Habitsourcing

Sensing the Environment Through Immersive, Habitbuilding Experiences

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Citizen science and communitysensing apps

Citizen science and communitysensing apps

...but we don't always have interested volunteers.

Leveraging habits

Millions of people experience the environment while practicing a habit

Many use mobile apps to support their habit practice

3 million users

200,000 active users

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Leverage these routines to collect data!

Many use mobile apps to support their habit practice

3 million users

200,000 active users

Leverage these routines to collect data!

...but users aren't interested in collecting data

Habitsourcing

Habitsourcing uses **immersive interactions** embedded within **existing habitbuilding experiences** to collect **sensing data** about the environment

ZenWalk

Zombies Interactive
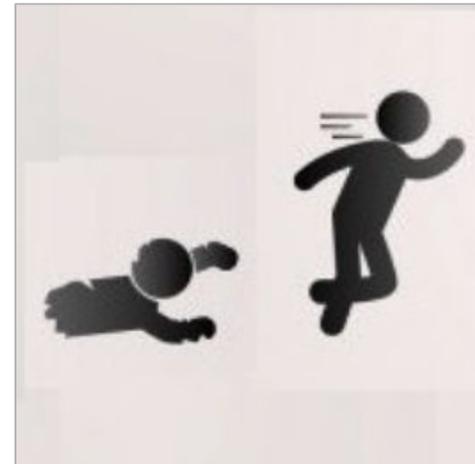
How can we gather data from people who are not intrinsically interested in collecting it?

Related Work: Physical Games with a Purpose

Kathleen Tuite et al.,
CHI 2011

INGRESS

Related Work: Passive Sensing
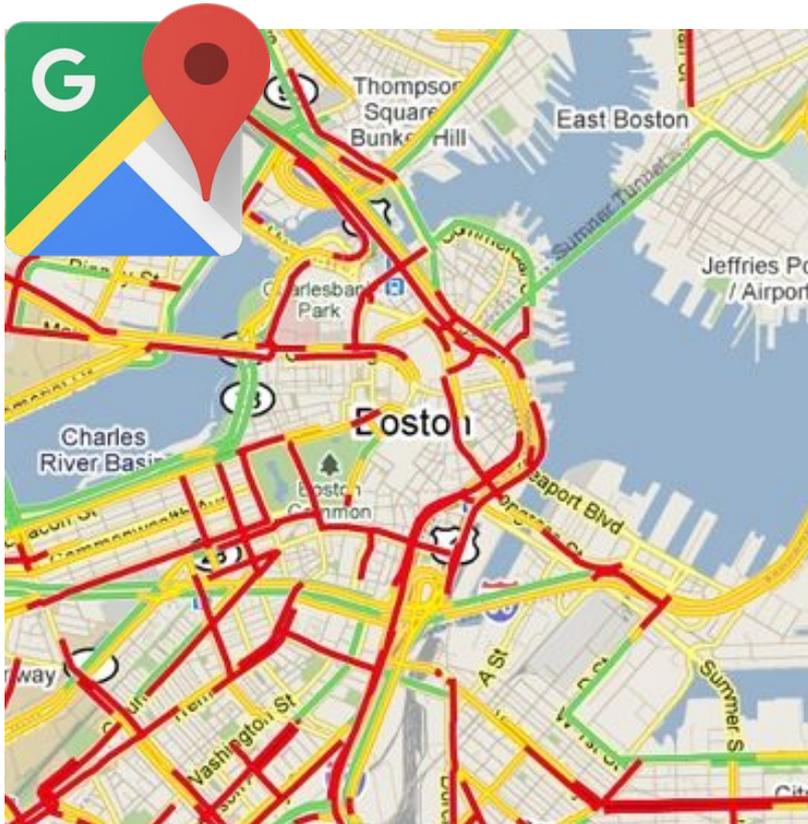
Sensing through actuation

Cue users to **perform physical actions** that are appropriate given their habitbuilding goals and **elicit useful sensing data**

Placing interactions in experiences

Headspace

Intro	Focus on breathing, posture	Focus on surroundings	Reflect

Placing interactions in experiences

Headspace

Sensing Interaction			

Intro	Focus on breathing, posture	Focus on surroundings	Reflect
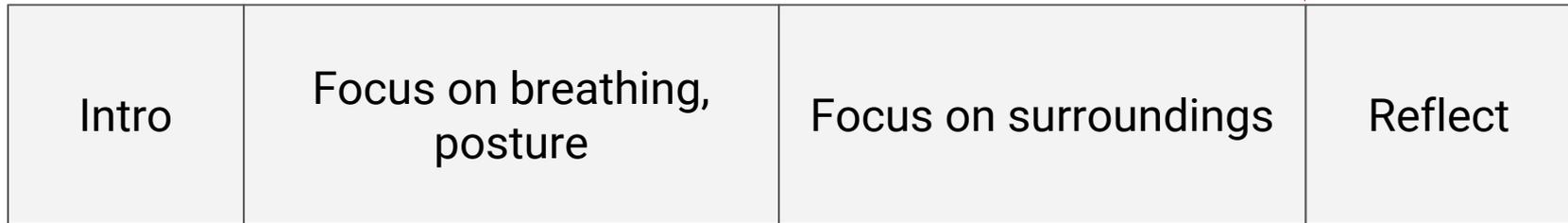
Placing interactions in experiences

Headspace

Intro	Focus on breathing, posture	Focus on surroundings	Reflect

ZenWalk

Intro	Focus on breathing, posture	Focus on surroundings	*Sensing Interaction*	Reflect

Sensing through actuation in Zombies Interactive

VIDEO

Sprint detection
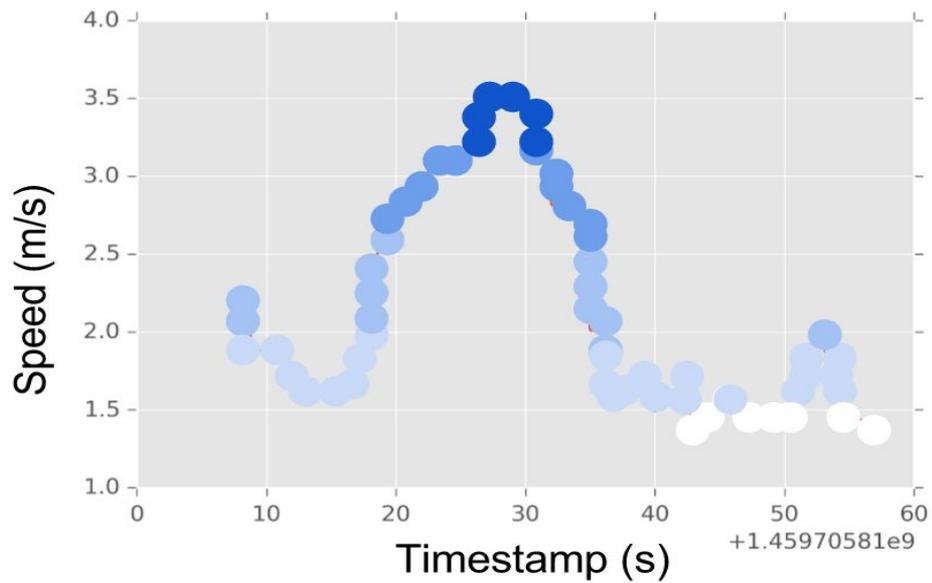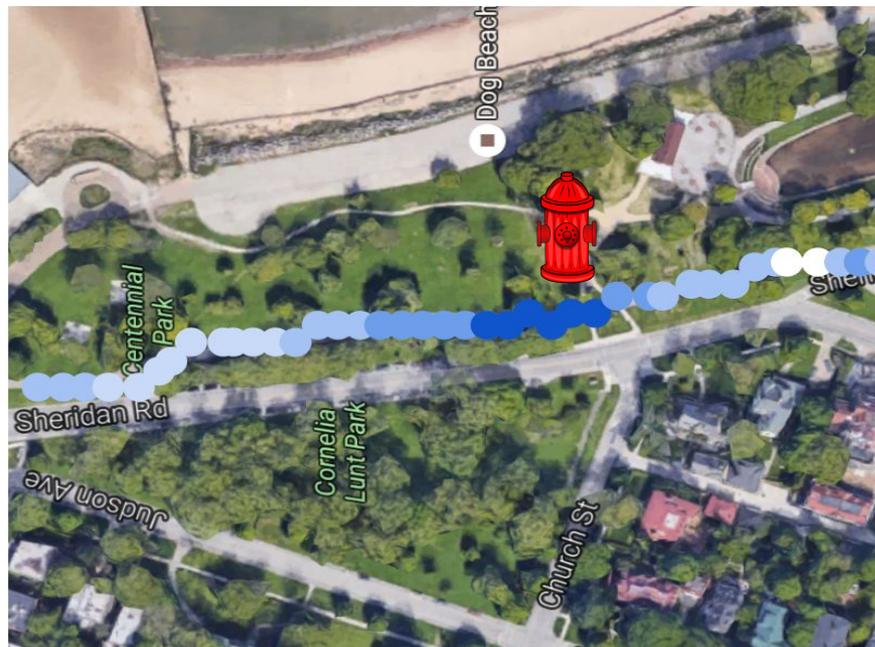
Sensing through actuation in ZenWalk

VIDEO

How can we make sensing through actuation interactions enjoyable in a particular habitbuilding experience?

