



# User Experience of Gamified Mobile Crowdsourcing in Smart Cities

---

Aylada Khunvaranont

Advisor: Cheng-Hsin Hsu

Networking and Multimedia Systems Lab

Institute of Information System and Applications, NTHU

# Outline

- Introduction
- Problem Statement
- Mobile applications
- User Study
- Conclusion



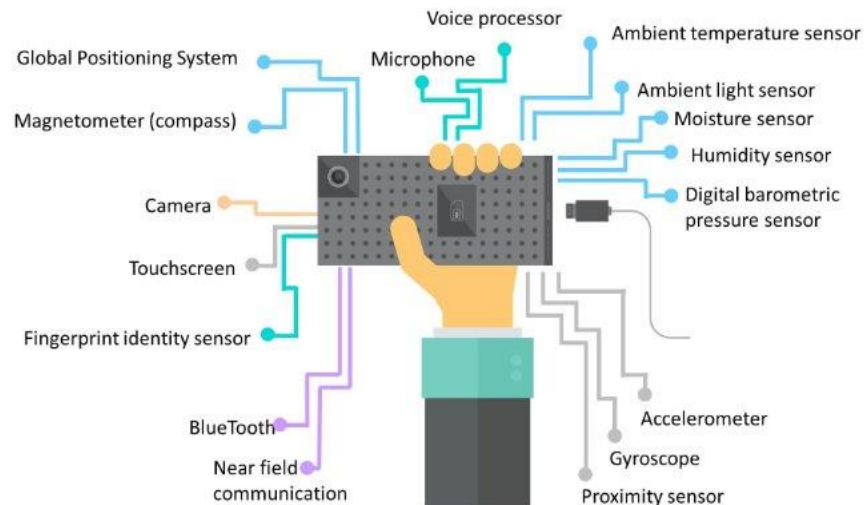
# Introduction

- Smart cities concept utilize the information and communication technology in sensing and analysis that provide data for monitoring and create awareness in running a city.
- The market forecast predicts that it will grow and reach 1.45 trillion USD in 2020.



# Introduction

- Mobile phone users in urban area are ubiquitous and smartphones are equipped with various sensors.
- Determining the suitable payment for crowdsourced sensing tasks is a difficult problem.

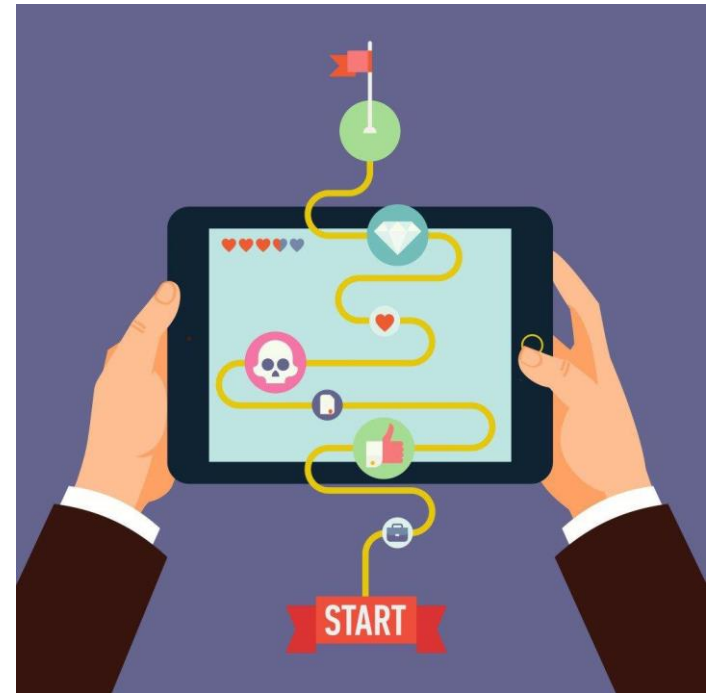


© 2016 ICON plc. All rights reserved.



