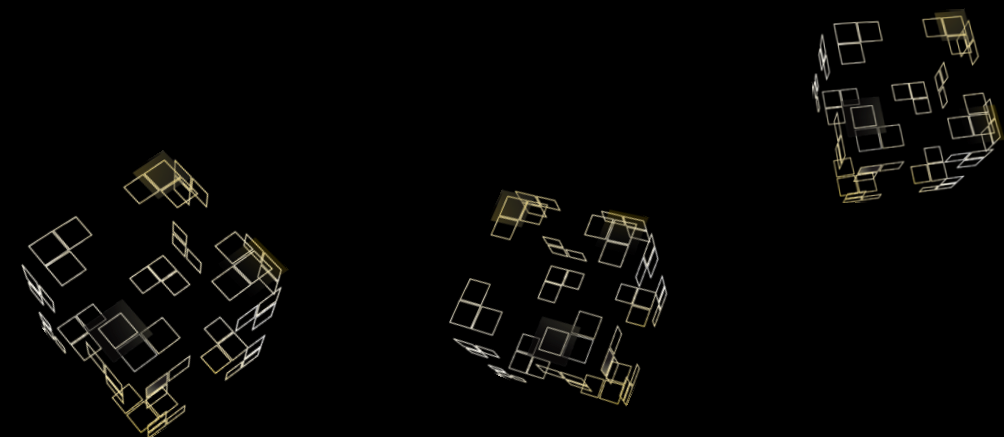


# User Requirements Analysis for a Mobile Augmented Reality Application

## Supporting Geography Fieldwork

Xiaoling Wang, Corné P.J.M. van Elzakker, Menno-Jan Kraak

*1st ICA European Symposium on Cartography, 11 November, 2015 | Vienna, Austria*



# Overview

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- Background
- Problems and research objectives
- Research questions
- Methodology
- Results
- Conclusions - User requirement analysis
- Future work



# Background - Geography fieldwork



Preparation stage

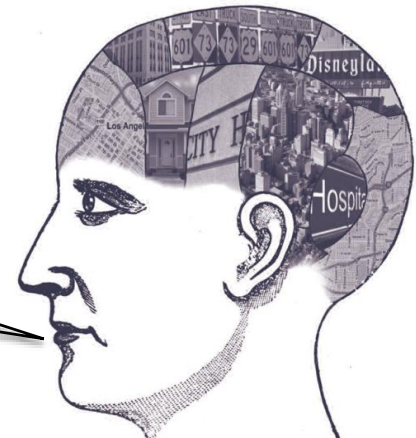
Fieldwork stage

Follow-up stage



My **geographic understanding**

.....  
.....  
.....



The geography fieldwork in this research:

