

Examining Crowd Work and Gig Work Through The Historical Lens of Piecework

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Ongoing Threads in Crowdsourcing Research



Tasks



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1. Complexity

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Complexity



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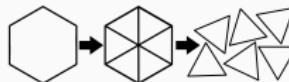
Complexity

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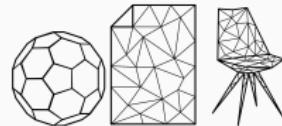
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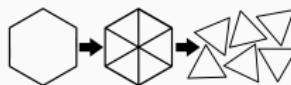
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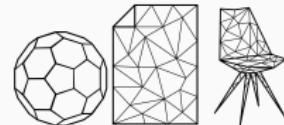
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Tasks

3. Relationships

Gray et al. (2016), Irani and Silberman (2016, 2013), Lee et al. (2015), McInnis et al. (2016), and Salehi et al. (2015)



Decomposition

What will be the future of work?



What will be the future of work?

How will **technology** affect the complexity of the work that on-demand workers do?

What are the **limits** of complexity in on-demand work?

How can we **reach** those limits?



Thesis

These questions have all been asked before.

History can help us answer them today.

We'll reach into the history of **piecework** — of human computers, match stick makers, and metalworkers — and show how the **history** of their work can inform answers to questions about the **future** of digital work.



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- **Piecework:** Payment for *output* rather than for *time*

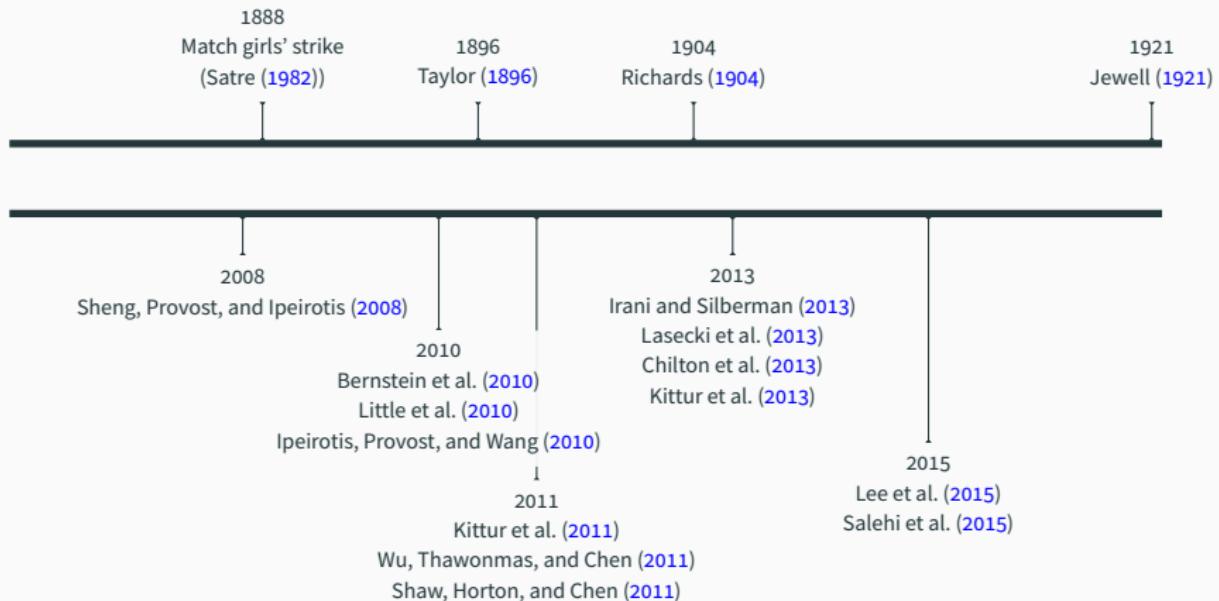


A Timeline of Piecework



On-Demand Work

A Timeline of ~~Piecework~~





Introduction

We hope to provide:

- A useful ontological lens for making sense of on-demand work as a resurgence of **piecework**.
- A method for making sense of contemporary phenomena through **historical analysis**.