# Introduction

- Gamification might be a substitute incentive as many researchers claimed that gamification can help increase user engagement and motivation.



# Introduction

- “Gamification is *the use of game elements and game design techniques in non-game contexts.*”
- Designing and implementing gamification system is to create gamified environment with realistic purposes.



# Outline

- Introduction
- **Problem Statement**
- Mobile applications
- User Study
- Conclusion



# Problem Statement

The purpose of this study is to investigate how gamification effects:

- user enjoyment
- routing behavior
- perception on monetary incentive





# Background

- When designing gamification, the use of game elements varies to the purpose and expected outcome from the application.
- Common game elements are:-
  - Point
  - Badges
  - Leaderboards



# Types of Motivation



## **Intrinsic**

- Autonomy
- Belonging
- Curiosity
- Learning
- Mastery
- Meaning

## **Extrinsic**

- Badges
- Competition
- Money
- Points
- Rewards

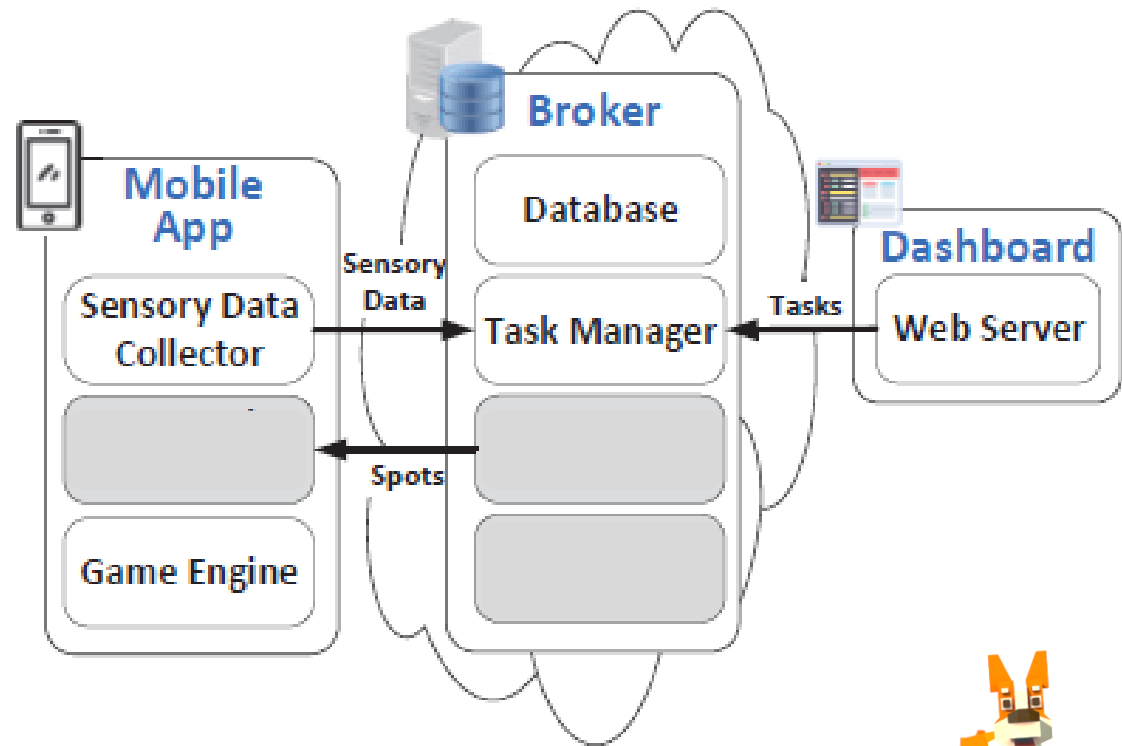
# Outline

- Introduction
- Problem Statement
- **Mobile applications**
- User Study
- Conclusion

