Project Paper Seminar

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Quickstart Project Overview

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

- **Functionality**
  
  Remote display solutions for mobile cloud computing

- **Usability**
  
  Lost in Menuspace: User Interactions with Complex Medical Devices
Functionality Paper
Background

- Mobile devices as display solutions
- Participate in cloud network
Problems

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

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Importance</th>
<th>Reason</th>
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<tbody>
<tr>
<td>Battery Lifetime Consumption</td>
<td>High</td>
<td>Length of surgery</td>
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<tr>
<td>Network Bandwidth</td>
<td>Low</td>
<td>Simple user inputs</td>
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<tr>
<td>Interaction Latency</td>
<td>Medium</td>
<td>Require quick response</td>
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</table>
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

- **Usability**
  
  Lost in Menuspace: User Interactions with Complex Medical Devices
Usability Paper Background

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

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

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

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<th>Exper (pump)</th>
<th>%GDK Task 1</th>
<th>%GDK Task 2</th>
<th>%GDK Task 3</th>
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*mean* 5.07 3.5
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
Critique

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

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