Comparative Historical Analysis

- Historical analysis isn't new
 - In general
Rosenberg ([1994](#), [1982](#))
 - In HCI
Bødker ([1993](#)) and Wyche, Sengers, and Grinter ([2006](#))
- Still, it's an underutilized method
 - Provide some basic framing for *ostensibly* new phenomena
 - *Explicate* our theoretical grounding
 - Flesh out *differences* and their implications

Complexity



Complexity

What do we mean when we talk about complexity?

- Can crowds help you write something?

Bernstein et al. (2010), Kim et al. (2014), and Nebeling et al. (2016)



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- Can crowds create things from whole cloth?

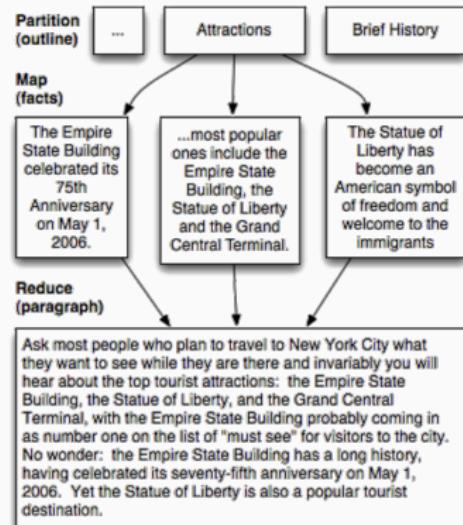
Hahn et al. (2016), Kim and Monroy-Hernández (2016), Kim et al. (2017), and Lasecki, Kushalnagar, and Bigham (2014)



What Does Crowdsourcing Say?

- Build complexity into the process
 - Apply CS methods to people

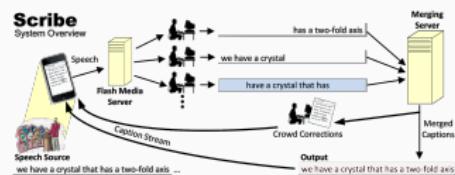
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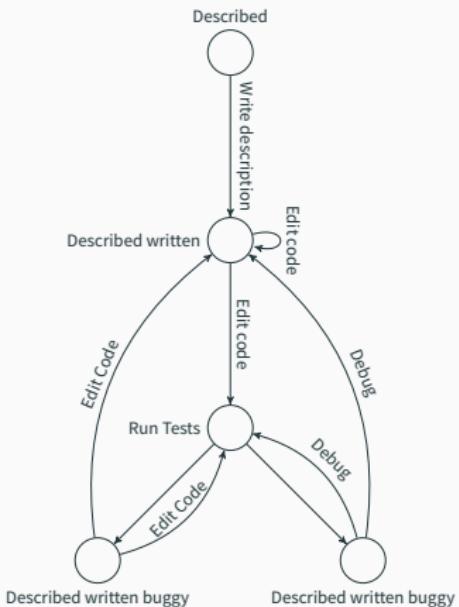
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Kittur et al. (2011)
 - Humans as computational units
Lasecki, Kushalnagar, and Bigham (2014)
- **Crowdsourcing workflows as function state machines**
LaToza et al. (2014)





What Does Piecework Say?

George Airy (astronomer) used a very similar approach
Grier (2013)



- Employed computers
- 13–20 years old
- Overworked
- Underpaid
- Could be fired at will

George Airy



Airy built complexity into the process, assigning *human computers* to compute, verify, and correct the right ascension and declination of stars.