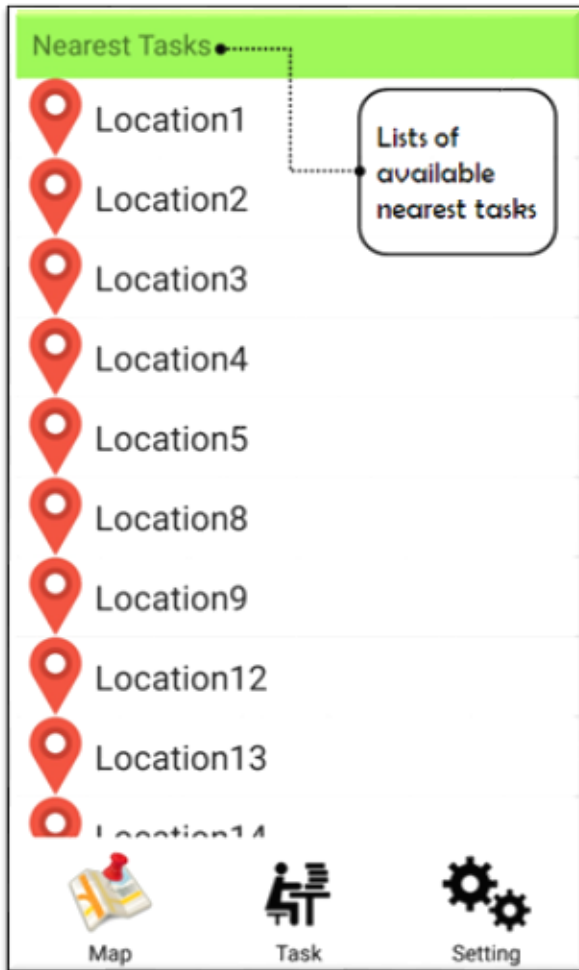


# System Architecture

- The mobile application is implemented based on this prototype system.
  - Mobile App
  - Broker
  - Dashboard