Designing Interactions

ZenWalk

"Observe the tree..."

Designing Interactions

ZenWalk

"Observe the tree..."

Interaction needs more
guidance

Designing Interactions

ZenWalk

"Observe the tree..."

Interaction needs more guidance

"Focus on the texture of the tree bark...observe the shape of the leaves..."

Designing Interactions

ZenWalk

"Observe the tree..."

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Interaction needs more guidance

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"Focus on the texture of the tree bark...observe the shape of the leaves..."

Zombies Interactive

"They're all around you...go take cover by that tree"

Designing Interactions

ZenWalk

"Observe the tree..."

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"Focus on the texture of the tree bark...observe the shape of the leaves..."

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"They're all around you...go take cover by that tree"

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Interaction unnatural to habit

Designing Interactions

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"Focus on the texture of the tree bark...observe the shape of the leaves..."

Zombies Interactive

"They're all around you...go take cover by that tree"

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Interaction unnatural to habit

↓

"Sprint to that building..."

User Studies

Study 1: Would people use habitsourcing apps?

Study 2: Can habitsourcing interactions yield accurate data?

User Studies

Study 1: Would people use habitsourcing apps?

Within-subject

Non-interactive

S1	S2	S3	S4

Warm up

Interactive

S1	I1	S2	I2	S3	I3	S4

Warm up   Sprint to...

User Studies

Study 1: Would people use habitsourcing apps?

Recruited via Reddit

9

ZenWalk participants
(5F)

12

Zombies Interactive participants
(2F)

Users preferred the interactive version more than or as much as the non-interactive version
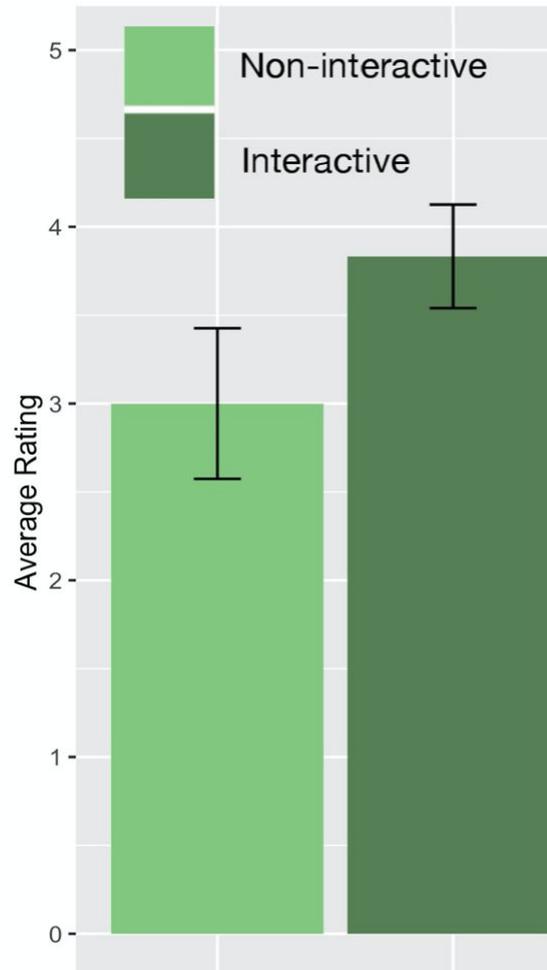
Zombies Interactive
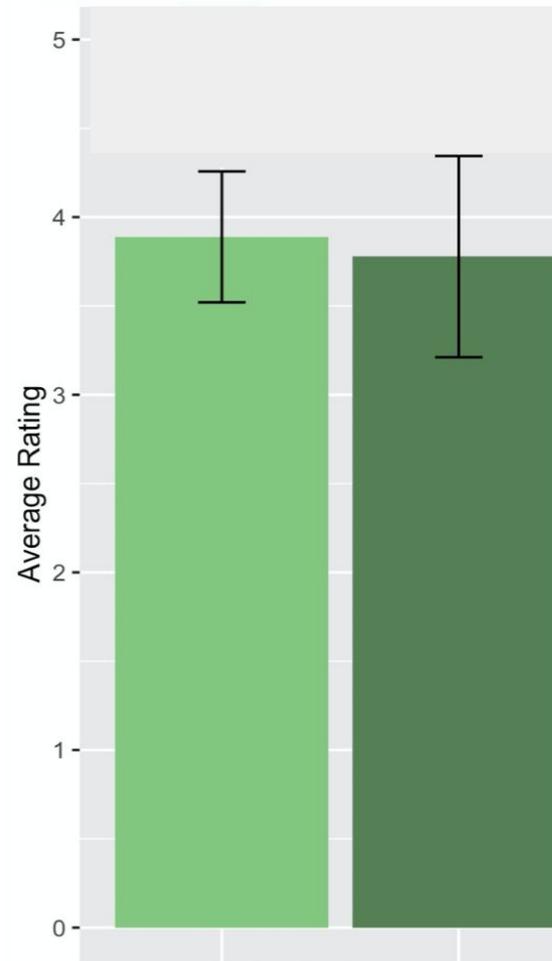
ZenWalk

Interactions increase immersion

"I like the prompts to speed up at various places in the run. Made the experience seem more personalized and interactive. **I felt more like a part of the storyline**"

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"It was nice to focus on trees and **notice things I might not otherwise have**."

Users dislike contextual mismatches

"The **instructions were a little weird**, saying that I might see a tall building (I'm in NYC, tall buildings are everywhere)"

Users dislike contextual mismatches

"The **instructions were a little weird**, saying that I might see a tall building (I'm in NYC, tall buildings are everywhere)"

"Being surrounded by people that I know (that might be judging me if I'm focusing on a tree) **tended to halt the effects of the meditation**"

User Studies

Study 2: Can habitsourcing interactions yield accurate data?

Can we accurately detect when a user performs an interaction?

Can we accurately detect objects from an interaction's data trace?

User Studies

Study 2: Can habitsourcing interactions yield accurate data?

Abbreviated experience

| S1 | I1 | I2 | I3 | S4 |

Sensor traces

Object detection
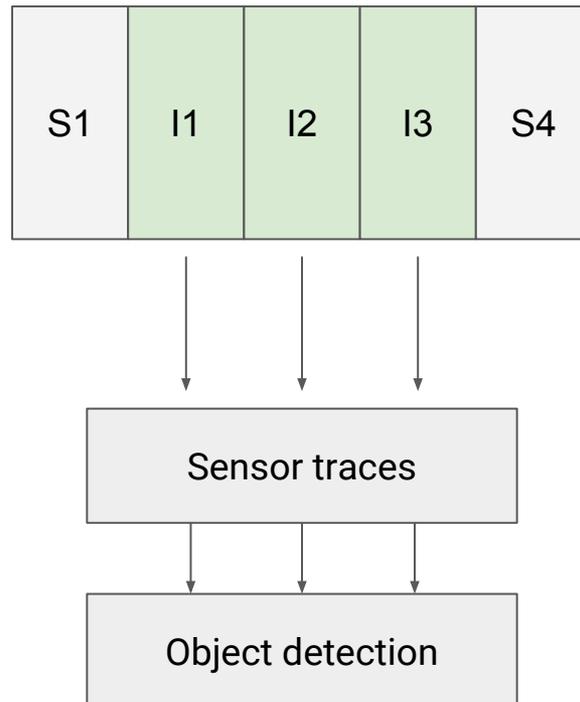
User Studies

Study 2: Can habitsourcing interactions yield accurate data?

