

Ubiquitous and Mobile Computing

CS 403x: *Sleep Monitoring*

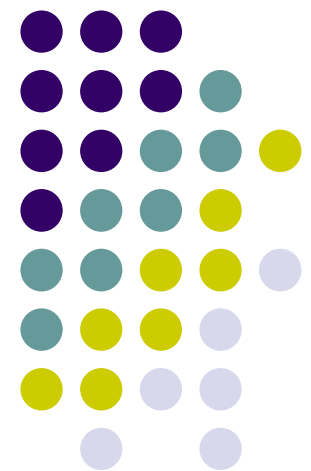
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Introduction

- Current sleep monitoring apps are:
 - Intrusive (headbands, wristbands)
 - Requires user input
 - Change behavior
 - Consistent user action
 - Need to be on bed (some)



1.

Place your phone in your bed.



Vision

- No touching your phone
- No sensors
- Just go to bed





Best Effort Sleep (BeWell)

- Automatically detects sleep duration
- Does not provide detailed analysis of sleep quality
- Uses following sensors/states:
 - Light
 - Silence
 - Phone on/off
 - Phone charging
 - Phone lock
 - Stationary



Best Effort Sleep (BeWell)





Similar Apps

- Fitbit / Jawbone (Wristband)
- Zeo (Headband)
- Sleepcycle (Sleep with phone)

- Other Concepts:
 - Meditation
 - Yoga
 - Ambient / White noise
 - Nature sounds

Methodology



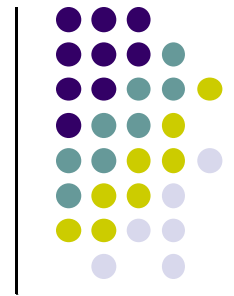
- 8 users:
 - All male
 - 23-31 years old
 - Computer Science, Material Engineering of Dartmouth College
 - Visiting Scholars and Graduate Students



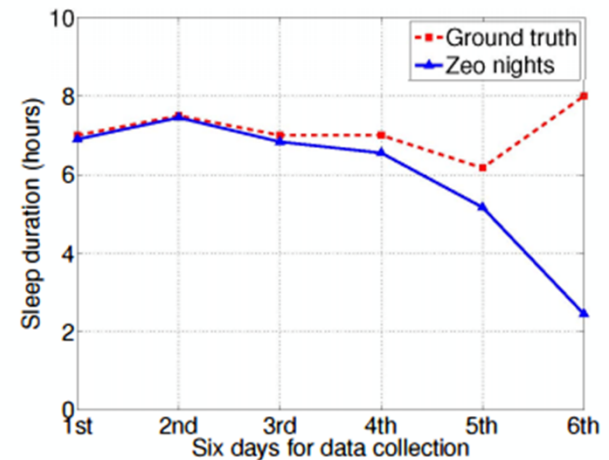
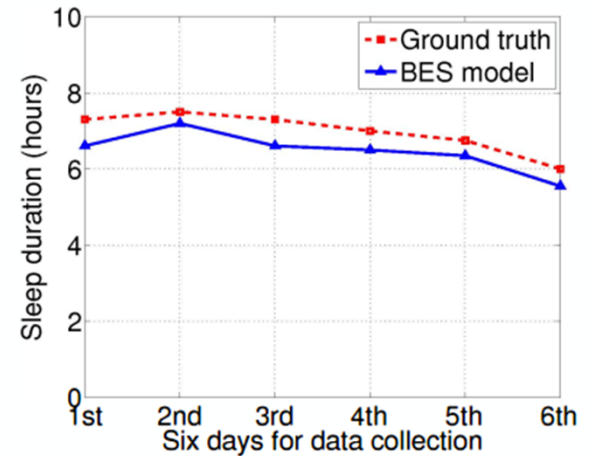
Methodology

- One week
- Each carried 3 phones
- Used all 4 methods
 - Zeo headband (LG Nexus 4)
 - Jawbone wristband (iPhone 4S)
 - Sleep With Phone (Google Nexus One)
 - BeWell (LG Nexus 4)
- Users wrote down sleep times

Results



- BeWell
 - ~45 mins accuracy
 - High user satisfaction
 - Most flexible
- Other methods
 - Between 20-40 mins accurate
 - Low user satisfaction
 - Users forgot steps
 - Inflexible to interruptions





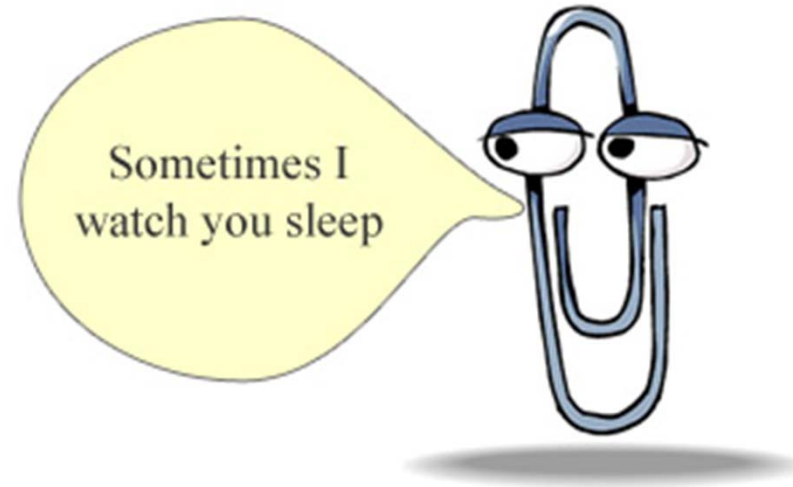
Their Conclusion

- Our app is “good enough”
 - Sleep is usually measured by hour anyway
- Promising technology
 - Free
 - No extra hardware
 - Easiest to use
 - Most flexible



Critique

- Small study
- One demographic
- Used different phones
- Didn't factor in:
 - Daily activities
 - Eating habits
 - Health
 - Sleeping conditions





Potential Improvements

- Better study
 - Larger user group
 - Longer timeframe
 - More demographics
 - Consistent hardware
 - Factor sleep influences
- Apply machine learning individually
 - Properly weight the six sleep factors