

Investigating strategies for reducing interruptions from mobile communication systems in surgical wards

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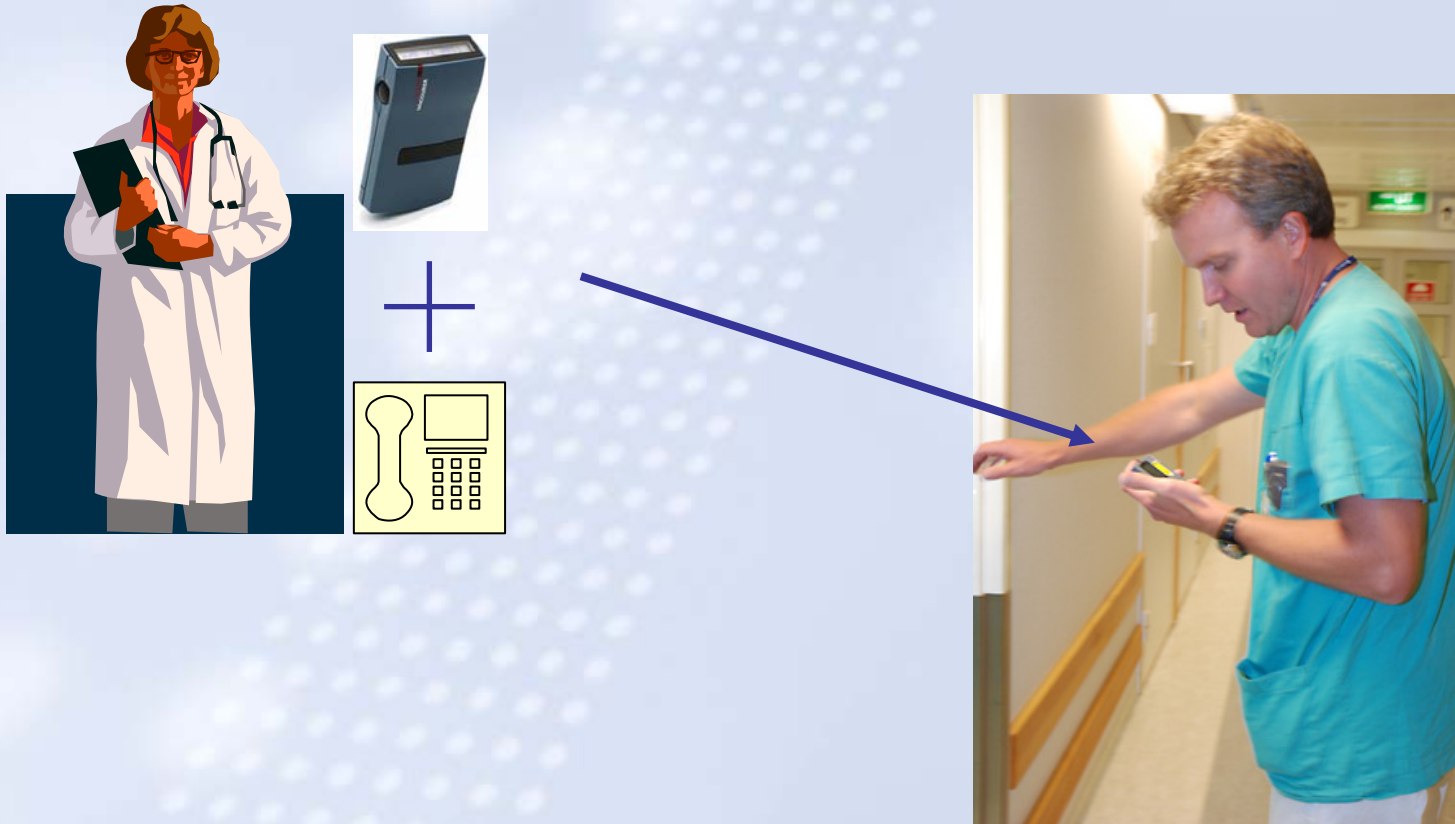
Introduction

- This paper presents a pilot study conducted on design of context-aware systems for reducing interruptions from mobile devices in surgical wards
- We conducted interviews with 2 surgeons from the department of digestive surgery at UNN, to confirm problems with interruptions from mobile devices and to gain some understanding into the nature of these interruptions

Introduction cont.