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(7F)

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(5F)

Recruited locally via university Facebook groups and mailing

Good at detecting if a user performed an action
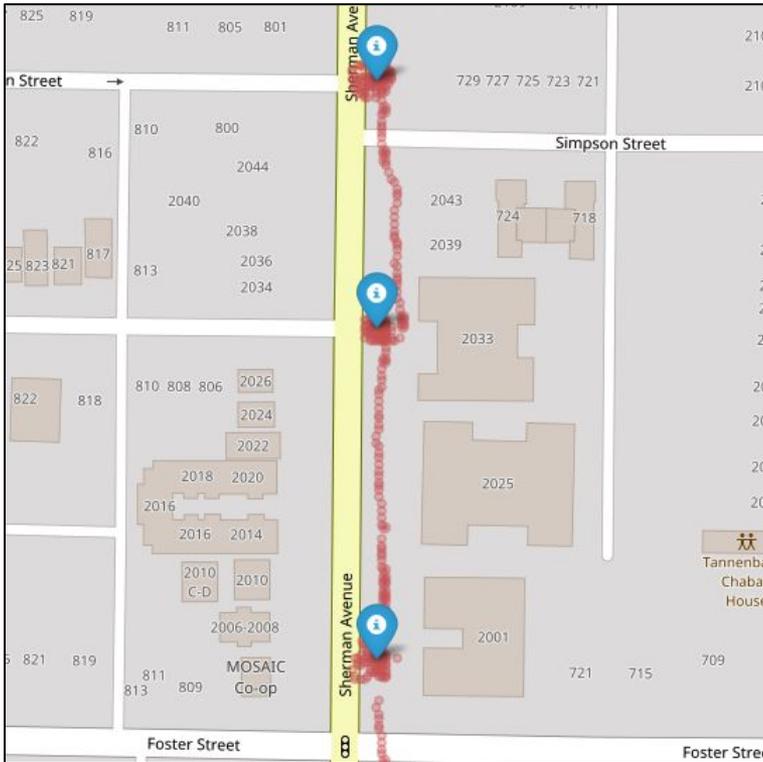
34/36
user actions accurately detected
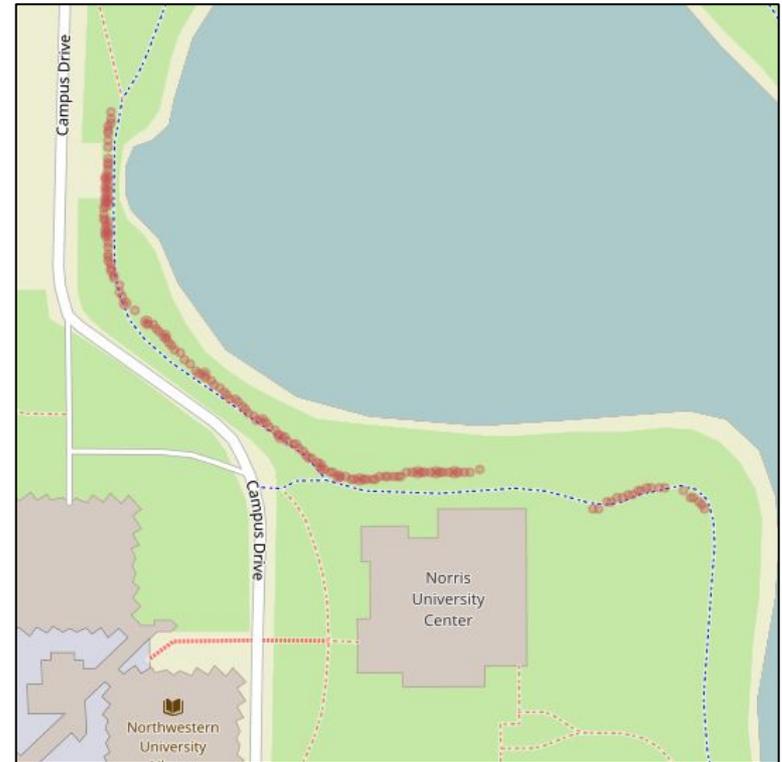
7/8
user non-actions accurately detected

Success cases
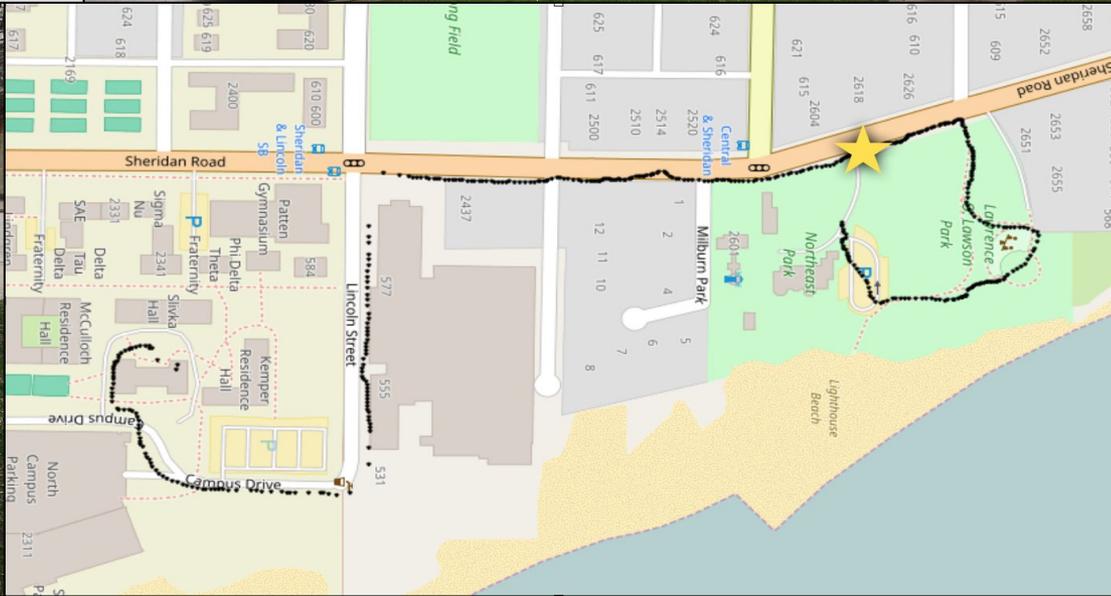
Failure case: object not in environment

Failure case: instructions not specific enough

Design Principles

- Prioritize habitbuilding

- Consider social context

- Provide feedback

- Keep interactions relevant and provide guidance / fallback

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# Design Principles

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Future Work

- What kind of interaction techniques can provide more enjoyment and yield better data?

- Can we scaffold collected data to achieve accuracy, coverage, and detail?

- How do we design new immersive experiences within the physical world?

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- **How do we design new immersive experiences within the physical world?**

Conclusion

- We can provide a habitbuilding experience that's at least as enjoyable as existing ones

- It's possible to collect accurate data

- We can reach a broader population of people not interested in contributing data

