Continuous Real-Time (Interactive) Crowdsourcing
Real-Time Crowdsourcing

Seaweed
Real-Time Crowdsourcing

Seaweed

VizWiz

Figure 22 Screen of "Rock Paper Scissors" showing the timer with 10 seconds remaining
Real-Time Crowdsourcing

Seaweed

VizWiz

Adrenaline
Algorithms

[ Whiteboard! ]
Real-Time Crowdsourcing

Single-instance problems
- Context contained in the task itself

Quick response needed
Continuous Tasks

On-going tasks (no clear ending point)
- Keep going, and going, and going, and going…

Maintain context over time
Examples of Continuous Tasks

Activity recognition / prompting

Lasecki et al., CSCW 2013
Interactive Tasks

[Often] Continuous, real-time

Must react to their environment

Must be consistent
  - Otherwise it can just get confusing
Examples of Interactive Tasks

Robot navigation
Examples of Interactive Tasks

Conversational interaction / dialog systems
Crowd Agents

To the rescue!
What do we need?

To solve continuous tasks:
- We need people to remain available

To maintain context / be consistent:
- We need the same people (memory)

To react to our environment:
- We need quick, reliable responses
What do we need?

To solve continuous tasks:
  - We need people to remain available ✗

To maintain context / be consistent:
  - We need the same people (memory) ✗

To react to our environment:
  - We need quick, reliable responses

Crowds Behind the Scenes
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Crowd Agents

Mediate worker input to be:

- Reliable
- Fast
- Continuous / on-going
- Consistent
Crowd Agent Model

![Diagram of Crowd Agent Model](image)

- **Crowd Agent**
  - Task Mediator
  - Worker Input: $u_i(t)$
  - Reward Scheme
  - $y_i(t)$
  - $W_1$, $W_2$, ..., $W_n$

- **Response Mediator**
  - Environment / Actors
  - Input: $u(t)$
  - Feedback: $y(t)$
  - Context Maintenance
  - Communication Channels
Legion: Control any existing UI
Legion: Control any existing UI (drive a robot)
Legion: Control any existing UI (drive a robot)
Algorithms

[ Whiteboard! ]
Legion: Control any existing UI (drive a robot)
Legion: Control any existing UI (drive a robot)
**Legion:** Control any existing UI (drive a robot)

Terminal window running Python robot controller.
Legion:Gaming - Collective Gaming
Twitch Plays Pokemon (a few years later)
Scribe - Realtime Captioning by Non-Experts

Speech Source: we have a crystal that has a two-fold axis ...

Caption Stream: we have a crystal that has a two-fold axis

Flash Media Server

Merging Server

Merged Captions

Output: we have a crystal that has a two-fold axis
Scribe - Realtime Captioning by Non-Experts
Scribe - Realtime Captioning by Non-Experts

Merging Incomplete Captions

C1: the brown fox jumped
C2: quick fox lazy dog
C3: fox jumped over the lazy

Combiner

Final Caption

the quick brown fox jumped over the lazy dog
Legion:AR - Realtime Activity Recognition
Chorus - Conversational Assistant
Chorus - Conversational Assistant

crowd: I am new but if I can do this more than once
requester: Good! I'm on vacation in Los Angeles and was hoping you could help me find a good place for lunch tomorrow.
crowd: Does anyone know if we can
requester: I'm in Westwood, near UCLA.
crowd: How is everyone doing, are there any questions
requester: It's across the 405 on San Vicente
crowd: Are we the only ones in here
requester: I believe you can walk there. San Vicente is a nice street also. Lots of Restaurants in case you decide to try something else
crowd: I'm good, how about you?
requester: Oh, that's perfect then! What kind of food is it?
crowd: Which part of Los Angeles are you at?
requester: Excellent. Thank you so much for your help!
crowd: I'm in Westwood, near UCLA.
crowd: What time is it there?
requester: How far away is that? Can I walk there?
crowd: Which part of Los Angeles are you at?
crowd: Almost anything is fine, but I'm allergic to shellfish and peanuts, so places that serve that are off my list.
crowd: How is everyone doing
crowd: Pizzacotto is a nice place also
requester: I'm going to head out. Have a good one.
crowd: OK, what kind of food do you prefer?
requester: Zax is a great restaurant near UCLA
requester: Almost anything is fine, but I'm allergic to shellfish and peanuts. You should be fine. They have a menu that has no peanuts
requester: Try Pizzacotto
<table>
<thead>
<tr>
<th>Requester</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>requester</td>
<td>I am on vacation in Los Angeles and was hoping you could help me find a good place for lunch tomorrow.</td>
</tr>
<tr>
<td>crowd</td>
<td>I'm good, how about you?</td>
</tr>
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<td>Which part of Los Angeles are you at?</td>
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</tr>
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<td>crowd</td>
<td>OK, what kind of food do you prefer?</td>
</tr>
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</tr>
<tr>
<td>crowd</td>
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</tr>
<tr>
<td>requester</td>
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</tr>
<tr>
<td>crowd</td>
<td>Pizzacotto is a nice place also</td>
</tr>
<tr>
<td>requester</td>
<td>Oh, that's perfect then! What kind of food is it?</td>
</tr>
<tr>
<td>crowd</td>
<td>Its Italian. You said you are allergic to shellfish and peanuts. You should be fine. They have a menu that has no peanuts</td>
</tr>
<tr>
<td>requester</td>
<td>Excellent. Thank you so much for your help!</td>
</tr>
<tr>
<td>crowd</td>
<td>Its across the 405 on San Vincente</td>
</tr>
<tr>
<td>requester</td>
<td>I'm going to head out. Have a good one.</td>
</tr>
</tbody>
</table>
Instructions are likely on the other side of the box.

Box is mostly out of frame to the right.

Preheat to 400, remove from box, cover edges with foil and put on tray, cook 70 minutes.
Chorus: View - Conversational Q&A
Hybrid Intelligence
Why Hybrid Intelligence?

Robot navigation
Why Hybrid Intelligence?

Robot navigation
Recap: Behind the Scenes
Recap: Behind the Scenes
Crowd Agent Model
Legion:AR - Realtime Activity Recognition
“AAI” needs AI

Figure 3: Decision-theoretic Computations needed to control an iterative-improvement workflow.

Figure 4: Decision-theoretic Computations needed to control the Soylent word processor.
Uses of AI in crowd systems

... in workflow design/management

- Decide which workflow
- Decide on parameters
- Decide on a UI (or UI adaptations needed)
- Decide how to execute (execution control)
Next Class >>

- **Topic**: Privacy in SoCS / Crowdsourcing
- **Reading**: Legion (2011)
- **Team Assignment E**: DUE 4/7, 11:59PM
  - Build system, justifying your designs