- Physicians often need information fast, and any delay between the decision made and the action taken could cause medical errors
- Accordingly they are in need of a mobile communication device to communicate with colleagues at any time and place
- The most intuitive approach for this is to provide physicians with wireless phones

Today vs. tomorrow



Pagers

- However, pagers are still the dominated mobile communication device in hospitals
- Most physicians only use pagers, often several pagers to cover both personal and role based communication
- Pagers suffer from limitations due to their simplicity, and often cause delays

Wireless phones

- Wireless phones also have limitations
 - Can be more interruptive than a pager
 - Don't have a convenient display on top like some pagers
- The fact that hospital workers prefer interruptive communication methods before non-interruptive methods, amplifies the risk of overloading people when phones are widely deployed
 - A key challenge is how to handle the balance between increased availability, and increased interruptions

Related work

- There have been many suggestions on how to reduce interruptions from mobile devices during the years
- Context aware communication systems that aims to reduce interruptions can be divided into two categories
 - Phones that automatically changes configuration
 - Systems that gives the caller information about the receivers context

Change configuration Automatically

- Quiet calls;
 - the receiver negotiates with the caller through text or pre-recorded audio messages
- SenSay;
 - combines information from several sensors to sense the user's context, and thereby controls the ringer/vibration on the phone
- WAP;
 - is used to automatically change the phone settings based on the recognized context in combination with the users scheduled activity, to automatically configure the phone

Context information provided to the caller about the receiver's situation

- Resent studies showed that this could reduce the mismatch between the caller's decision and the receivers desires
- Systems within this category:
 - Information provided about the receiver's presence using the phone book and location, like the "buddy list" in IM-services
 - An interaction web-page gives caller information about the receivers' situation and the available communication channels
 - A member-list combined with a prototype of a wristwatch that captures the user's context and share it to the members of the list, which use the information to check the availability before calling

In hospital settings

- While the society outside of hospitals have embraced mobile phones, have healthcare only shown limited use, due to a possible interference with medical equipment
- Several studies within hospital settings have been carried out with improved communication and reduced interruption in mind

Systems within hospital settings

- Asynchronous communication with acknowledgement and different kind of text messaging systems for hospitals, have been suggested
- Positive results have been shown from providing nursing teams with wireless phones, wearable radio transmitters, and wireless hands-free headsets which interfaces the phone system
- PDA's have been used in a contextual message exchange system, and for simple text
- PDA's with built in mobile phones, web-browsers, electronic textbooks, anatomy atlases, international classification of Diseases – 10 (ICD-10), guidelines, and medical calculators, have been used to enrich communication between health care workers
- PDA's with access to patient data with virtual white boards, which allows health care workers assigned to the same patient know about each others work progress

AwareMedia and AwarePhone system

- These systems in combination, forms a complete communication system for clinicians in a surgical ward
 - The tracking system is tracking clinicians in selected areas, using Bluetooth tags/devices used by the clinicians
 - The AwareMedia is big touch screens placed in selected locations at the ward, showing information from the tracking system along with the clinician's schedule
 - The AwarePhone system is an application running on a mobile phone, which allows clinicians to call or send a message to a person in an operating theatre
 - Messages sent directly to the room, is shown to all people presented in that room through the AwareMedia Screen

Initial design study

- Previous studies have investigated mobile phone usage in oncology wards which may not be the same in a surgical ward
 - Oncologists have long term relationships with patients and few emergencies
 - surgeons have short term relationships and many emergencies

Gastro surgical department at UNN

- The study consisted of extensive non-structured interviews and open ended discussions with one surgeon, a presentation of potential context aware solutions at the department, followed by a question and answer session, and a discussion with the head of the department for approximately one hour
- Confirmed that interruptions are a problem, especially in;
 - surgery theatres
 - outpatient wards
 - emergency wards
 - in patient rooms

Gastro surgical department at UNN cont.

- They have a saying at the department:
 - “when you are in the most critical part of a surgery, and just a small error could have tremendous consequences, the beeper always goes off”
- If we could manage to reduce those kinds of interruptions, we have solved a major part of the problems with interruptions at that department
- Interruptions from the pager are also a problem when they are having serious talks with patients in patient rooms:
 - “It is not beneficial if the beeper constantly goes off when you maybe are telling a patient that he/she have a serious illness”

On-call-duty-phone

- This phone is carried by the surgeon that is signed on as on-call-duty and thereby responsible for answering calls to the department, even though they are in surgery
 - The surgeon that we talked with really dislikes this phone, and thinks it makes a lot of unnecessary interruptions
 - The head of the department thinks that young surgeons learn how to focus when they are interrupted all the time by this phone