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Thank You

DTR

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Appendix

Questions

Questions

Algorithm for sprint detection
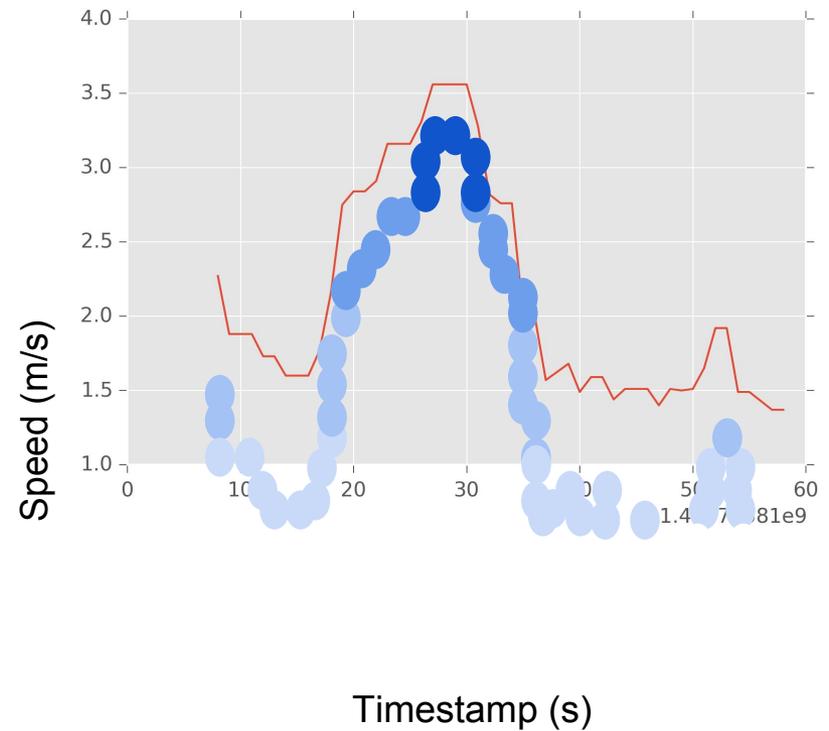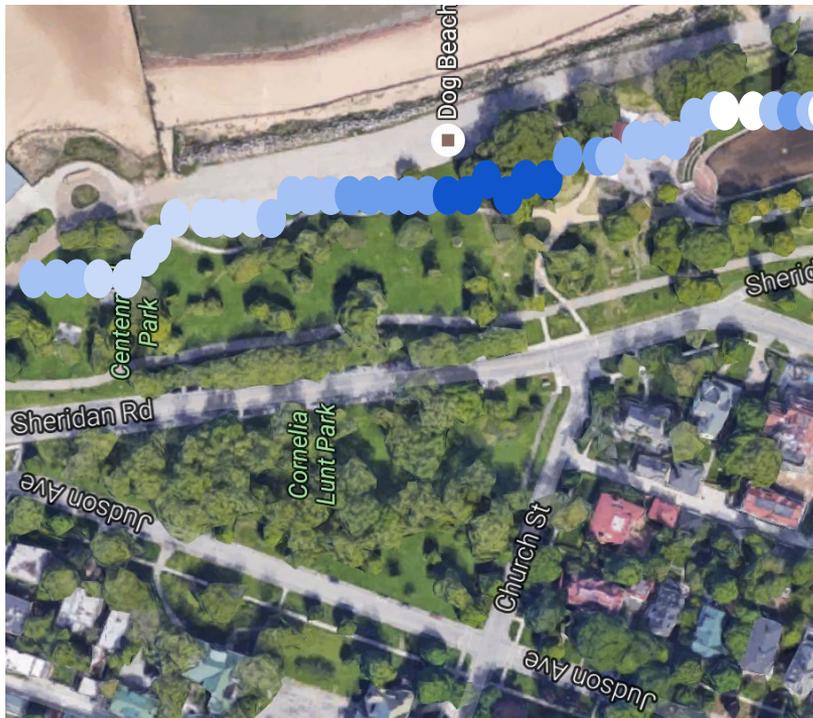
Algorithm for circle detection
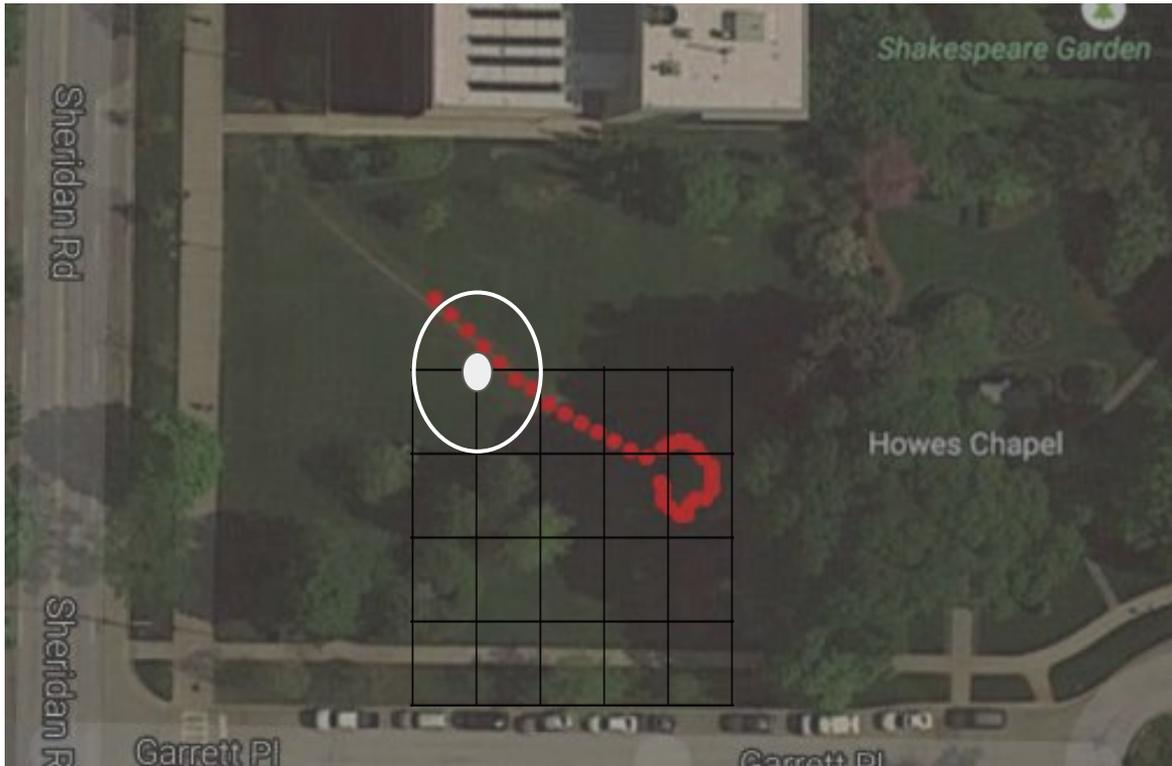
numLocations = 3

Algorithm for circle detection
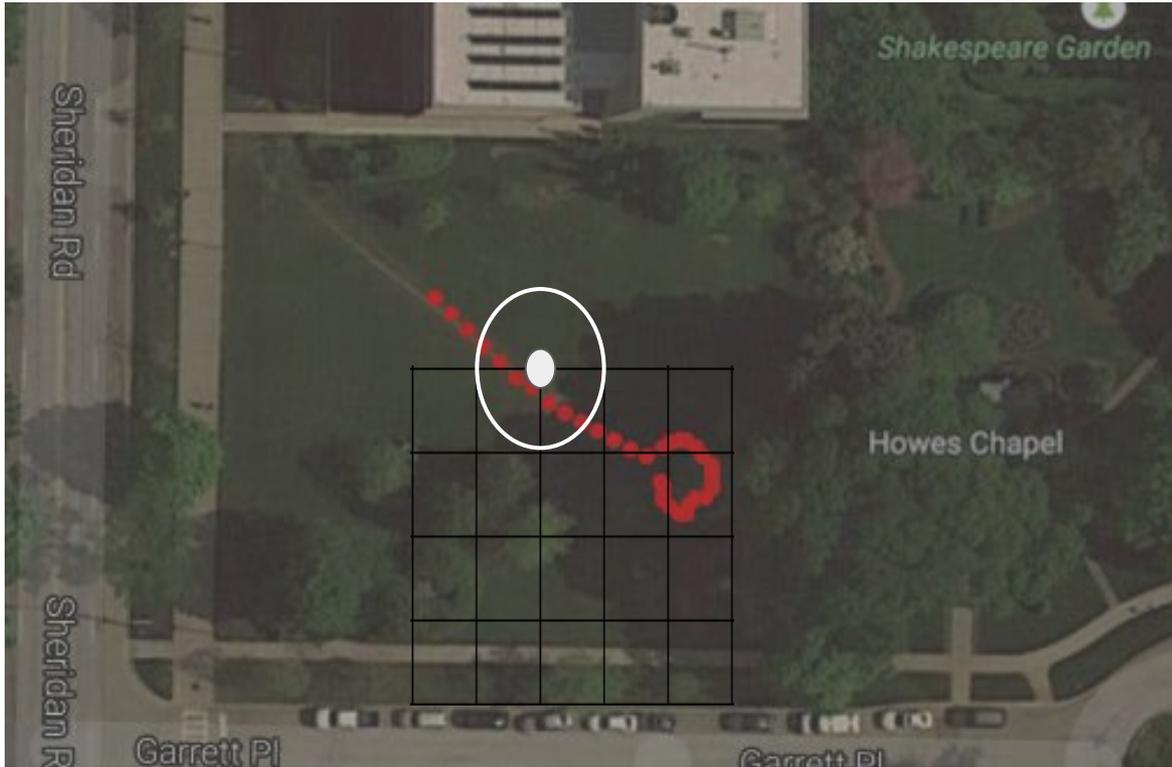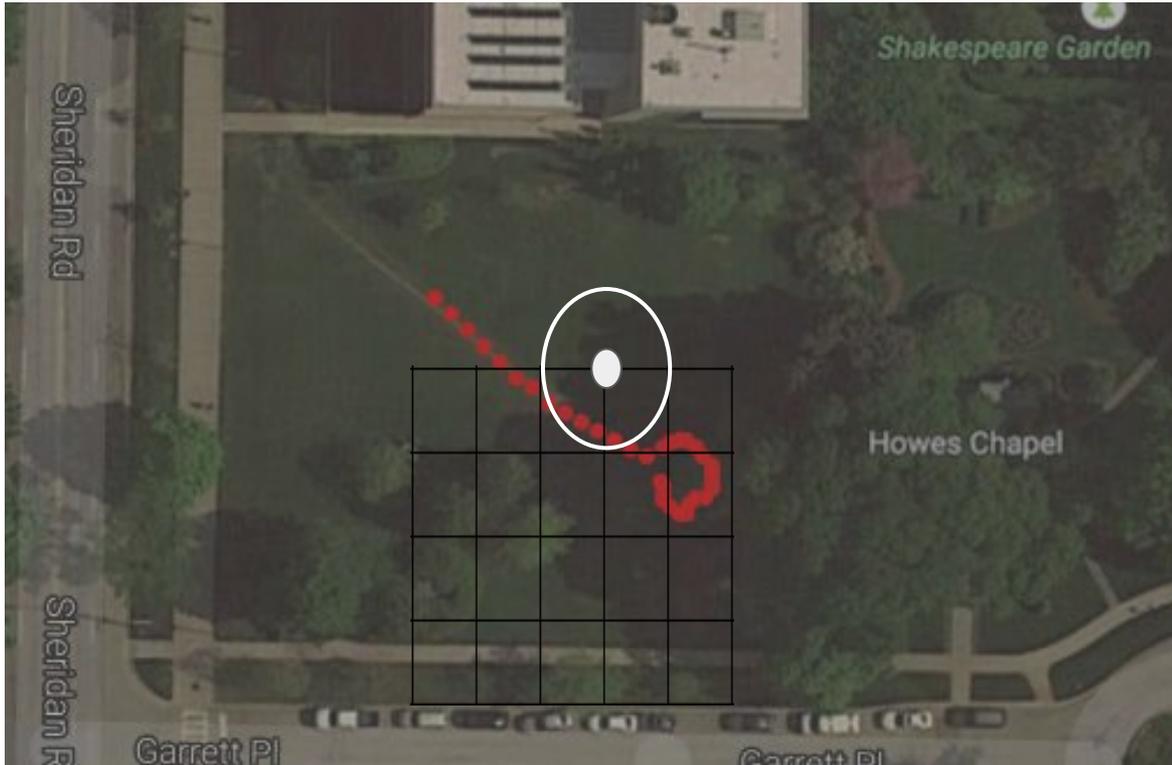
numLocations = 0