No. of Swings.	Approximate Time (Astronomical Reckoning).	Number of Signals.	Mean of Times by SHELTON.	Mean of Times by EARNSHAW.	Interval by SHELTON.	Interval by EARNSHAW.	Rate EARNSHAW / SHELTON	Logarithm of EARNSHAW / SHELTON	Corrected Logarithm of EARNSHAW / SHELTON
1....	Oct. h 1. 23	22	3 19 36-505	21 23 28-764	h m s ..4 0 23-100	h m s 4 0 38-722	1.0010831	0.00047012	
2....	2. 3	21	7 19 59-605	1 24 7-486	..3 58 21-652	3 58 37-400	1.0011011	0.00047793	
3....	2. 7	21	11 18 21-257	5 22 44-886	..4 45 27-829	4 45 46-421	1.0010855	0.00047117	0.00047387
4....	2. 11	29	16 3 49-086	10 8 31-307	..4 17 6-532	4 17 23-234	1.0010827	0.00046995	
5....	2. 16	17	20 20 55-618	14 25 54-541	..3 13 21-898	3 13 34-795	1.0011116	0.00048249	
6....	2. 19	25	23 34 17-516	17 39 29-336	..3 49 42-503	3 49 57-654	1.0010994	0.00047720	0.00047990
7....	2. 23	31	3 24 0-019	21 29 26-990	..3 55 2-071	3 55 17-433	1.0010893	0.00047282	
8....	3. 3	21	7 19 2-090	1 24 44-423	..4 2 41-510	4 2 57-445	1.0010944	0.00047503	
9....	3. 7	25	11 21 43-600	5 27 41-868	..4 31 5-786	4 31 23-591	1.0010947	0.00047516	0.00046316
10....	3. 11	22	15 52 49-386	9 59 5-459	..3 27 49-747	3 28 3-324	1.0010888	0.00047260	
11....	3. 15	24	19 20 39-133	13 27 8-783	..3 59 47-292	4 0 3-188	1.0011049	0.00047959	
12....	3. 19	24	23 20 26-425	17 27 11-971	..4 3 30-416	4 3 46-620	1.0010686	0.00046384	0.00047194

Cottage Industry



Farms





Cottage Industry

Farms



Textiles



Cottage Industry



Farms



Textiles



Matchsticks





Planes, Trains, and Automobiles

Trains



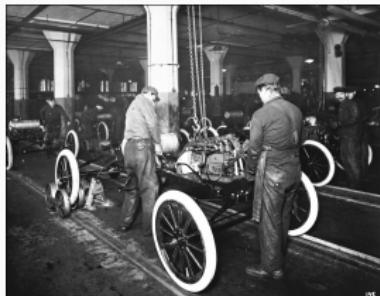
- “Efficiency experts” measured how long it would take to do various jobs
Cunningham ([1911](#))
- These measurements would be used to assign values for each specific task
Jewell ([1921](#))
- Train engineers instituted “The Fix” to correct perceived unfairness
Roy ([1954](#))



Planes, Trains, and Automobiles

Automobiles

- Fordism,
Taylorism, and
Scientific
Management in
full force



- *Manufacturing* proved amenable to assembly line processes.



Planes, Trains, and Automobiles

Planes

- Men drafted during World War II
- Factories turned to a new workforce who had neither conventional training nor experience
- Training for individual tasks and correspondingly assigning workers



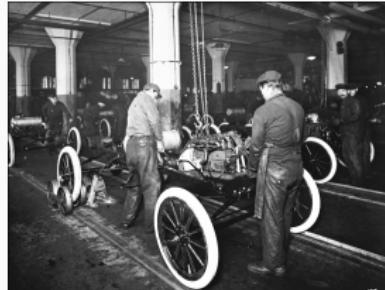


Planes, Trains, and Automobiles

Trains



Automobiles



Planes





Comparisons

- Limited array of tasks versus arbitrarily complex work
 - *Building* planes versus *fixing* trains
- Has technology changed this?
 - Technology makes complex tasks relatively trivial
 - Measuring workers is easier than ever



Complexity

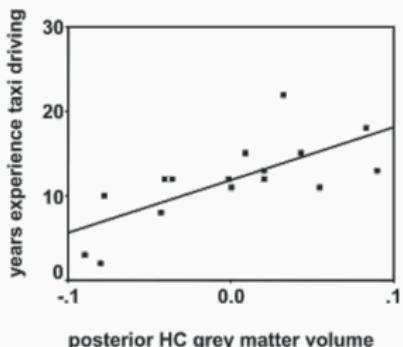
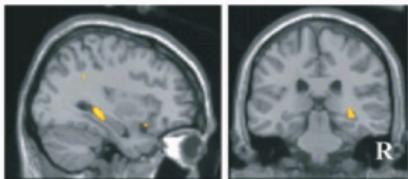




