Supporting Big Tasks through Microtasks

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Presentations:
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• Jeff Bigham (Carnegie Mellon University)
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Discussion (build from The Future of Work: Societal Challenges)
Average Employed Adult Daily Behavior, U.S., 2014, Hours : Minutes

TOTAL: 31 HOURS 28 MINUTES

SLEEP

7:06

MEDIA AND CONSUMER TECH ACTIVITY
(VIDEO, AUDIO, SOCIAL MEDIA, GAMING, READING)

11:05

OTHER NON-WORK ACTIVITY
(COOKING, HOUSEWORK & SHOPPING, PERSONAL & HOUSEHOLD CARE, LEISURE, FITNESS, COMMUNITY & OTHER ACTIVITIES, EATING & DRINKING)

7:13

WORK & EDUCATION

6:04

Sources: Bureau of Labor Statistics, The Telegraph, Edison Research, We Are Social, eMarketer, Nielsen, National Sleep Foundation, Deloitte, SNL Kagan, Sandvine, Ipsos, comScore, Global Web Index, OECD, Activate analysis. Behaviors averaged over 7 days. Related travel time is included within timing reported for daily activities.
microproductivity

/ˈmīkrō prōˌdəkˈtivətē/ noun

The transformation of large productivity tasks into a set of smaller microtasks that can be completed individually in short bursts of time with limited context.
Key Aspects of Microproductivity

**Task Structure** – Break tasks into microtasks
  - State of art: Examples of many complex tasks can be broken down
  - Emerging: Workflow creation, composition, reuse; context maintenance

**Task Completion** – Make it easy to complete microtasks
  - State of art: Microtasks easier, especially during mobile micromoments
  - Emerging: Workflow search and application; microtask prioritization

**Task Sharing** – Allocate microtasks to the right person
  - State of art: Reduces overhead in collaborating with colleagues, crowd
  - Emerging: Automated task allocation; support for task marketplaces

**Task Automation** – Learn microtasks via hybrid intelligence
  - State of art: Humans and machines have complementary abilities
  - Emerging: Models for when AI systems can benefit from human input
Soylent, a prototype crowdsourced word processing interface. It focuses on three main tasks: shortening the user's writing, proofreading [...]


Luther, Hahn, Dow & Kittur. Crowdsourcing in the field: A case study using local crowds for event reporting. HCOMP 2015.

Nebeling, To, Guo, de Freitas, Teevan, Dow & Bigham. WearWrite: Crowd-assisted writing from smartwatches. CHI 2016.

Hahn, Chang, Kim & Kittur. The Knowledge Accelerator: Big picture thinking in small pieces. CHI 2016.


Bernstein, Little, Miller, Hartmann, Ackerman, Karger, Crowell & Panovich. Soylent: A word processor with a crowd inside. UIST 2010.
1. Collect content
2. Organize content
3. Turn content into writing
Collect Content

The MicroWriter breaks writing into microtasks
Microtasks can be shared with collaborators
Microtasks can be done while mobile
Collaborative writing typically requires coordination
Collaborators can be known or crowd workers
People have spare time when mobile
Structure turns big tasks into series of small microtasks
Microtasks make it easy to get started
Collect Content

Microtasked Writing

Let's add a bunch of ideas!

Structure turns big tasks into series of small microtasks
The MicroWriter breaks writing into microtasks

Microtasks can be shared with collaborators
Microtasks can be done while mobile
Organize Content
② Organize Content

Microtasks can be shared with collaborators

collab
microtask
mobile
2 Organize Content

- The MicroWriter breaks writing into microtasks
- Microtasks can be shared with collaborators
- Microtasks can be done while mobile
- Collaborative writing typically requires coordination
- Collaborators can be known or crowd workers
- People have spare time when mobile
- Structure turns big tasks into series of small microtasks
- Microtasks make it easy to get started
Collect content
Organize content
Turn content into writing
The MicroWriter breaks writing into microtasks

- Microtasks can be shared with collaborators
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3 Turn Content into Writing

**microtask**
- The MicroWriter breaks writing into microtasks
- Structure turns big tasks into series of small microtasks
- Microtasks make it easy to get started

**collab**
- Microtasks can be shared with collaborators
- Collaborative writing typically requires coordination
- Collaborators can be known or crowd workers

**mobile**
- Microtasks can be done while mobile
- People have spare time when mobile
3 Turn Content into Writing

Microtasked Writing

Write a paragraph using these ideas...

Microtasks can be shared with collaborators
Collaborators can be known or crowd workers
Collaborative writing typically requires coordination
Microtasks can be shared with collaborators
Collaborative writing typically requires coordination
Collaborators can be known or crowd workers

Collaborative writing typically requires coordination. However, microtasks are easy to share with collaborators without the need for coordination. The collaborators can be known colleagues, or paid crowd workers.
Turn Content into Writing

• Complete output:

Structure makes it possible to turn big tasks into a series of smaller microtasks. For example, the MicroWriter breaks writing into microtasks. These microtasks make the larger task easier to start.

Collaborative writing typically requires coordination. However, microtasks are easy to share with collaborators without the need for coordination. The collaborators can be known colleagues, or paid crowd workers.

