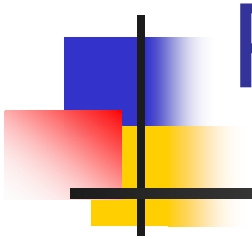


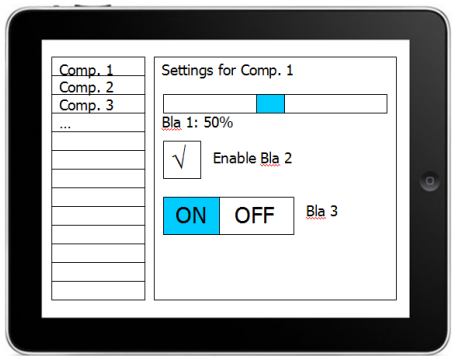
Project Paper Seminar

Jonathan Satria

March 3, 2011

Quickstart Project Overview

- Improve system workflow in OR
- Mobile surgical console through iPad
- Implements cisst library and ICE
- Communicates with surgical peripherals



LABORATORY FOR
Computational
Sensing + Robotics
THE JOHNS HOPKINS UNIVERSITY

Paper Selection & Relevance

- Functionality

  Remote display solutions for mobile cloud computing

  Pieter Simoens, Filip De Turck, Bart Dhoedt, Piet Demeester. IEEE Computer 2011.

- Usability

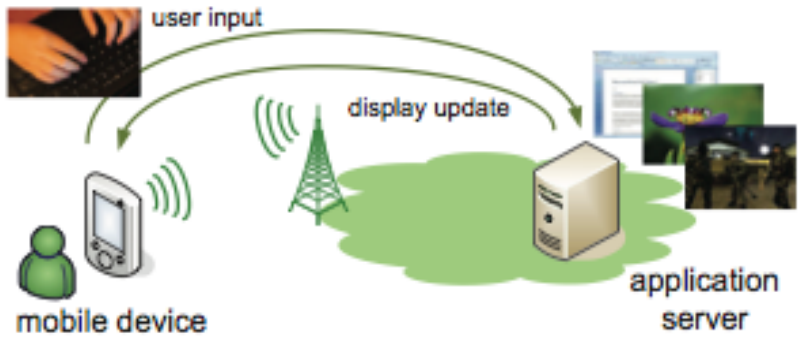
  Lost in Menuspace: User Interactions with Complex Medical Devices

  Mark Nunnally, Christopher P. Nemeth, Valerie Brunetti, Richard I. Cook. IEEE Vol. 34 No. 6 November 2004.

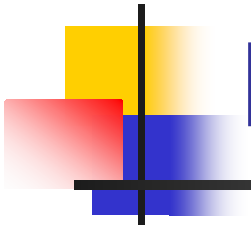
LABORATORY FOR
Computational
Sensing + Robotics
THE JOHNS HOPKINS UNIVERSITY

Functionality Paper Background

- Mobile devices as display solutions
- Participate in cloud network



LABORATORY FOR Computational Sensing + Robotics
THE JOHNS HOPKINS UNIVERSITY



Problems

- Unique set of challenges created:
  1. Battery Lifetime
  2. Network bandwidth considerations
  3. Network latency considerations

LABORATORY FOR
Computational
Sensing + Robotics
THE JOHNS HOPKINS UNIVERSITY

Battery Lifetime

- Rate limiting factor
- Improve battery by offloading applications
- New concerns with battery consumption by network card
- Solutions:
  - Cycle sleep/idle states
  - Find balance of application offloading and network usage

LABORATORY FOR
Computational
Sensing + Robotics
THE JOHNS HOPKINS UNIVERSITY

Network bandwidth considerations

- Video streaming requires high throughput over wireless network
- Application definition
- Downstream and upstream events
- Solutions:
  - Codec
  - Data peak reductions
  - User input bundling

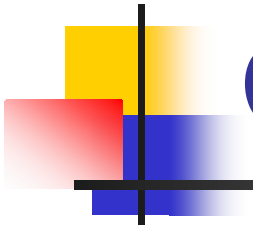
Network latency considerations

- Evaluation of user expectations with regards to immediacy
- Solutions:
  - Cloudlets - bring devices closer together
  - Predict potential display updates

Implications

Challenge	Importance	Reason
Battery Lifetime Consumption	High	Length of surgery
Network Bandwidth	Low	Simple user inputs
Interaction Latency	Medium	Require quick response

LABORATORY FOR
Computational
Sensing + Robotics
THE JOHNS HOPKINS UNIVERSITY



Critique

- Can’t really critique… but
- Paper does not present much empirical evidence
- No sense of criticality of these challenges

Paper Selection & Relevance

- Functionality

  Remote display solutions for mobile cloud computing

  Pieter Simoens, Filip De Turck, Bart Dhoedt, Piet Demeester. IEEE Computer 2011.

