking these bonds complicates the task of separating different activities. Our location tells us much less about our activity than it used to. He also makes a point of the fact that context aware systems could fail when they are made to guess socially constructed events without the users cooperation.

Agre presents a design methodology, which he calls the “capture model”. This model has certain tradeoffs that must be considered. The designers must choose between limiting the system to a subset of the aspects of the context or perform social engineering to force the users to adhere to the design.

The main methods a device uses to gather information about what context it currently resides in, is through sensor- and user input. User input data may be based on concrete choices made by the user, or automatic observations of the users actions.

The evolution of precision positioning methods based on GPS or mobile network triangulation allows one to gain access to precise information about ones geographical location. Several detailed map-services have been launched the last few years, and these days one can gain access to huge amounts of geo-data online. Combining ones geographical location with such geo-data can provide more information about the surrounding architecture than what was previously available. However this data cannot provide more information about practices or institutions.

“Specialized elements of hardware and software, connected by wires, radio waves and infrared, will be so ubiquitous that no one will notice their presence”[18] Here we find predictions about computers and context sensitivity in the 21st century. Even though we have yet to reach Mark Weisers dream of ubiquitous computing we have the building blocks and we are on our way. We would like to look further into this article.

5 Android to refocus netbooks?

Asus is at the moment developing a netbook that will run Google Android instead of Microsoft Windows[19]. Android is a open source operating system developed for cellphones by Google. Although Android still is in it’s

early childhood (only a few handsets running Android are available at the moment), the future marked seems promising as both Sony Ericsson[20] and HTC[21] have announced that they are working on Android based cellphones.

So what will this do to the netbook as we know it? Mainly two things. First of all this might be the first time we see Microsoft getting any real competition on the netbook operating system side. Secondly, and more important, this might very well be what is needed to bring the netbook back to it's original intention. Android is not a traditional PC operating system like Windows XP since it is developed for cellphones. It's created to run on small devices with small screens and limited hardware, exactly what the netbook is. A netbook actually offers much more screen and hardware than the devices Android is created to run on. Google has already created many advanced and commonly used "cloud computing" services like Google documents, Gmail, Google calendar, etc. If these are integrated in an Android powered netbook (Android is already tightly integrated with Gmail) we are back to the basic idea of the netbook, cheap hardware that relies on online services and cloud computing.

According to Leslie Fiering at Gartner Research this integration with googles "cloud computing" services is what is needed for Android to succeed on the netbook platform[19]. Windows has a much higher hardware demand than Android, and also boots slower. This might very well mean that Android is what we will see on netbooks in the future.

This might play a key role in context sensitive software running on netbooks. One very obvious benefit is the fact that to devices running on the same platform and also running similar software can, potentially, interact much easier. Secondly if users start using their netbook less like they use their computer and more like they use their cellphone, we might be in for a "context sensitive revolution". At the moment we are in the start faze of a revolution in the way we use our cellphones. Maps and location based services are becoming more and more important on cellphones. We are actually at the point where cellphones can "augment" reality by painting a map over an image of the user's surrounding produced by the phone's camera[22]. Netbooks in general have a much larger screen than a cellphone, and have the possibility to take this type of context sensitive services to a whole new level.

6 Device proximity

One very interesting aspect of context sensitivity when considering interaction between netbooks and mobile units like cellphones or PDAs is device proximity. Allowing devices to automatically configure themselves based on what other known devices they are in close proximity to can be a powerful feature. An interesting piece of software recently released for the GNU/Linux

platform entitled BlueProximity[23] (site here) enables this type of features. The software can handle multiple devices, supports configuring the duration and distance a device must be within before an action is taken, and supports three types of user configurable actions; device enters the proximity, device leaves the proximity, and an action that will be triggered at a configurable interval as long as the device is within the proximity.

BlueProximity is written in Python and therefore can easily be adapted for other uses, like selecting actions based on what devices are within proximity. Being able to customize the software opens an endless sea of possibilities. From the simplest of uses, like the intended use where one can configure the computer to lock and unlock when a device enters or leaves its proximity and block the screen saver from turning on while the device is within proximity, to more advanced features like automatically starting VOIP software when a given headset enters proximity and pushing a remote control for the VOIP software to a cellphone that enters the netbooks proximity. Even simple applications like updating ones status on social networks when one comes within proximity as a device could prove to be highly popular.

Here we would also like to look into more advanced software like the Hive found in [24] [25]

7 Dual use

The most obvious use of context sensitive applications between netbooks and mobile units is controlling the netbook from a mobile unit. However information exchange the opposite way can also provide several interesting services. One rather interesting idea is to allow the netbook to gain access to positioning information from the cellphone. Services based on a users geographical location are getting more and more popular and handsets today commonly offer positioning either through GPS or from the GSM/UMTS networks. Allowing a netbook to gain access to such data from a nearby cellphone can highly enrich the experience of many web services, not to speak of social navigation services.

