EdgeDroid

An Experimental Approach to Benchmarking Human-in-the-Loop Applications

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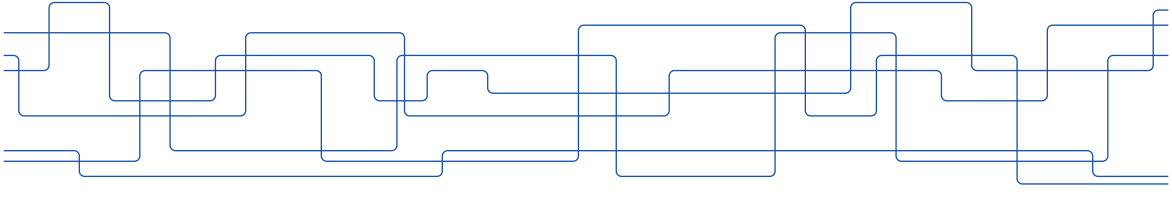


65
126ft
NE
354


SAMSUNG

Sensory Input

Human-parseable
Feedback

Human-in-the-Loop Applications

- Application Developers
- Infrastructure Providers
- Researchers

Too much text?

Human-in-the-Loop Applications

- Application Developers
  - Debugging
  - Resource Consumption
  - Performance and Optimization
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How to obtain these measurements?

Too much text?

Studying Human-in-the-Loop Applications

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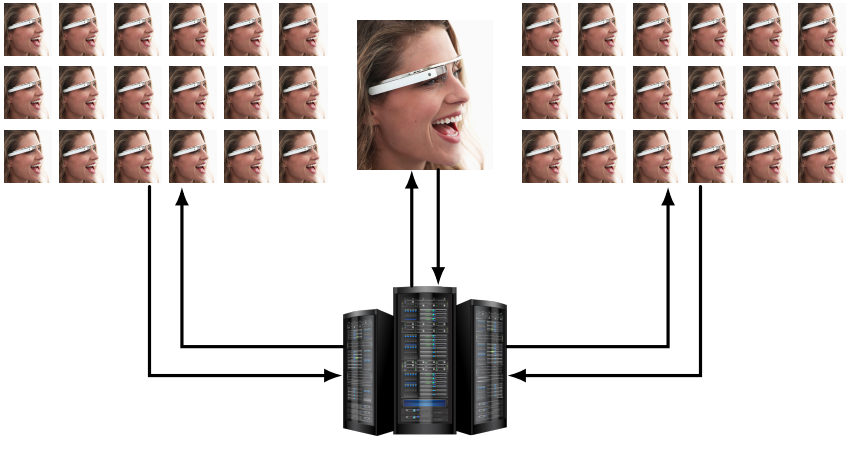
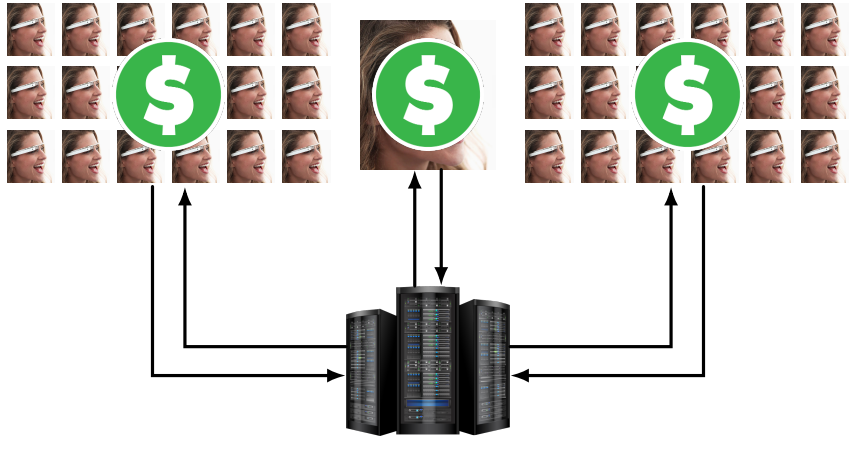
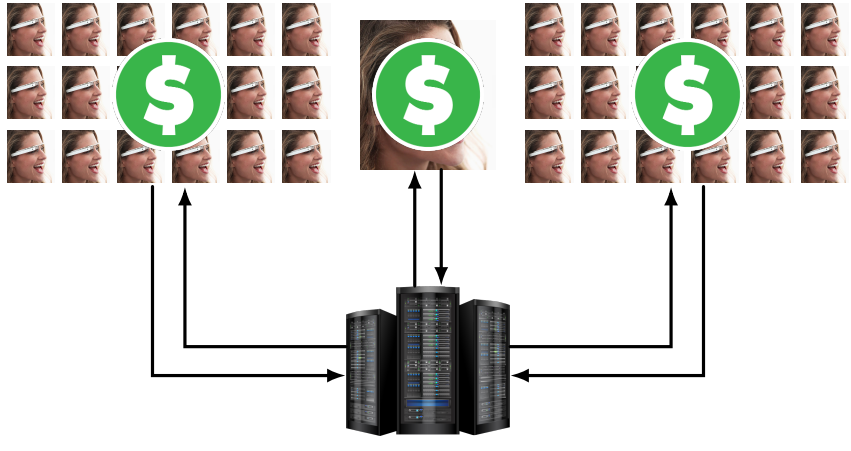