- Usability

  Lost in Menuspace: User Interactions with Complex Medical Devices

  Mark Nunnally, Christopher P. Nemeth, Valerie Brunetti, Richard I. Cook. IEEE Vol. 34 No. 6 November 2004.

LABORATORY FOR
Computational
Sensing + Robotics
THE JOHNS HOPKINS UNIVERSITY

Usability Paper Background

- Case study of a programmable infusion device
- Programmable Infusion pumps can deliver short-acting drugs at precise time

LABORATORY FOR
Computational
Sensing + Robotics
THE JOHNS HOPKINS UNIVERSITY

Experiment

- 14 Anesthesiologists, 26 Nurses
- Practioner experience and pump experience
- Design program schematic
- Complete 5 tasks
- Measured *Goal Directed Keystrokes* (GDK)

LABORATORY FOR
Computational
Sensing + Robotics
THE JOHNS HOPKINS UNIVERSITY

Tasks

TABLE II
INFUSION DEVICE PROGRAMMING TASKS

Task	Activity
1	Check a running dose of the drug dopamine (a premix concentration of 400milligrams in 250milliliters) that is set to run at 3micrograms/kilogram/minute for a 75 kilogram patient.
2	Change the same dopamine infusion to a rate of 2micrograms/kilogram/minute.
3	Set up and run a second powered down pump to deliver 1liter of intravenous fluid over 8hours.
4	Change the pump from scenario 3 to now deliver dopamine (400milligrams/250milliliters) at 3micrograms/kilogram/minute in a 65kilogram patient.
5	Change the same pump to deliver a premix of the drug nesiritide at a rate of 1microgram/kilogram/minute (a higher than normal dose).

LABORATORY FOR
Computational
Sensing + Robotics
THE JOHNS HOPKINS UNIVERSITY

Data

Data

Anesthesiologists

Subj	*Exper (pract)*	*Exper (pump)*	*%GDK Task 1*	*%GDK Task 2*	*%GDK Task 3*	*%GDK Task 4*	Mean %GDK
2	3	3	25	71.4	41.5	81.8	54.925
3	2	2	33.3	100	69.2	93.3	73.95
4	3	3	53.6	71.4	91.2	88.9	76.275
5	4	4	40	100	86.5	93.3	79.95
6	3	3	46.5	73.3	90.6	97	76.85
7	1	1	39.1	66.7	94.7	41.3	60.45
8	3	3	55.6	93.8	100	83.1	83.125
9	3	3	40	100	100	96.3	84.075
10	11	5	35.3	72.7	92.9	74.4	68.825
11	3	3	72.7	90 32.6	90.3		71.4
12	4	4	25	100	90	88.9	75.975
13	5	5	100	87.5	90	100	94.375
14	12	5	61.5	83.3	81.8	88.6	78.8
15	14	5	7.6	100	100	69.1	69.175
mean	5.07	3.5					

LABORATORY FOR
Computational
Sensing + Robotics
THE JOHNS HOPKINS UNIVERSITY

Results and Conclusion

- No correlation between years as a practitioner/experience with pump and %GDK
- Users are getting lost in “menuspace”
- GDK not an entirely accurate means of measuring proficiency

LABORATORY FOR
Computational
Sensing + Robotics
THE JOHNS HOPKINS UNIVERSITY

Critique

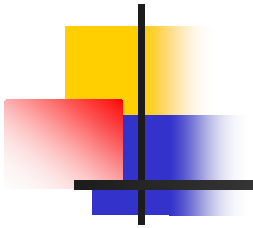
- Sample criteria factors needs to be evaluated (e.g. age, familiarity, etc.)
- GDK not a good measure
- Small sample size

LABORATORY FOR
Computational
Sensing + Robotics
THE JOHNS HOPKINS UNIVERSITY

Implications

- Shows the breakdown in using cursor and button input
- User needs to be aware of the navigation hierarchy/structure

LABORATORY FOR
Computational
Sensing + Robotics
THE JOHNS HOPKINS UNIVERSITY



Questions?

LABORATORY FOR
Computational
Sensing + Robotics
THE JOHNS HOPKINS UNIVERSITY