Human geography-oriented

Learning-oriented

Urban

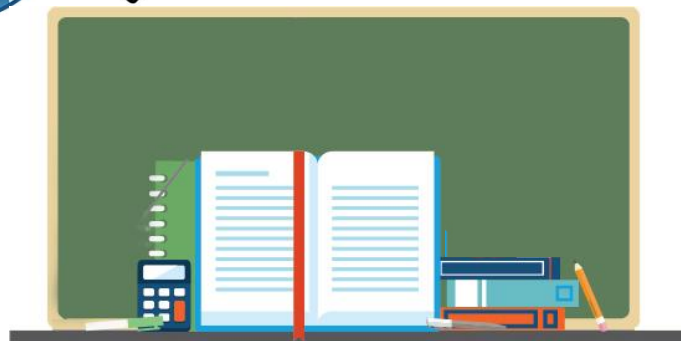
Undergraduate



# Background - Geography fieldwork and the use of tools

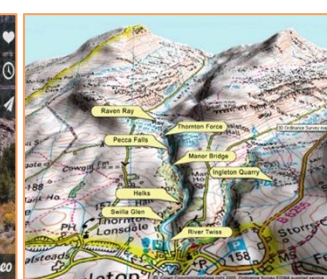
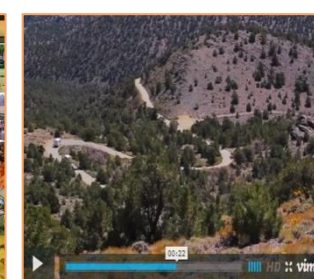
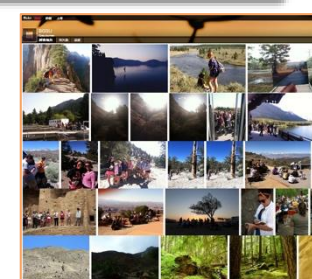
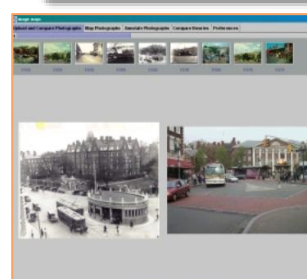
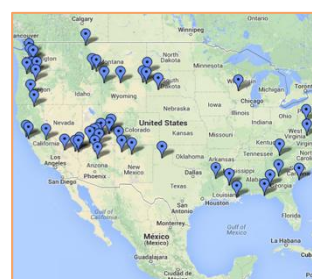
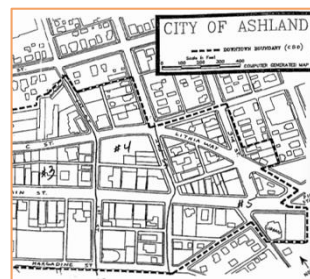


How to achieve optimal geographic understanding in geography fieldwork?



ICTs: Information and Communication Technologies

(cartographic) visualization tools



What is augmented reality (AR)?



# Background – (Mobile) augmented reality(AR)

Augmented reality = Augmentation + Reality

Device generated  
contextual data

Physical real-world  
environment








Reality

- Commerce, entertainment, tourism, military, education.....

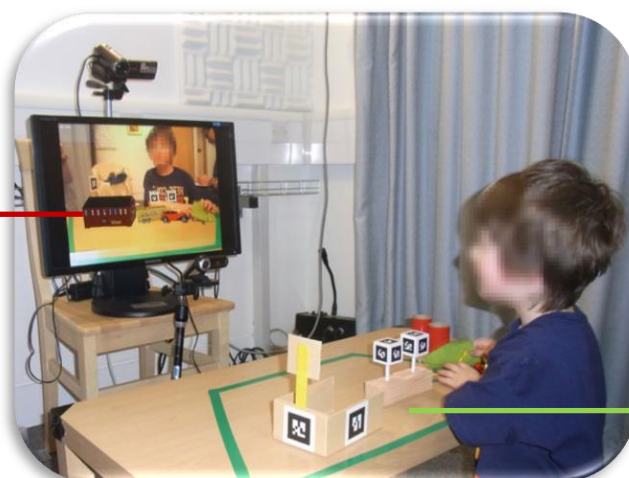
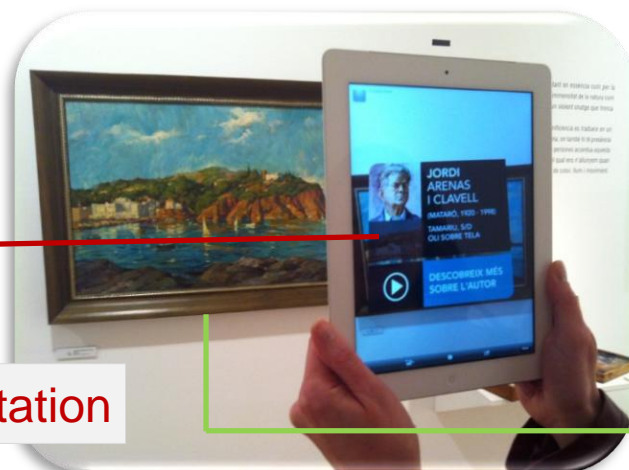
camera  
GPS  
wireless connectivity  
accelerometer  
compass



Example of mobile based AR applications

	Layar
 <b>wikitude</b> <small>See more.</small>	Wikitude
	Junaio
	Aurasma
 <b>Google Goggles</b>	Google Goggles