Studying Human-in-the-Loop Applications



Costly

Studying Human-in-the-Loop Applications



Costly, poor repeatability

Previous & Related Work

References to previous work. Mention wearable cognitive assistance is prime candidate for Edge Computing

Our Contributions

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- A methodology for benchmarking human-in-the-loop applications.

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- EdgeDroid: A benchmarking tool-suite.

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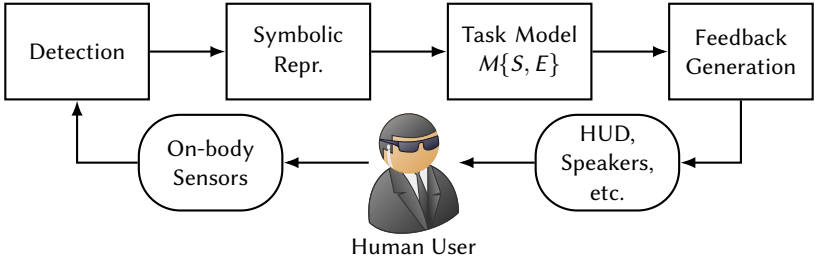
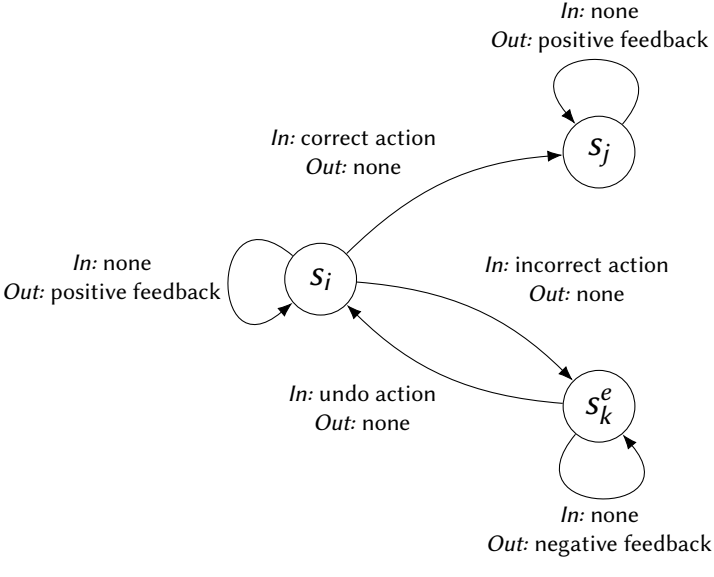
- A methodology for benchmarking human-in-the-loop applications.
- EdgeDroid: A benchmarking tool-suite.
- A set of experiments and measurements which show the effectiveness of the approach.