Algorithm for circle detection

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Algorithm for circle detection
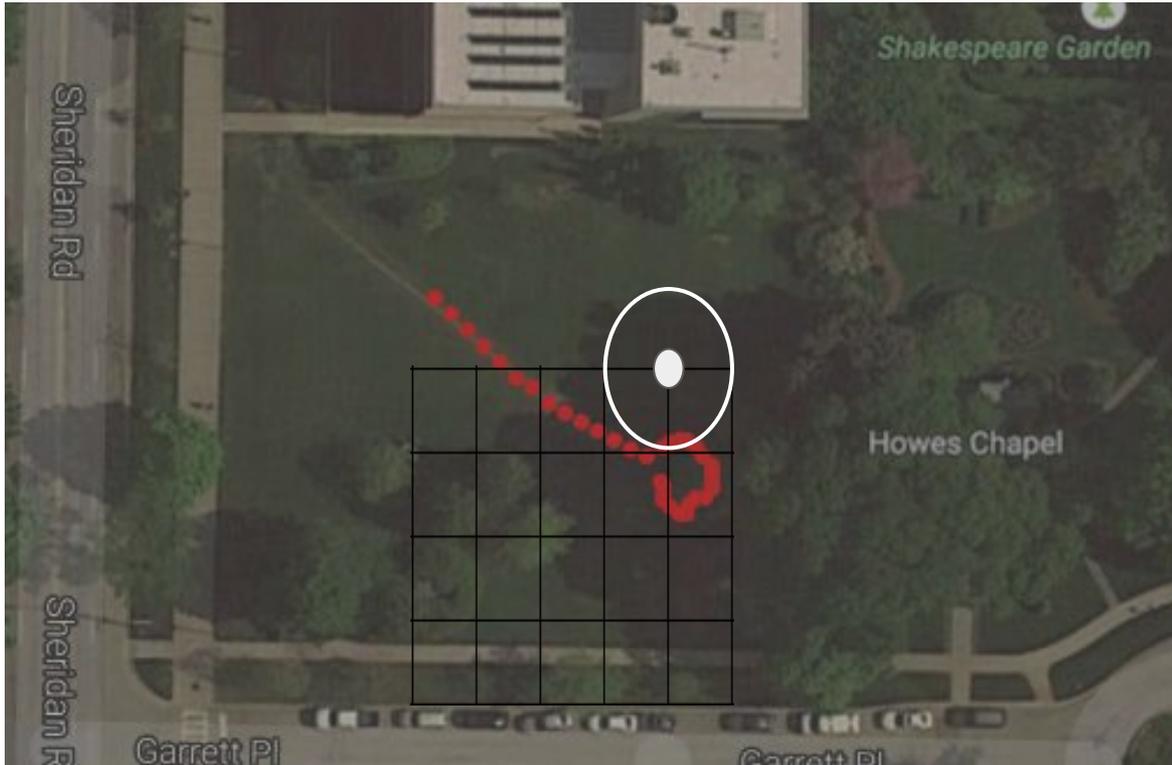
numLocations = 0