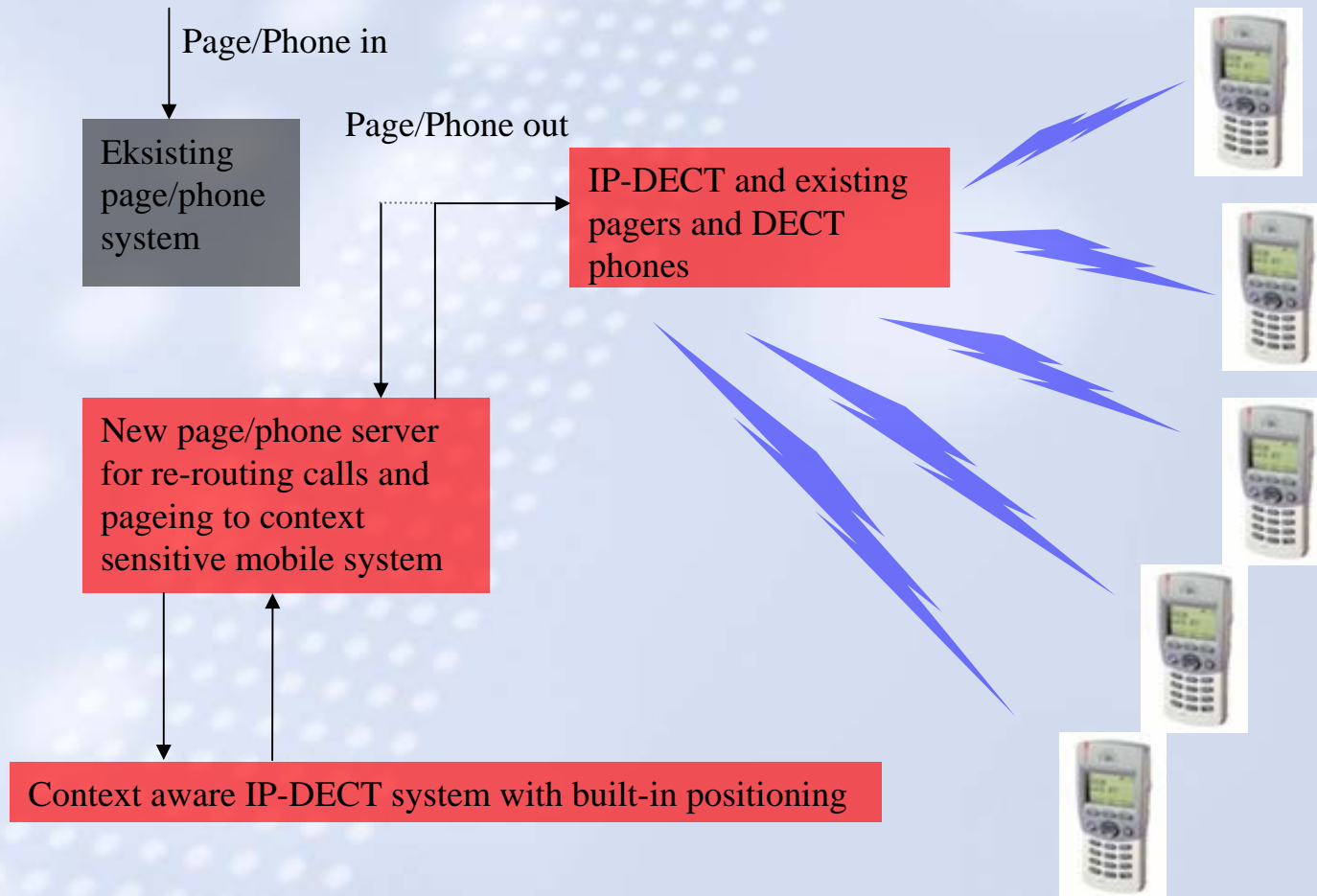
Architecture

- Based on the existing phone and paging system at UNN extended by an IP-DECT phone system from Ascom
- The device has:
 - Built in positioning
 - Is specially designed for health care
 - And only one device per surgeon/physician is needed, both for personal and role based communication

Low impact solution

- The idea behind the low impact solution that just extends the existing communication system is that this is familiar equipment for the surgeons/physicians, and that they could decide to use the existing pager/phone system without any reconfiguration of the new system, which also could limit our system due to possible integration problem with the existing hospital infrastructure

Proposed system architecture



Summary

- The limited functionality of today's communication systems in hospitals implies that the users in hospitals really need a better communication system that;
 - Integrates both the pager and the phone system in one device
 - Make use of context information to automatically control interruptions from a set of rules and context, and thereby could makes it up to the caller to decide whether to interrupt or not

Future work

- Further investigate surgical wards which include:
 - observations
 - interviews
 - registration on how often they are interrupted from whom (private/work related/urgent/not urgent)
- Design studies
 - Participatory design
- Development of our system
 - in close cooperation with the users
- Deploy the system
 - and then compare the new system to the existing system, with reduced interruptions and improved communication between physicians/surgeons in mind



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