

# EXAMINING CROWD WORK AND GIG WORK THROUGH THE HISTORICAL LENS OF PIECEWORK

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May 5, 2017

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# OPEN PROBLEMS IN ON-DEMAND WORK



Tasks



## • Complexity

Suzuki et al. [40], Kim and Monroy-Hernández [16], Yuan et al. [45], Yu, Kittur, and Kraut [44], Nebeling et al. [29], and Hahn et al. [11]



Complexity



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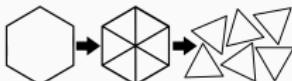
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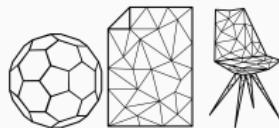


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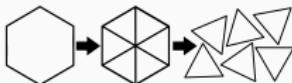
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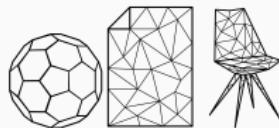
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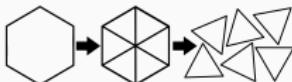
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Tasks



Decomposition

- **Relationships**

Irani and Silberman [14, 13], Gray et al. [9], McInnis et al. [28], Salehi et al. [36], and Lee et al. [25]



**WHAT IS THE FUTURE OF WORK?**

# WHAT IS 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?



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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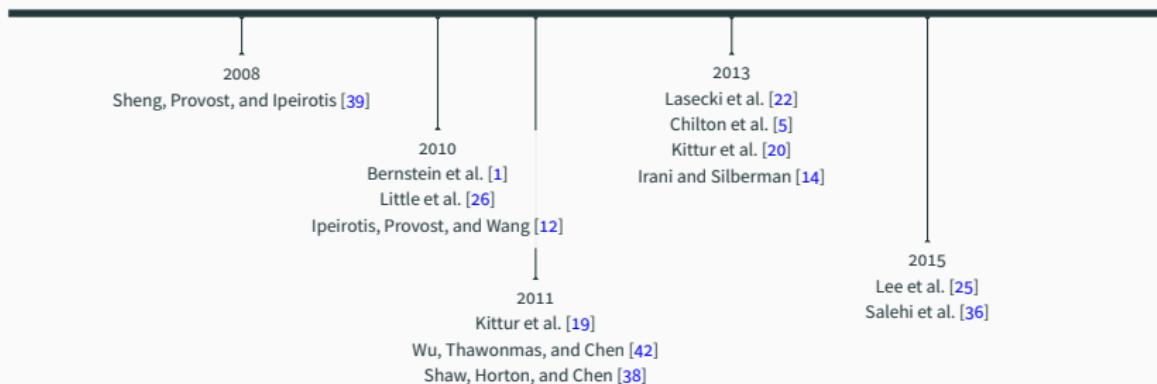


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- **Piecework**: Payment for *output* rather than for *time*

# A TIMELINE OF PIECEWORK



# A TIMELINE OF PIECEWORK ON-DEMAND WORK



# INTRODUCTION



We hope to provide:

- A useful ontological lens for making sense of crowdsourcing and gig work (which we collectively call “**on-demand work**”) as a resurgence of **piecework**.
- A method for making sense of contemporary phenomena through **historical analysis**.



- Historical analysis isn't new
  - In general  
Rosenberg [33, 34]
  - In HCI  
Wyche, Sengers, and Grinter [43] and Bødker [2]
- Still, it's an underutilized method
  - Provide some basic framing for ostensibly new phenomena
  - Theoretically ground ourselves
  - Flesh out *differences* and their implications

## COMPLEXITY

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What kinds of problems do we mean when we talk about complexity?

- Can crowds help you write something?

Bernstein et al. [1], Kim et al. [18], and Nebeling et al. [29]



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- Can crowds create things from whole cloth?