Algorithm for circle detection
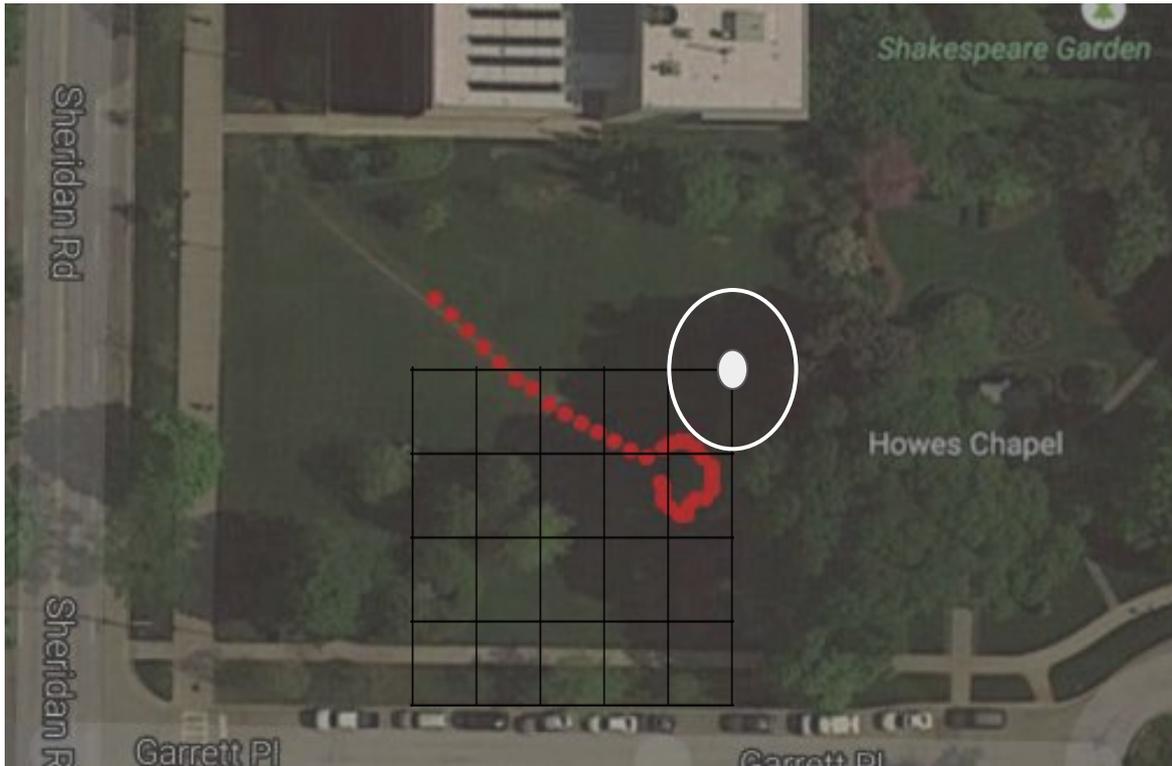

numLocations = 0

Algorithm for circle detection
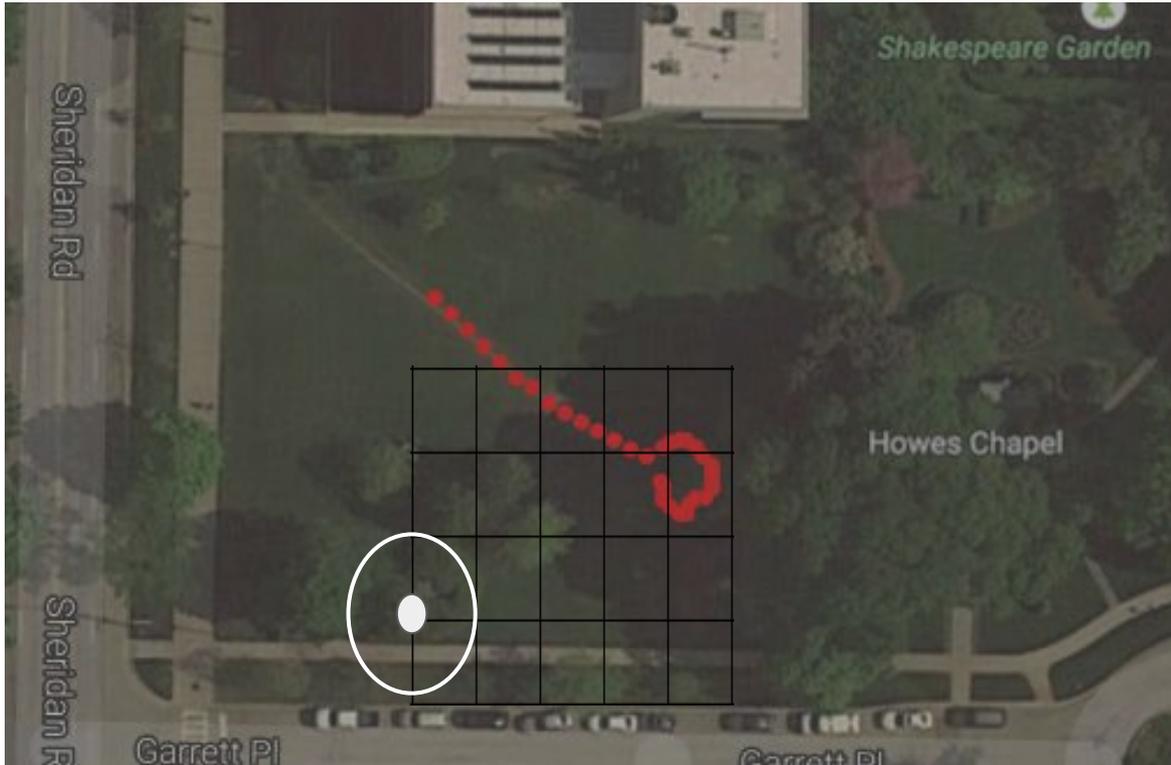
numLocations
= 0

Algorithm for circle detection
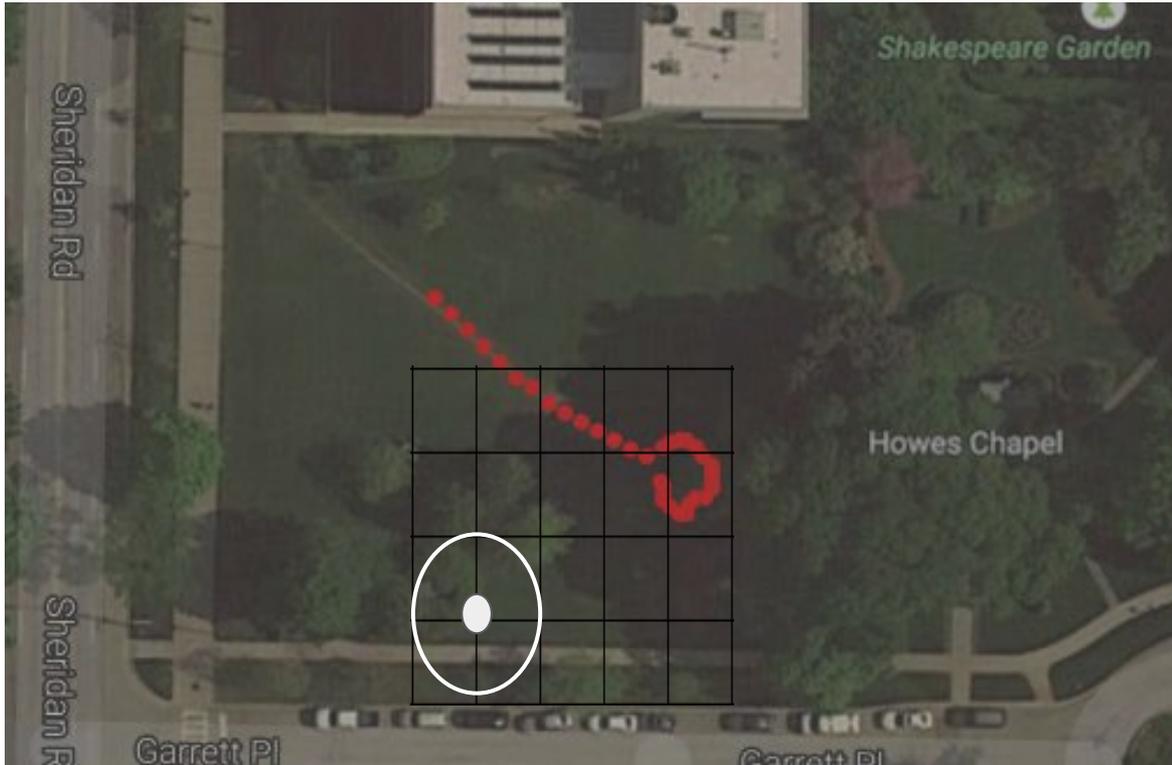
numLocations = 0

Algorithm for circle detection
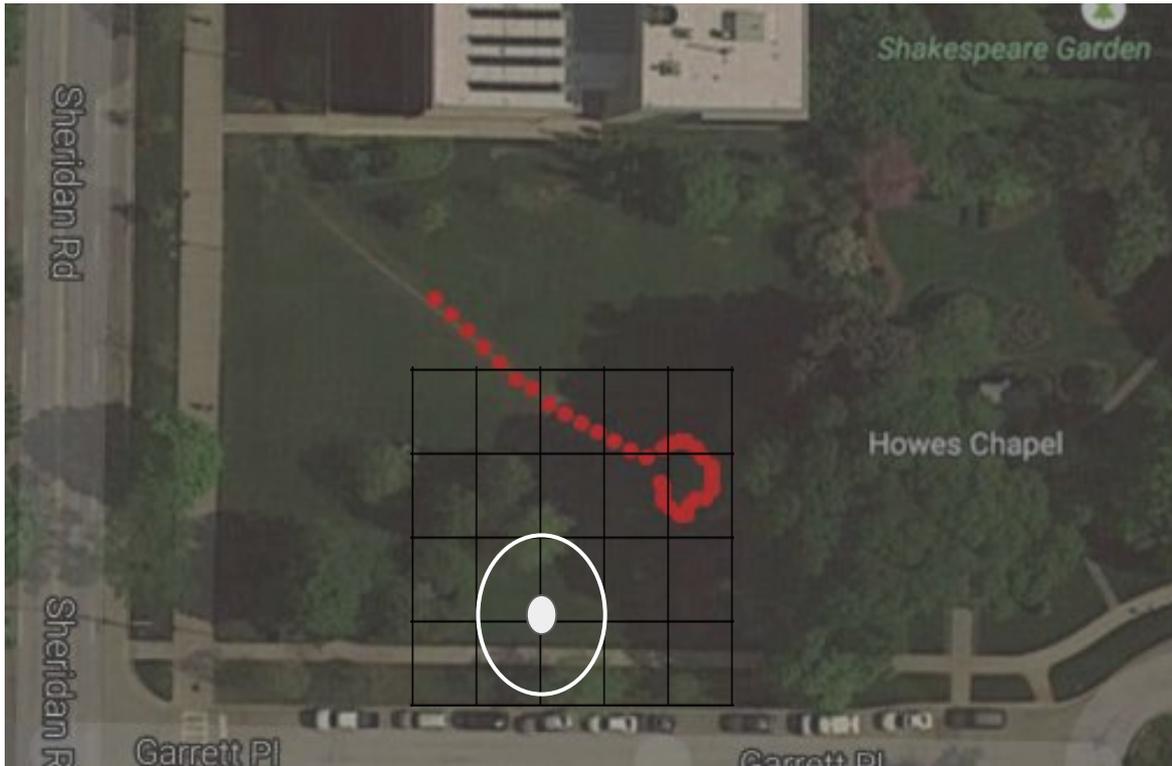
numLocations = 4