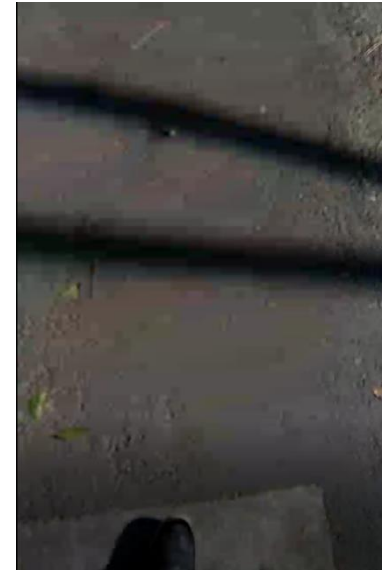


# Ordinary App



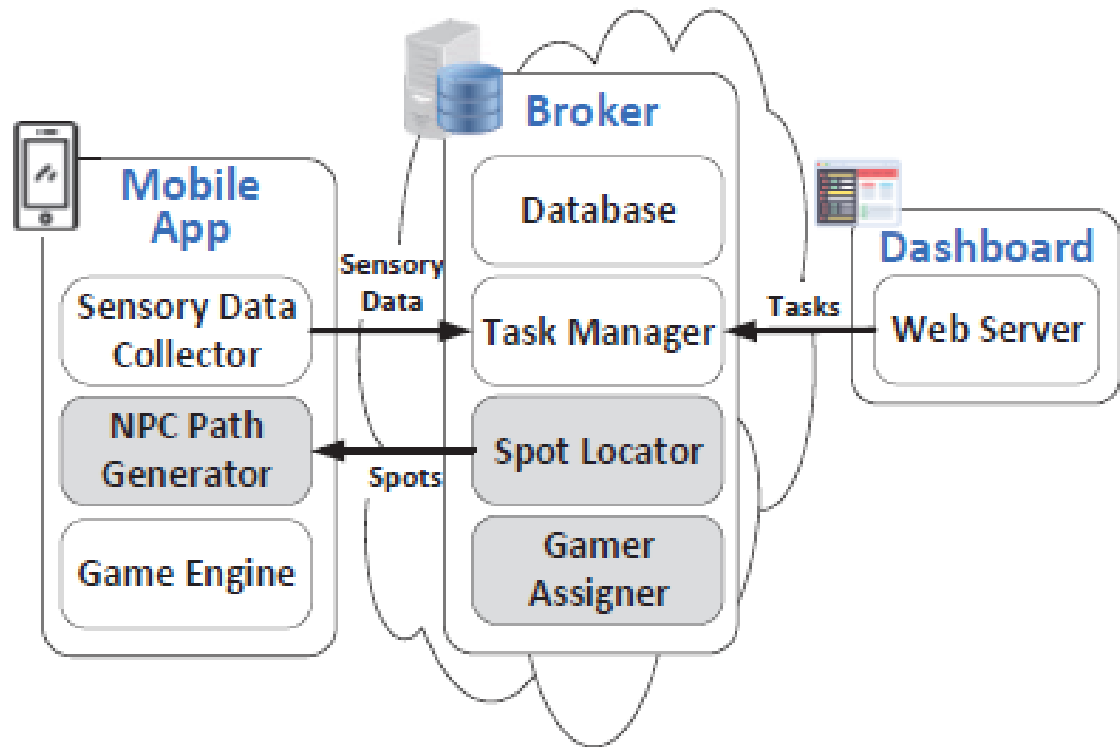
# Ordinary App

- The goal is to cover 360 degree of the location, we need more than one user.
- Some might record useless result, we need to guide the user.

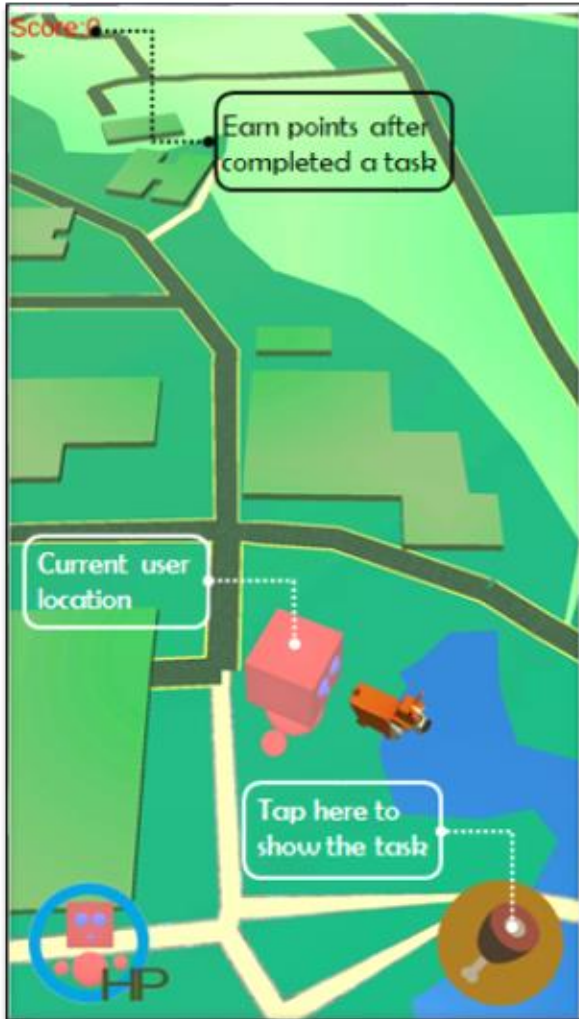


# Advanced System Architecture [1]

- Optimal Spot Locator
  - To locate the least number of spots to finish a task
- Nearest Gamer Assigner
  - To assign gamers to nearest tasks
- Nature NPC Path Generator
  - To create the paths to guide the gamers