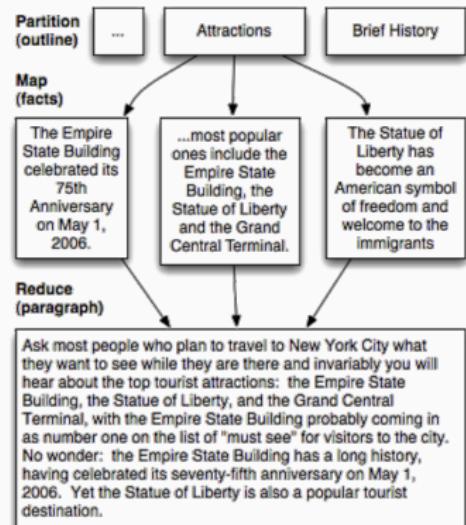
Kim and Monroy-Hernández [16], Kim et al. [17], Hahn et al. [11], and Lasecki, Kushalnagar, and Bigham [21]

# WHAT DOES THE CROWDSOURCING LITERATURE SAY?



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

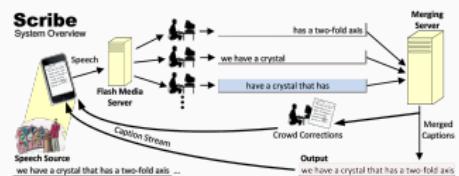
Kittur et al. [19]



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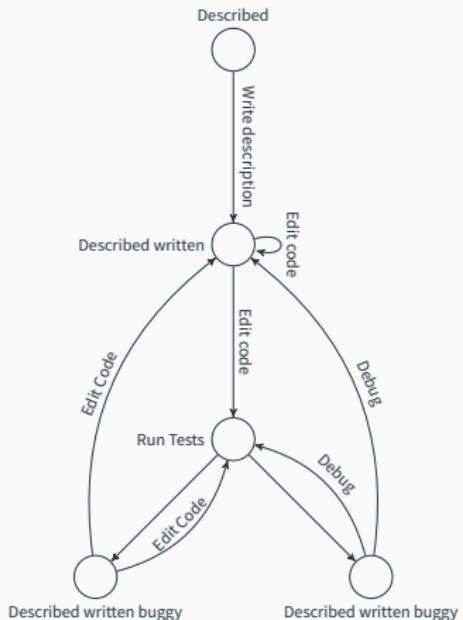
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  - Humans as computational units  
Lasecki, Kushalnagar, and Bigham [21]
  - Crowdsourcing workflows as function state machines  
LaToza et al. [23]



# WHAT DOES THE PIECEWORK LITERATURE SAY?



George Airy (astronomer) used a very similar approach [10]



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

# GEORGE AIRY — WHIZ KID



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 Rate EARNSHAW / SHELTON	Corrected Logarithm of Rate EARNSHAW / SHELTON
1...	Oct. h 1. 23	22	h m s 3 19 36-505	h m s 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 46-020	1·0010686	0·00046384	0·00047194



Farms



# COTTAGE INDUSTRY



Farms



Textiles



# COTTAGE INDUSTRY



Farms



Textiles



Matchsticks



# PLANES, TRAINS, AND AUTOMOBILES

... NOT IN THAT ORDER



## Trains



- “Efficiency experts” measured how long it would take to do various jobs [6]
- These measurements would be used to assign values for each specific task [15]
- Train engineers instituted “The Fix” to correct perceived unfairness [35]

# PLANES, TRAINS, AND AUTOMOBILES

... NOT IN THAT ORDER



## Automobiles

- Fordism,  
Taylorism, and  
Scientific  
Management in full  
force



- *Manufacturing*  
proved amenable  
to assembly line  
processes.

# PLANES, TRAINS, AND AUTOMOBILES

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Planes



# PLANES, TRAINS, AND AUTOMOBILES

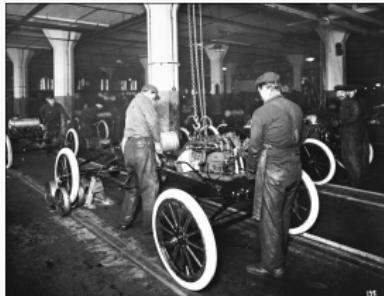
... NOT IN THAT ORDER



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 CAB DRIVERS



# COMPLEXITY CAB DRIVERS





### 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



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