Task-guidance Cognitive Assistance

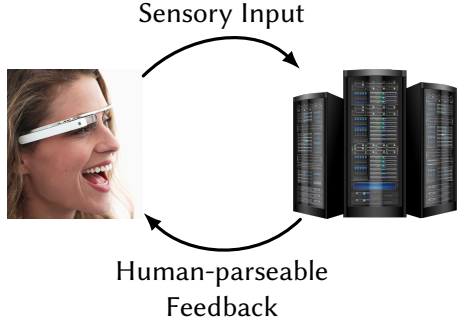
Some image of task guidance



The Task Model

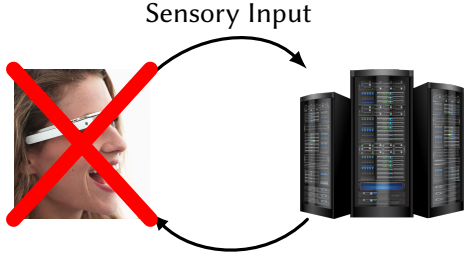


Approach: Motivation



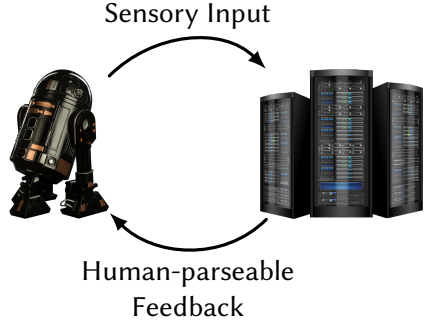
Benchmarking human-in-the-loop applications is HARD

Approach: Motivation



What if we could do away with the human users?

Approach: Motivation



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Requirements

- Generate realistic, high-dimensional, real-time inputs.
- Correctly and realistically react to feedback.
- KPI: Delays.

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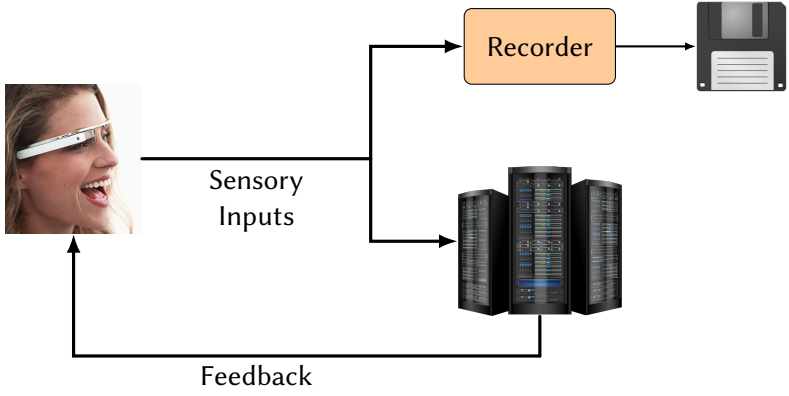
Trace of pre-recorded inputs

Input Generation

- Trace of human-generated inputs.



Add another figure showing usage of trace?

Trace-based approach: Issues

Metion problems with pure trace-based approach: timing issues, unreliability of CV

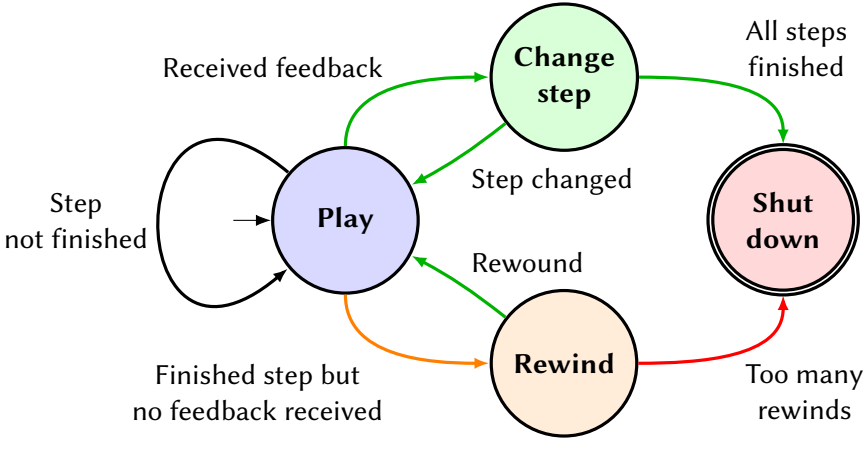
Requirements

- Generate realistic, high-dimensional, real-time inputs.
- Correctly and realistically react to feedback.
- KPI: Delays.