Simple features found in more and more cellphones can be used for many other features. A GPS isn't limited to providing location data. A GPS can be used to determine if the device (and hopefully its user) is on the move, creating the possibility for a netbook to have different modes based on movement. An example could be a netbook that automatically goes into "car mode" or "public transportation mode" when it exceeds a certain speed, "walking mode" at a slower speed and "stationary mode" when it isn't moving. What these modes involve would, of course, have to be defined by the user. One could even create more complex scenarios. Imagine running to catch the bus to work in the morning, and missing it. One could define an event that detected running between 7 and 8 am. If the running event is shortly

followed by high speed movement, nothing is done. If the device however goes stationary after detecting running speeds, it could automatically send an email to yourDevices boss informing him that you missed the bus, and will be running a bit late.

Some cellphones also come with one or more integrated accelerometers. This has resulted in several types of gesture based applications, mainly software that enables us to control the cellphone itself with gestures and software that enables us to use our cellphone as a gesture based remote control unit. A netbook could also use data from a phones accelerometers for new types of features. Depending upon how reliable the accelerometers are, one could for example detect if the user just sat down, just got up or did some sort of other detectable movement.

8 Are netbooks going away?

According to AMDs chief executive netbooks as we know them are going to disappear sometime in the near future[26]. According to Meyer netbook users today are compromising. They want a small portable machine, but the netbooks don't offer a full PC experience. His prediction is that upcoming ultra-thin notebooks will replace the netbook as we know it today. One has to take into account that AMD isn't in on the netbook market, and such a statement might be highly biased. However Intel might have a similar conclusion. Intels CEO Paul Otellini spoke of the netbook in past tense during his in Intels company earning conference in January. This might have been a Freudian slip, or it might be a warning about Intels plans for the future. However Intel hasn't released any future plans for the Atom processor, other than a 0.06 GHz update this year, something that might also support the idea that the netbook craze is nearing its end.

During our research we discovered that what we are interested in is not the netbook per se but rather small portable computers. Devices with enough resources to act as a personal computer, an interface that allows a similar user experience as a laptop, but still has a size and weight that encourages mobility. According to AMD it's the netbooks as we know them that will disappear in the future. However, the concept of small portable computers that netbooks represent will continue to be the trend. Hence AMDs predictions will in no way affect our research negatively, but rather create a greater need for context sensitivity.

9 Other software of interest

9.1 Mobiola Headset for Skype

Mobiola Headset for Skype[27] turns a Symbian cellphone into a Skype handset. In addition to routing the call through the phone like any Bluetooth headset the application offers a remote control for Skype directly on ones phone. The software works via Bluetooth or USB connection, and WLAN support is promised. This is quite close to the original idea for this project, and this software shows that there is some sort of demand for this type of applications.

9.2 Psiloc Wireless Presenter

Psiloc wireless presenter is an advanced remote control application for controlling Powerpoint presentations. It includes advanced features like presentation timing, controlling other software, showing the phones screen on the PC, notes for each slide on the phone, etc. The software relies on the Bluetooth remote control protocol and doesn't require any additional software to be installed on the computer.

9.3 Other software we are studying

- pyacceleremoter
- mobile as wlan server software (what was the name)?
- anyremote
- blueproximity (already mentioned)
- alling clicker
- mobiola headset for skype
- bluetooth remote

10 Ethics

We need to find more literature about the ethics.

10.1 The mind

Neuroscientists have discovered a link between the activity in, and the size of the brains hippocampus and our ability to navigate maps[28]. Modern navigational systems, including the world wide web, the way we use our cell-phones, and also the techniques presented in this article are moving towards

mapping methods. Hugo Spiers has speculated that as we now rely more and more on the web to tell us how to navigate we might be reducing the growth of cells in our hippocampus[22]. This might have serious ethical implications. If the evolution of what we are using our technology for actually is affecting our brains in a negative way, then further development of this types of software will place the developers in an ethical dilemma, and might seriously affect how we use software in the future.

11 An experiment at Blindern

We would like to do a small scale test at Blindern regarding WLAN and positioning. The idea is to use WLAN for positioning of students for services like finding and connecting to the nearest printer. What we are interested in is measuring the WLAN networks locally on campus to see how spread they are, and if there actually are enough access points to use for this type of solution. Actual implementation however is definitely not feasible within the time line of this project. This type of localization requires a very large database of measurements, either actual physical measurements or estimated with a network planning tool based on the base stations location. In addition for good accuracy one must use a database correlation method like a kalman filter or a map-matching.

12 Thoughts and notes

12.1 Experiences

- Google docs - works well for collaboration
- Google groups - works well for communication, would like to see integration with docs
- Videoconferencing - we would like to try it to make it easier to meet
- Google scholar - very good for finding papers, exporting references.
- Zotero - good option instead of bookmarking, work in progress.
- Mindmaptools - great for brainstorming sessions and document overviews, brainstorm presentations
- latex, bibtex and reftex

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