What is a task?

A task has 3 main components:
- Basic information
  - Inputs
  - Question
  - Output
- Condition of success
- Incentives

Design principles
- Information
- Granularity
- Independence
- Incentive
- Quality control

Gambler's fallacy

Common belief: If you tossed 4 heads in a row, the probability of having a tail the next step is higher.

The probability of having 4 heads followed by one tail is the same than having 5 consecutive heads!

Iteration can help to improve existing solutions, (Little et al., 2010)

Iteration may also prevent creativity...

Maximal granularity

Find-Fix-Verify pattern yields better results in word processor Soylent.


Iterative tasks

Iterative tasks

Maximal granularity

Empirical studies suggest different trade-offs

• 38 image tagging HITs with various in complexity & reward,
• use results as training data.
Conclusion: Complex and rewarding HITs are more effective.

Beyond simple tasks

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Beyond simple tasks

How do humans work together?

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How do communities grow?
Some actions and links can be predicted.
Information is useful to design collaborative systems and design routing.

Beyond simple tasks

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How do humans work together?
Create incentives

- Level of participation,
- Quality of the task assignment,
- Accuracy of the answer.

Extrinsic vs. intrinsic motivations

**Extrinsic:** Money, trophy, reward...

**Intrinsic:** Power, curiosity, status, social contact, competition, idealism...

Important, are connected but impact on the quality of the work is still unknown.

Some rules on extrinsic incentives

- Some worker have clear money objectives: Paying the right price is important.
- Free could be better than too small reward.
- Extrinsic incentive can motivate workers to not game the system (good task with expertise vs easy ones)
- Currently system are using fixed price but dynamic pricing should be explored.

Validation

**Standard techniques:**

- Automatic verification
- Vote for the best output (voting)
- Vote for the worst output (filtering)
- Merging

These techniques can be augmented with an a priori control. Kittur *et al.* (2008) showed that a verifiable questions before subjective ones help to reduce invalid answers by 43%.

Vickey-Clarke-Groves Mechanism

How to price an apple?
The client with the highest bid win the auction but pay the price offered by the other client.

**Objective:** Design a system where participants benefit the most to answer correctly.

ESP Game

von Ahn and Dabbish, 2004
Output agreement

3 axes of the ESP games:
- **Independence**: tags are generated independently.
- **agreement**: An agreement indicates higher trust.
- **shared information**: Only the image is shared and thus the search space is reduced.

Seminal example of an output agreement mechanism.

Challenges in output agreement

Output agreement is efficient for simple tasks. For more complex tasks (e.g., audio tagging), this mechanism is inefficient.

An audio version of ESP showed that 36% of the gamers skip the game before entering any valuable tag.

Tag-a-tune

- Each player is given a song.
- Player exchange tags to determine if the song is identical.

*(E. Law et al., 2007)*

Input agreement

*Input agreement* is an instance of the *function computation* mechanisms:
- Partial input (e.g., song)
- Computation (e.g., generate tags)
- Evaluate an auxiliary function (e.g., the songs are the same)

By allowing communication between players, input agreement are noisy.

Input vs. Output Agreement

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Asymmetric function computation

- Only Guesser compute the function,
- Communication is unidirectional.

*(von Ahn et al., 2006)*
Prevention of bad behaviors

How to prevent common & uninformative tags?

Create incentive for diversity:

- Reward (Google Image Labeller)
- Restrictions (E.g. taboo words)

But restriction can be counter-productive.

KissKissBan

In ESP, a third player (adversary) enters words to block the team.

(Ho et al., 2009)

Complementary agreement

- **Positive player**: Select words that describe a concept.
- **Negative player**: Select words that do not describe a concept.

Players alternate their role and score when the word match.

**BUT** the player receive penalties if the a word is tagged as positive and negative simultaneously!

3 central aspects

What operations to perform

- **What**
- **How**
- **Who**

Human-computer system

Designing HIT

**Input**

- Task routing
- Task design
- Task aggregation

**Output**

Reference

Human Computation
Edith Law, Luis von Ahn
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