# Gamified App





# Outline

- Introduction
- Problem Statement
- Mobile applications
- **User Study**
- Conclusion



# User Study

- Location: NTHU Campus
- Tasks: 20 locations
- Participants: 14 people
- 7 male and 7 female in their twenties
- 43% are international students and 57% are local Taiwanese students in NTHU



# User Study

- Participants are given a smartphone with our 2 apps pre-installed
- They have to complete all the tasks (20 locations) within one day for each app
- After each run, they will fill in a questionnaire measures by using 5-point Likert scale



# Questionnaire

- 7 questions measuring enjoyment from Intrinsic Motivation Inventory (IMI)
- 5 questions about usage behavior and UI
- 1 open question for other comment or feedback



# Intrinsic Motivation Inventory (IMI)

- A multidimensional measurement tool that aims to assess user's subjective experience
- Has total of 7 subscales (45 items)
- Interest/enjoyment subscale is mainly for measuring intrinsic motivation

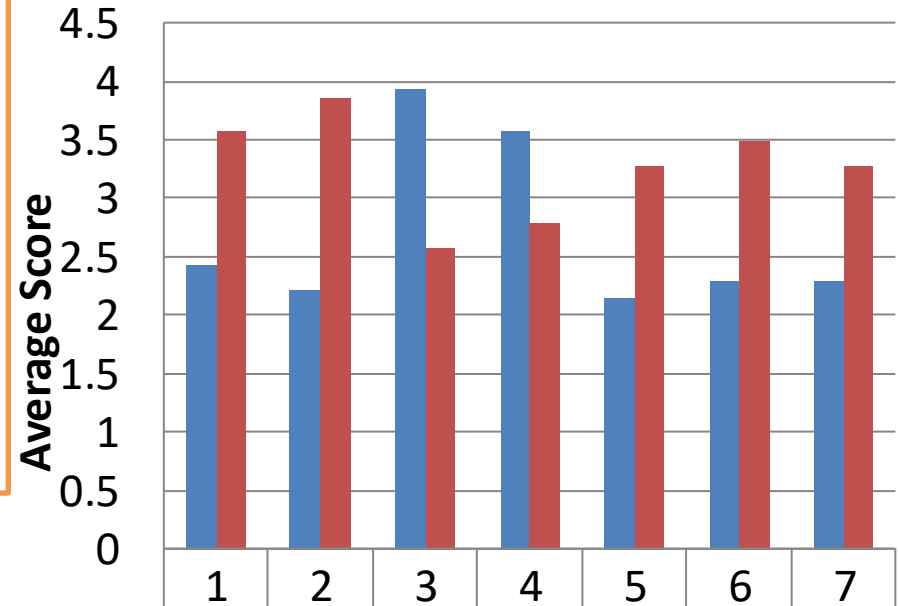


# Intrinsic Motivation Inventory (IMI)

## 7 Items from enjoyment subscale

1. I enjoyed doing this activity very much
2. This activity was fun to do.
3. I thought this was a boring activity. (R)
4. This activity did not hold my attention at all. (R)
5. I would describe this activity as very interesting.
6. I thought this activity was quite enjoyable.
7. While I was doing this activity, I was thinking about how much I enjoyed it.

## Result



	1	2	3	4	5	6	7
Ordinary	2.43	2.21	3.93	3.57	2.14	2.29	2.29
Gamified	3.57	3.86	2.57	2.79	3.29	3.5	3.29

## Discovering new route

64%

Gamified app

user say they discovered new route when using the app

14%

Ordinary app

of Gamified app user say they *did* went out from their daily route

57%

## Deviate from daily route

of Ordinary app user say they *did not* went out from their daily route



## Perceived monetary incentive

79% of Ordinary app & 70% of Gamified app user thinks that they will be more motivated if presented with monetary incentive