Trace of pre-recorded inputs
& a model of user behavior

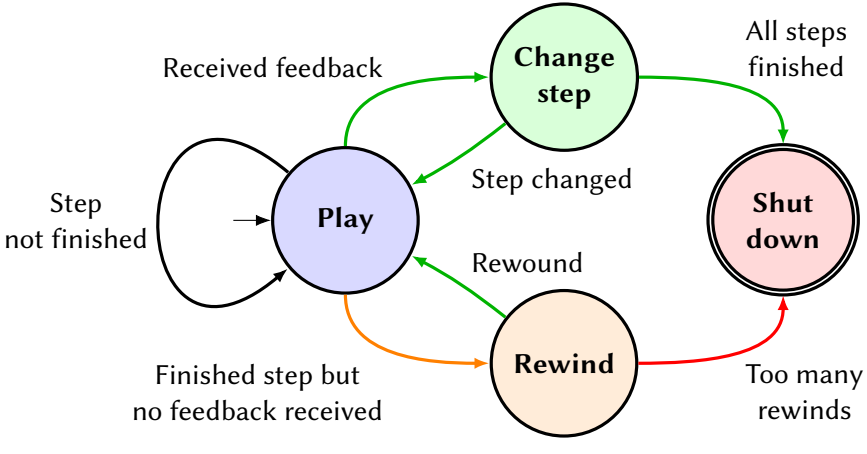
Reaction to Feedback: User Model

- Model of human interaction.



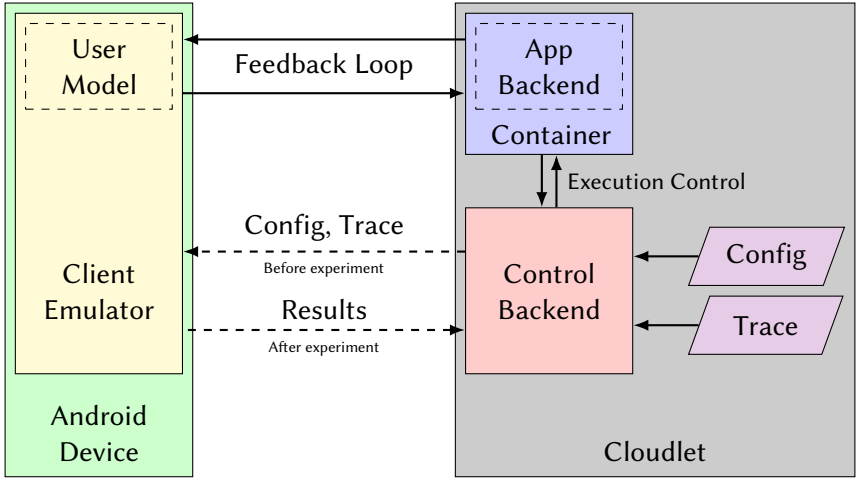
Reaction to Feedback: User Model

- Model of human interaction.

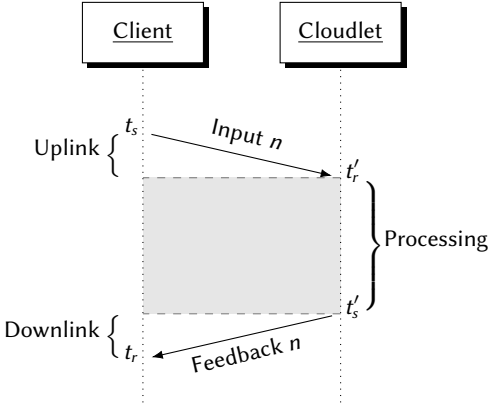


Currently working on a more thorough characterization of human behavior.

Implementation



Timestamping



Clocks are synchronized previous to the experiment.

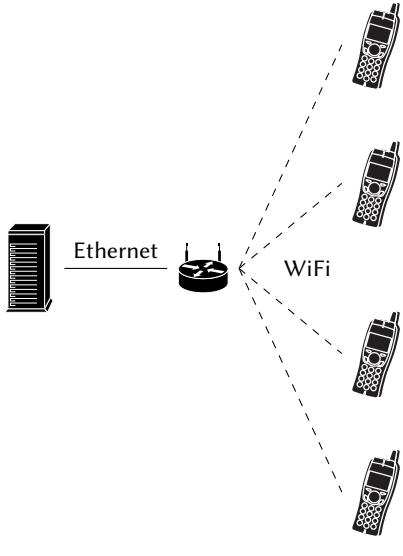
Timestamps at key points to obtain:

$$\Delta T_{\text{up}} = t'_r - t_s \tag{1}$$
$$\Delta T_{\text{proc}} = t'_s - t'_r \tag{2}$$
$$\Delta T_{\text{down}} = t_r - t'_s \tag{3}$$

$$\Delta T_{\text{total}} = \Delta T_{\text{up}} + \Delta T_{\text{proc}} + \Delta T_{\text{down}} = t_r - t_s \tag{4}$$