Algorithm for circle detection
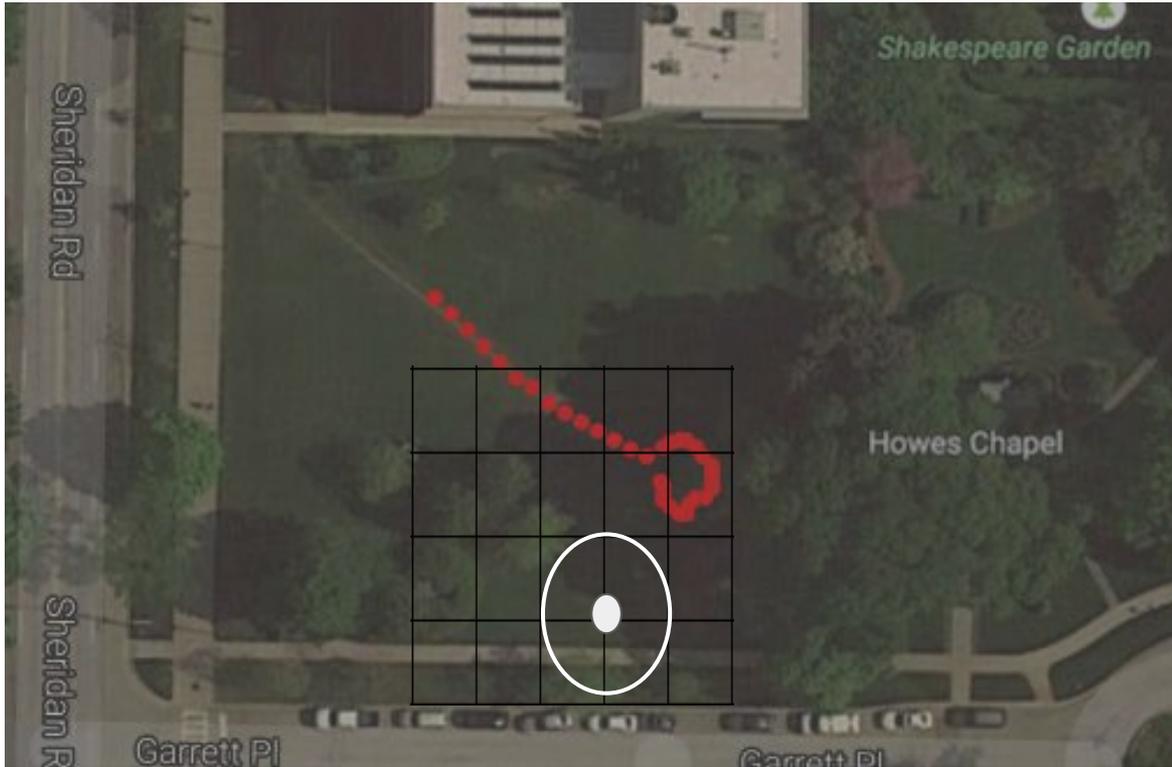
numLocations = 9

# Algorithm for circle detection
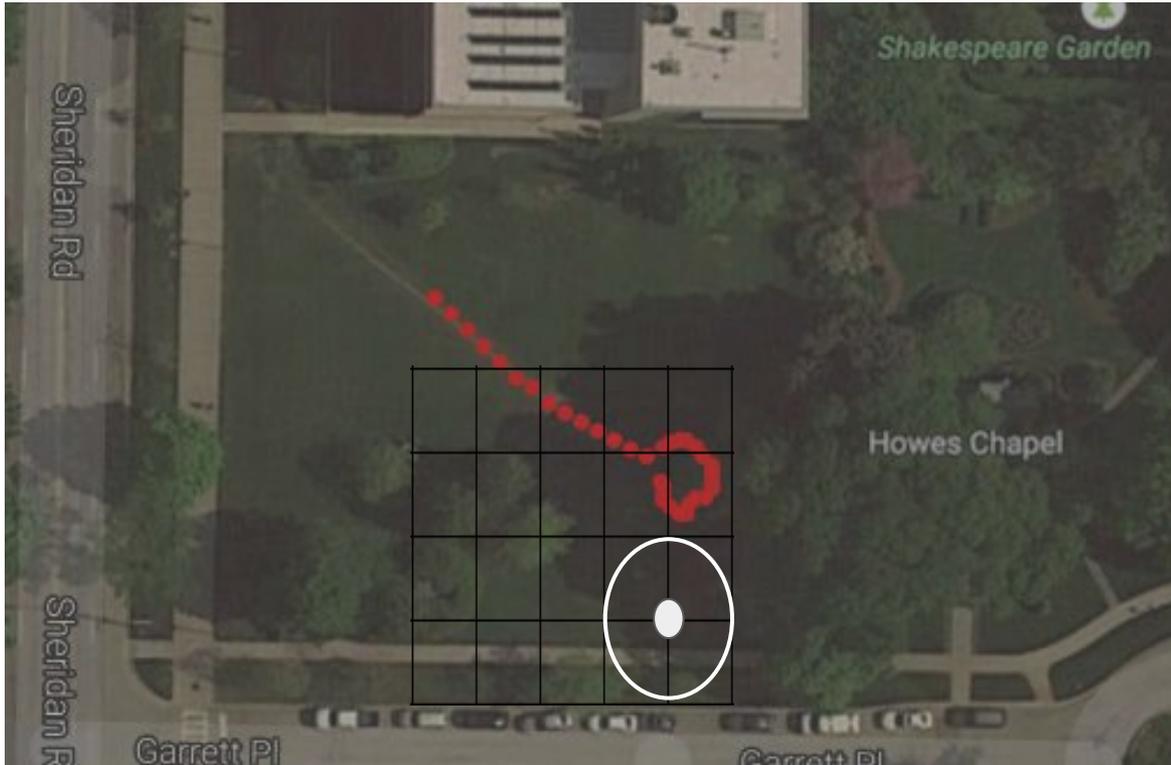
numLocations = 27

Algorithm for circle detection
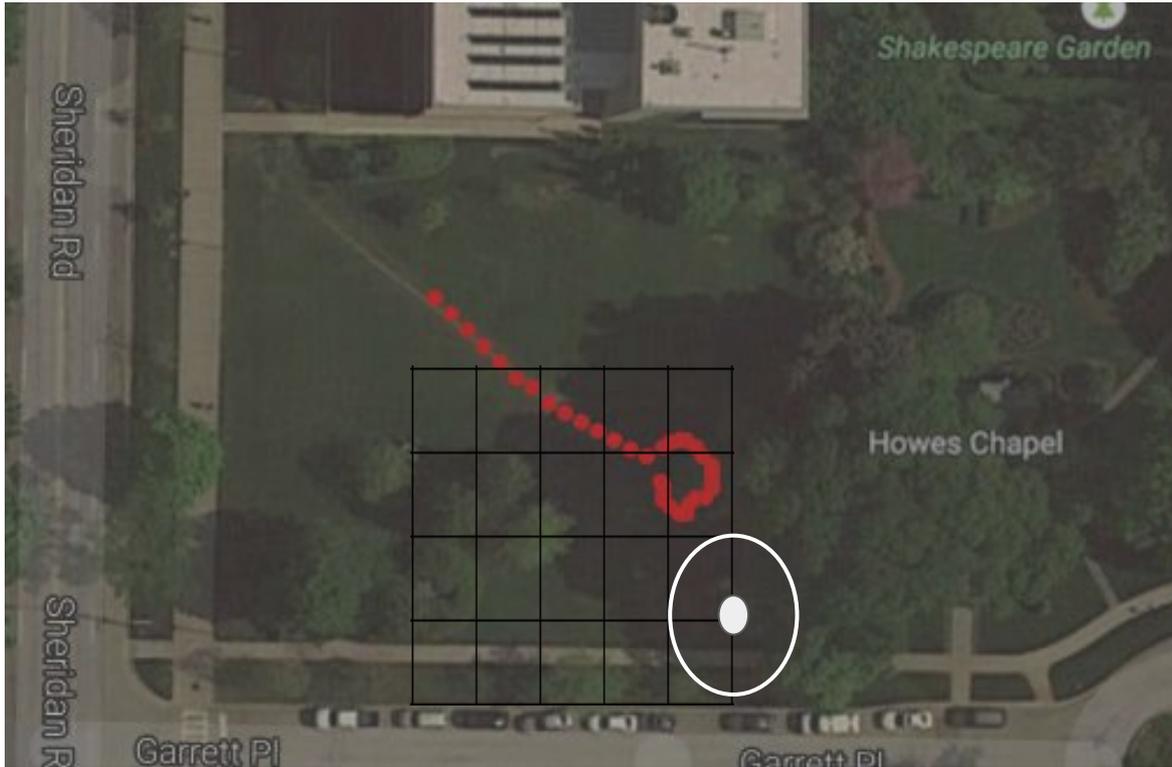
numLocations = 10