## User Friendliness

**43%**

of user says  
Ordinary app  
is difficult to use

**29%**

of user says  
Gamified app  
is difficult to use

---

## Preference

**71%**



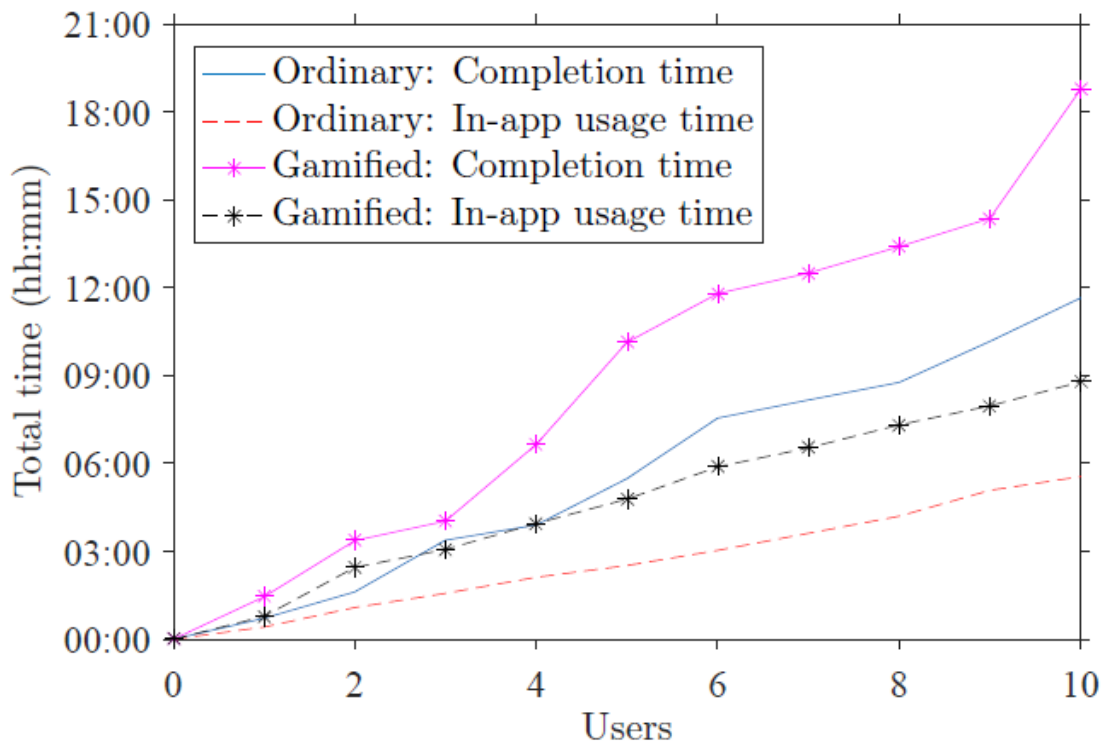


# Quantitative Result

- Total Completion time
  - Total time spend to complete all the tasks
- In-app usage time
  - Time user/gamer spends on the app
- Video duration time
  - The duration time of the video recorded by the gamer
- Walking distance
  - The distance that the user/gamer walked during the experiment.



# Comparing Completion time and In-app usage time between Ordinary and Gamified app



Completion time

2x

In-app usage time

Gamified app

1.6x

Ordinary app

## Video recording time

---

Gamified app

2.5x

Ordinary app

MAX

35s

MIN

1s

---

Total

34.22 km

MAX

6.66 km

MIN

2.21 km

## Walking distance



---

# Outline

- Introduction
- Problem Statement
- Mobile applications
- User Study
- Conclusion



# Limitation and Recommendation

- Weather is biggest obstacle!
- Internet connection needs to be strong and stable.
  - GPS accuracy
- Participants might not represent all the population.



# Conclusion

- We conducted the user study to prove that user enjoy using gamification version of the application.
- Overall, user study results are positive towards gamification.



Thank you!