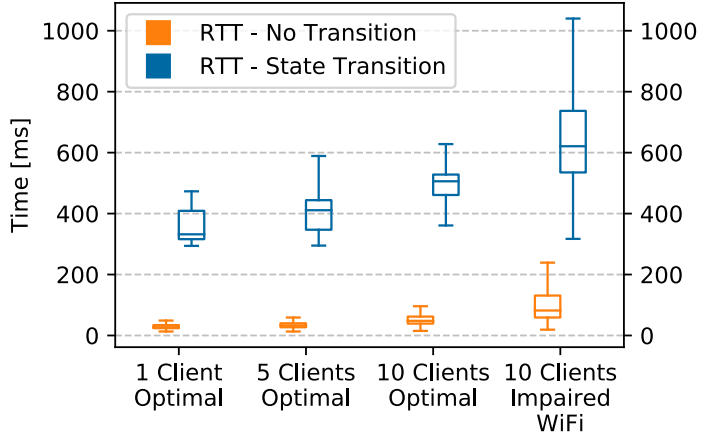
Evaluation

Insert pictures of LEGO Assistant



Results

Figure labels



I haven't explained the task model, maybe skip this graph?

Results

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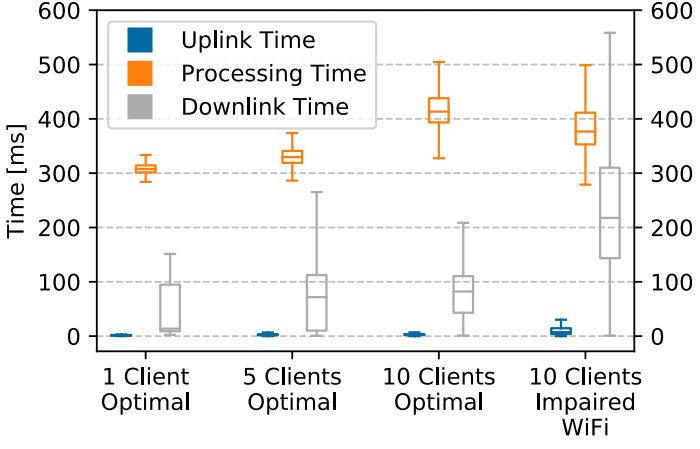

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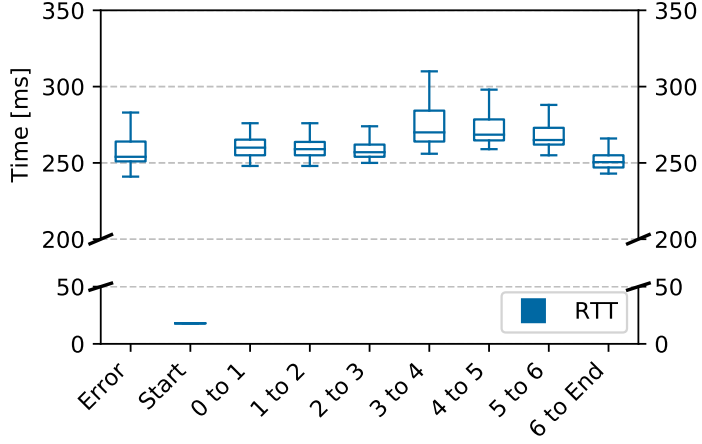

Future Work

- More accurate user model.
- Expand to other types of Applications.

Summary

- There's a need to study the scaling of Human-in-the-Loop applications.
  - This is difficult due to human users.
- We present a methodology + tool suite for benchmarking:
  - **EdgeDroid**
  - Trace based.
  - Model of human behavior.
- We present results which show the utility of EdgeDroid.