RESOURCE OPTIMIZATION
BY
ADAPTIVE MONITORING

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ADAPTIVE LISTENING

- Track location based on bluetooth beacons
- Easy: just put BT dongles in PC’s, right?
  - Wrong: install often hard; dongles disappear
- Easy: just use location as dongle name, right?
  - Wrong: fast to find BT-id, slow to get name
What is best inquiry frequency?

- Too often, expensive: Costs energy for phone to issue BT inquiry
- Too rare, miss beacons
- Same issue when phone access BT GPS receiver
- Some idea when next turn should occur
Adaptive Probing

- Lots of stuff interacting
- Dynamic
- What if a device acts strange?

Each component monitors its health
App. spec monitor probes components
How frequently?
Conference Assistant

- Static content + generated content
- Alice generates on various devices
- Alice shares some content with others

When and how to move content between Alice’s devices?

- Shared content vs. replicated private content -- how much, where, when?
NEED THEORY; STRATEGY

- To make best use of resources
- adapt to situation
- need way to decide what to do and when

SKIS: RENT OR BUY?

- Amortized Cost Analysis, skiing example:
  - $50 to rent; $500 to buy
  - after spending $500 renting, then buy
  - no knowledge of future $\leq 2 \times$ optimal
  - Keep track of expenditures & savings
RISK BASED COMPUTATION

- Example: Checkpointing
  - Programmer knows where to put them
  - System knows if it is worth doing them

\[(\text{Amount of work lost}) \times (\text{probability of crash}) \text{ vs } (\text{Overhead}) \times (\text{probability of no crash})\]

![Diagram showing the decision process for checkpointing with ideal and worst-case scenarios.]

SPEECH RECOGNITION

- Ambiguous mapping from wave to phonemes
- Ambiguous mapping from phonemes to words
- Ambiguous mapping from words to sentences
- Carry along the ambiguity but reducing it at each level
TOUCH SCREEN FAULTS

- Common buttons should be large
- Visually unpleasing
- Increase touched area and weigh overlap by frequency

UNIFICATION OF UI?

- Impacts several layers: OS, Language, Runtime

Universal User Interface

- Graphical UI
- Speech UI
- Sketch UI
- Visual UI

Engine

Expectations (Domains)

Confidence (N-Best)
CONCLUSION

- Adaptive schemes can reduce resources
  - human time, errors, power, memory
- Often need off-line and on-line knowledge
- Need some guiding theory
- Widely applicable, especially in new domains