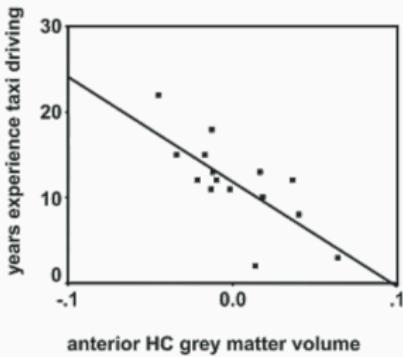
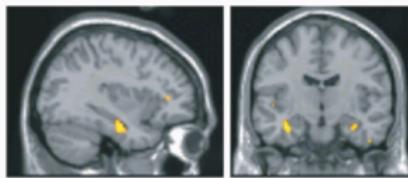
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A

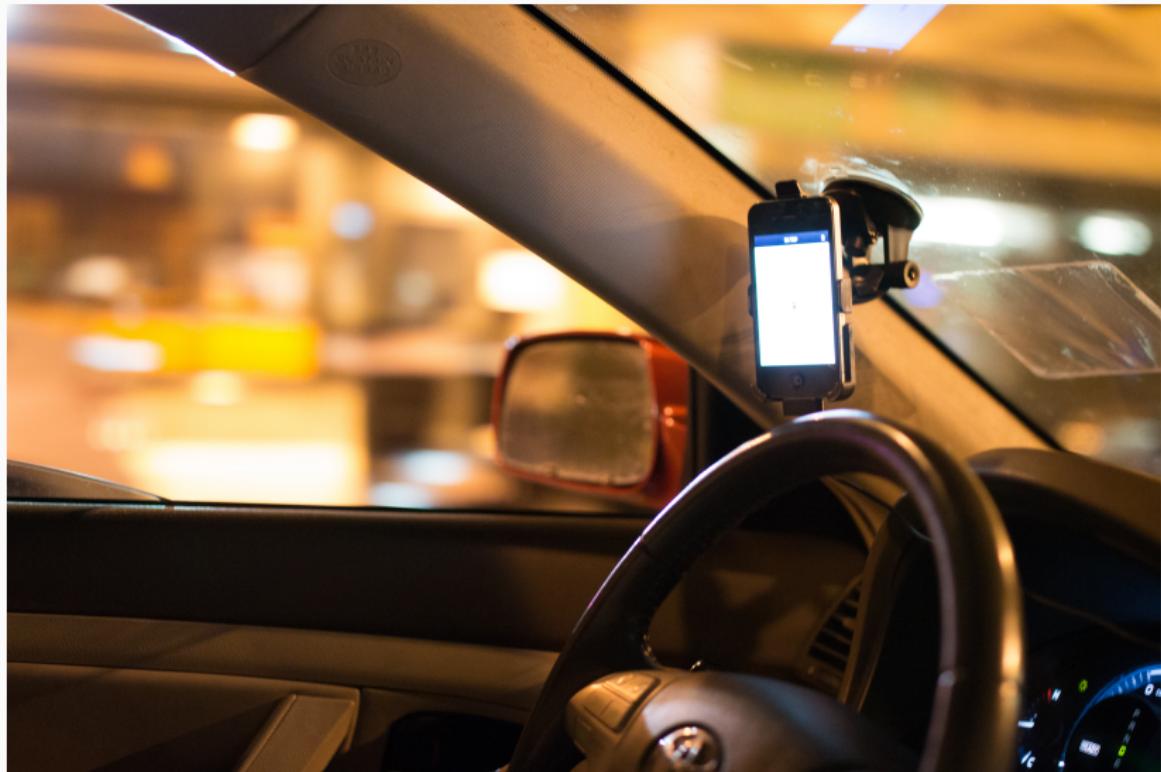


B





Complexity





Complexity

notes

- I'm thinking of pointing to UpWork's screen recording tool as a way to measure workers
- also maybe google analytics and other ways of tracking web-based workers



Implications

- We make stronger assumptions about workers' abilities thanks to technology
- Evaluation remains difficult, but we're trying to find stopgap solutions through decomposition
- We're still not solving the problems of inherently subjectively judged work



Discussion

Twofold purpose:

- Give some historical context to **on-demand work**
- Answer some questions that have been difficult to answer
- Recapture attention toward a valuable sense-making methodology



Conclusion

[al2: This used to be a big thing about the future of work being dystopian or utopian. Seems sort of coming out of nowhere if I just talk about complexity.]



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