People have spare time when mobile, and these micromoments are ideal for doing microtasks.
① Collect content
② Organize content
③ Turn content into writing

MicroWriter
Microproductivity for Writing

Task Structure – Break tasks into microtasks
• The MicroWriter’s simple writing workflow creates reasonable output
• Also explored: workflows for cleaning up written text

Task Completion – Make it easy to complete microtasks
• Microtasks can be done while mobile or in atypical situations
• Easy to start microtasking, thoughtful ordering supports engagement

Task Sharing – Allocate microtasks to the right person
• Studied microtasks sharing with: collaborators, crowd workers
• Reduces need for coordination, but context transfer important

Task Automation – Learn microtasks via hybrid intelligence
• Natural language processing techniques used to support microtasks
• Workflows allow people to use imperfect NLP algorithms
Extra Slides
Microproductivity Publications from MSR

- **Microproductivity**

- **Writing via microtasks**
  - Nebling, To, Guo, de Freitas, Teevan, Dow, Bigham. WearWrite: Crowd-assisted writing from smartwatches. CHI 2016.

- **Crowdsourcing personal information tasks**
WearWrite

give instructions
provide feedback

WearWrite

complete tasks
ask questions

Watch User

Crowd Workers
WearWrite

Orchestrating the tasks from wearables

Introduction

- general problem area
- contribute to complex task like writing
- wearable tablet input new line we had he could ride my running on taking

Problem being addressed

- aspects of writing that do not require
- orchestrate crowd heard from with
- used small fragment of time
- small fragment called micro moment
- in this paper we introduce a new

Abstract

While there is a general increase in the global application of wearables technology, the majority of the world populations are yet to fully embrace these technologies, since large tasks such as writing use complex user interfaces not practical for small screens. However, shorter tasks which do not require expertise can be outsourced so that large projects can be managed from wearable technology. WearWrite is a proof-of-concept implementation of this idea. It is essentially an app developed to connect with Google Docs so that instructions and feedback can be provided from the face of a watch. Two preliminary trials tested the viability of such a system and the first draft of this paper was written using WearWrite.


WearWrite

[Introduction to the image: An image of a Google Doc with a task related to a context-aware delivery platform for opportunistic mobile apps. The task involves finding a sentence in the document, checking for issues, and asking a question if more information is needed.]

- **Google Doc**: The document being reviewed.
- **Timer**: The timer for the task duration.
- **Workers**: The individuals or agents assigned to the task.
- **Instructions**: The instructions for the task.
- **Questions**: The questions posed as part of the task.
- **Q&A**: The platform for task-related questions and answers.
Eventful

5 Things You Missed at Seattle Transit Reception: Expanding Rail

Streetcars along Broadway and Jackson will work with light rail to improve transit around the greater Seattle area. Conlin and McGinn also noted Broadway as an example of integrated bike/rail planning.
Eventful
Collaborative Writing with the MicroWriter

- 6 groups, active collaborators
- 2 to 5 people in each group
- Total number of people: 19

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<th>Location</th>
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<td>Write</td>
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Writing with the MicroWriter

- Self-motivated report topics
  - System description
  - Overview of the group
  - Research plan
  - A rebuttal
- Time to write: 1 hour
- Length: 723 words on average
- Example: See Discussion Section

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Key MicroWriter Opportunities

• Easy to get started
  • “It was a relatively fast way to divide the work and produce a great starting point... I think we’ll actually use this..”

• Everyone got a voice
  • “I felt the process enabled us all to contribute significantly.”

• Intertwined contributions
  • “Typically .. one of us would write a full draft and circulate. The tool changes this up a bit by producing an initial draft that is drawn up collaboratively.”

Content:

• Microtasks can be shared with collaborators
• Collaborative writing typically requires coordination
• Collaborators can be known or crowd workers

Collaborative writing typically requires coordination. However, microtasks are easy to share with collaborators without the need for coordination. Collaborators can be known colleagues, or paid crowd workers.
Key MicroWriter Challenges

• Writing via microtasks
  • Bottom-up organization unfamiliar
  • Tried to consider all of the implications of each micro-action
    • Label merging least favorite stage
    • People wanted to go back and correct errors
  • Opportunity: Liked the unexpected connections

• Coordination and collaboration
  • Individual nature of microtasks discouraged explicit collaboration
  • Hard to understand the content other people entered
  • Opportunity: Intentional task allocation
MicroWriter Summary

• Possible to decompose writing into a series of microtasks
  • Simple writing workflow creates reasonable output
  • Microtasks make it easy to start writing
  • Using a structured writing process is unfamiliar
  • Bottom-up organization creates unexpected connections

• Writing microtasks can be shared with known collaborators
  • Reduces the need for collaborators to coordinate work
  • Everyone gets a voice and helps produce the final product
  • The need to develop a shared understanding remains
The hourly-wage rate alone is not a strong predictor of automatability, despite some correlation between the two.

Comparison of wages and automation potential for US jobs

Ability to automate, % of time spent on activities\(^1\) that can be automated by adapting currently demonstrated technology

![Graph showing correlation between hourly wage and ability to automate.](image)

\(^1\)Our analysis used “detailed work activities,” as defined by O*NET, a program sponsored by the US Department of Labor, Employment and Training Administration.

\(^2\)Using a linear model, we find the correlation between wages and automatability in the US economy to be significant (p-value <0.01), but with a high degree of variability ($r^2 = 0.19$).

Source: O*NET 2014 database; McKinsey analysis

McKinsey&Company