Algorithm for circle detection
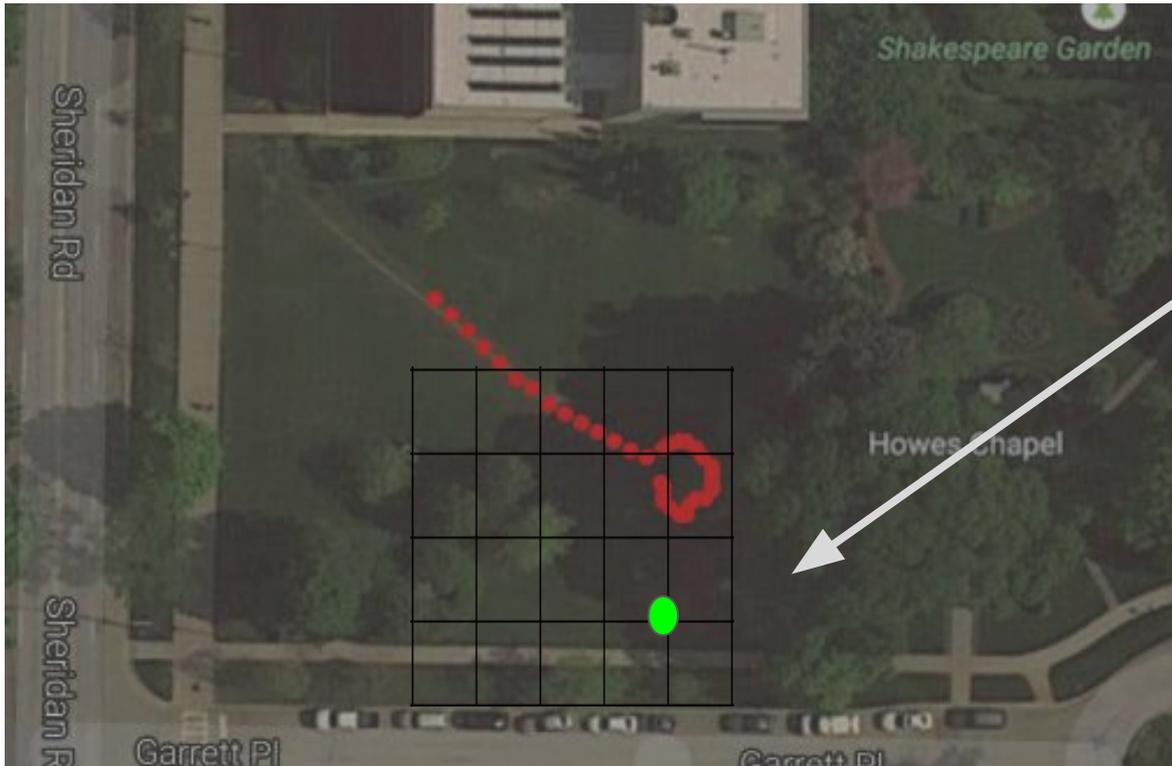
Detected tree location

ExperienceKit

Implement an experience in fewer
than 100 lines of code

See paper for more details
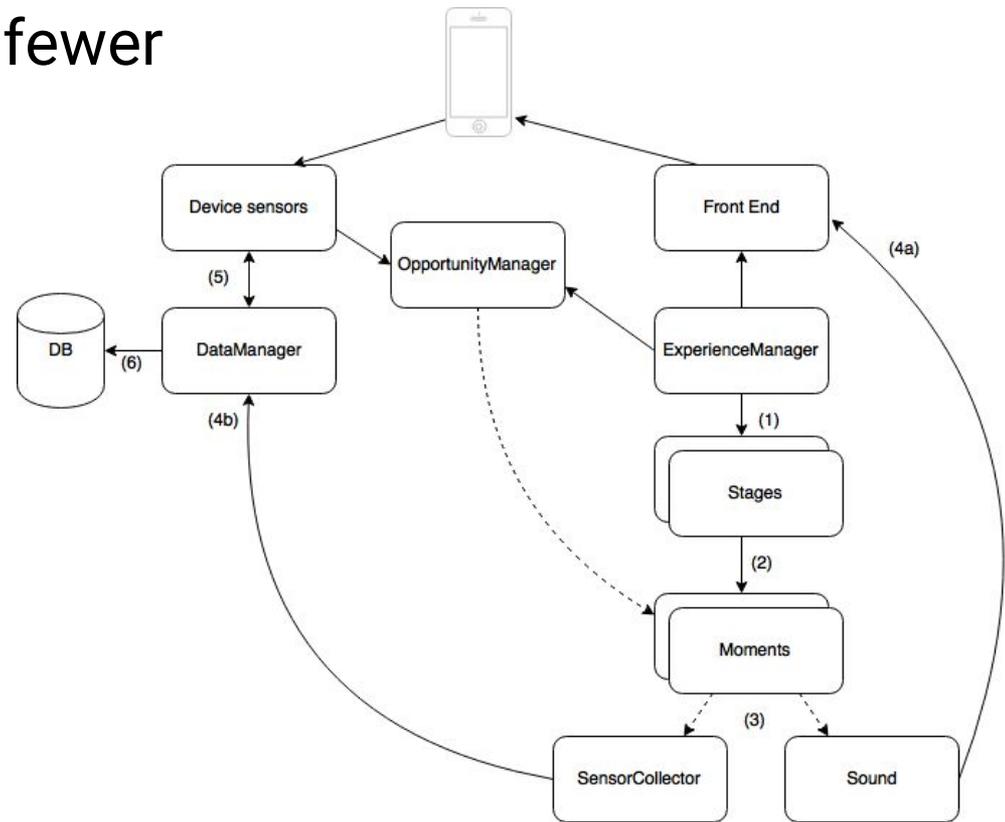
Balancing interactions

Enjoyability   **Data Quality**

Study Design

Version X

Version Y

S1	S2	S3	S4

S1	I1	S2	I2	S3	I3	S4
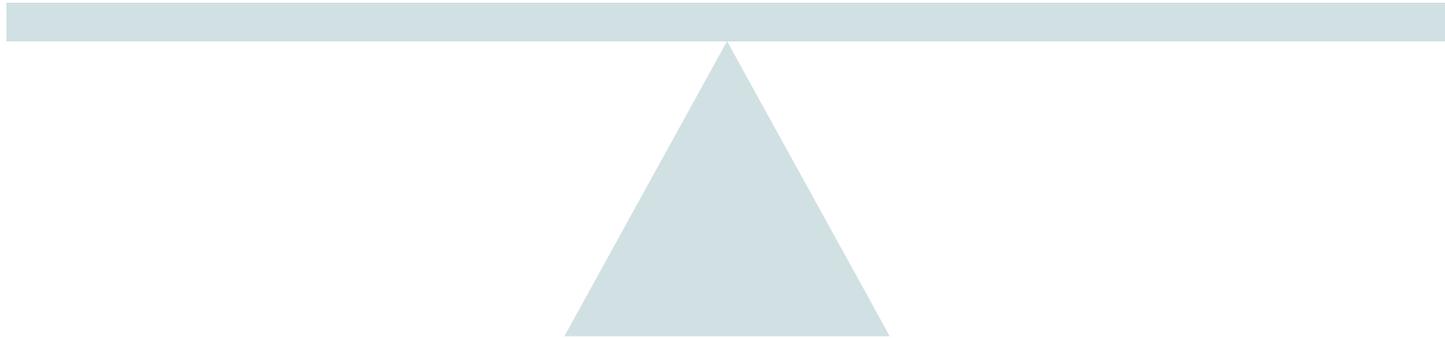
Warm up

Warm up   Sprint to...

Interaction User Study

How do habitsourcing apps compare to their non-interactive counterparts?

- Enjoyability
- Likelihood of future use

Interaction User Study

9

ZenWalk participants
(5F)

12

Zombies Interactive participants
(2F)

Recruited via Reddit

Recruitment/demographic

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ZenWalk participants
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Recruited locally via university Facebook
groups and mailing lists

Data Study

Can we accurately detect when a person performs an interaction?

Can we accurately detect objects from an interaction's data trace?

User Studies

Study 2: Can habitsourcing interactions yield accurate data?

Full experience

Abbreviated experience

| S1 | I1 | S2 | I2 | S3 | I3 | S4 |

35 minutes

| S1 | I1 | I2 | I3 | S4 |

10 minutes

Warm Up