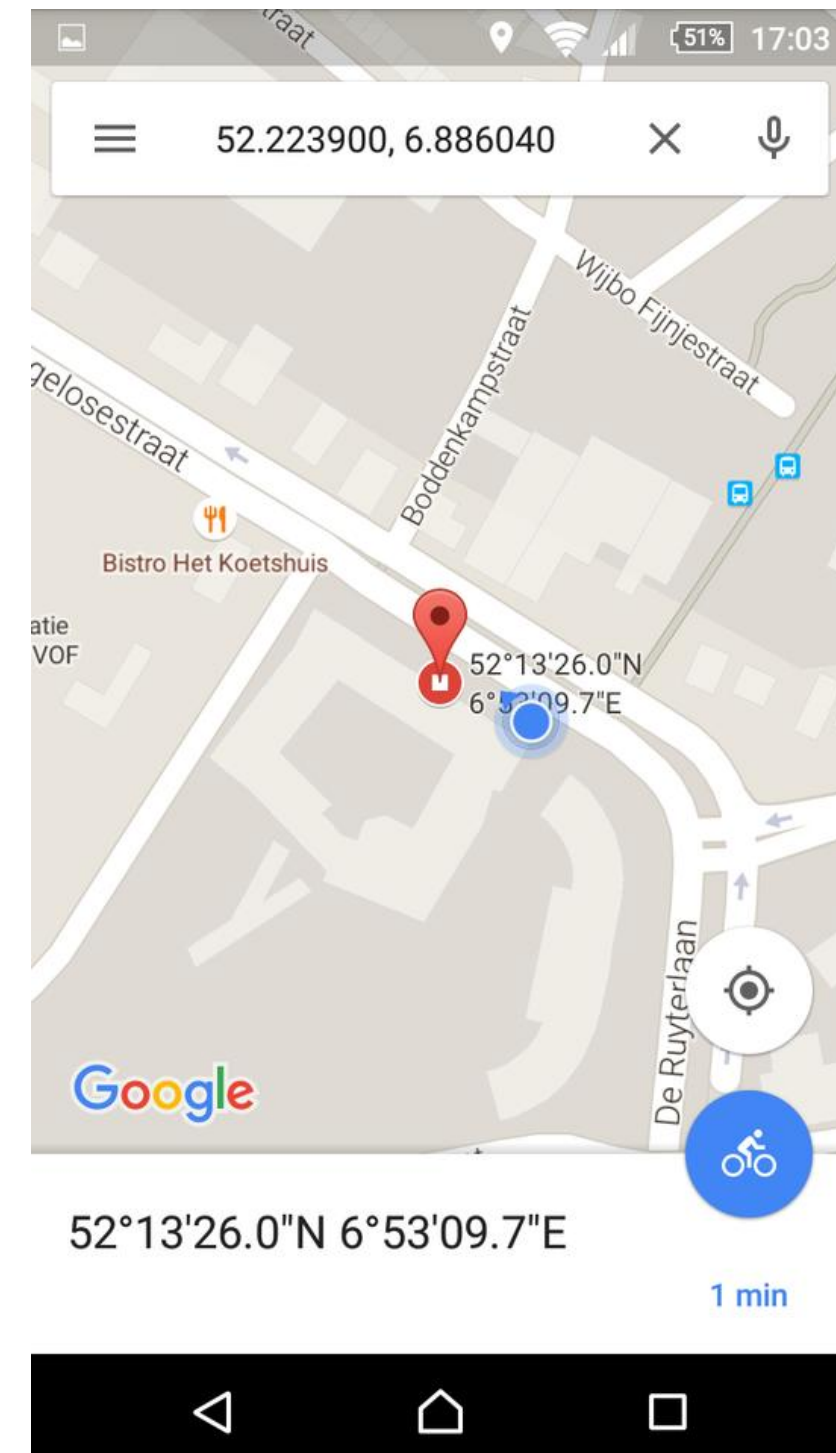
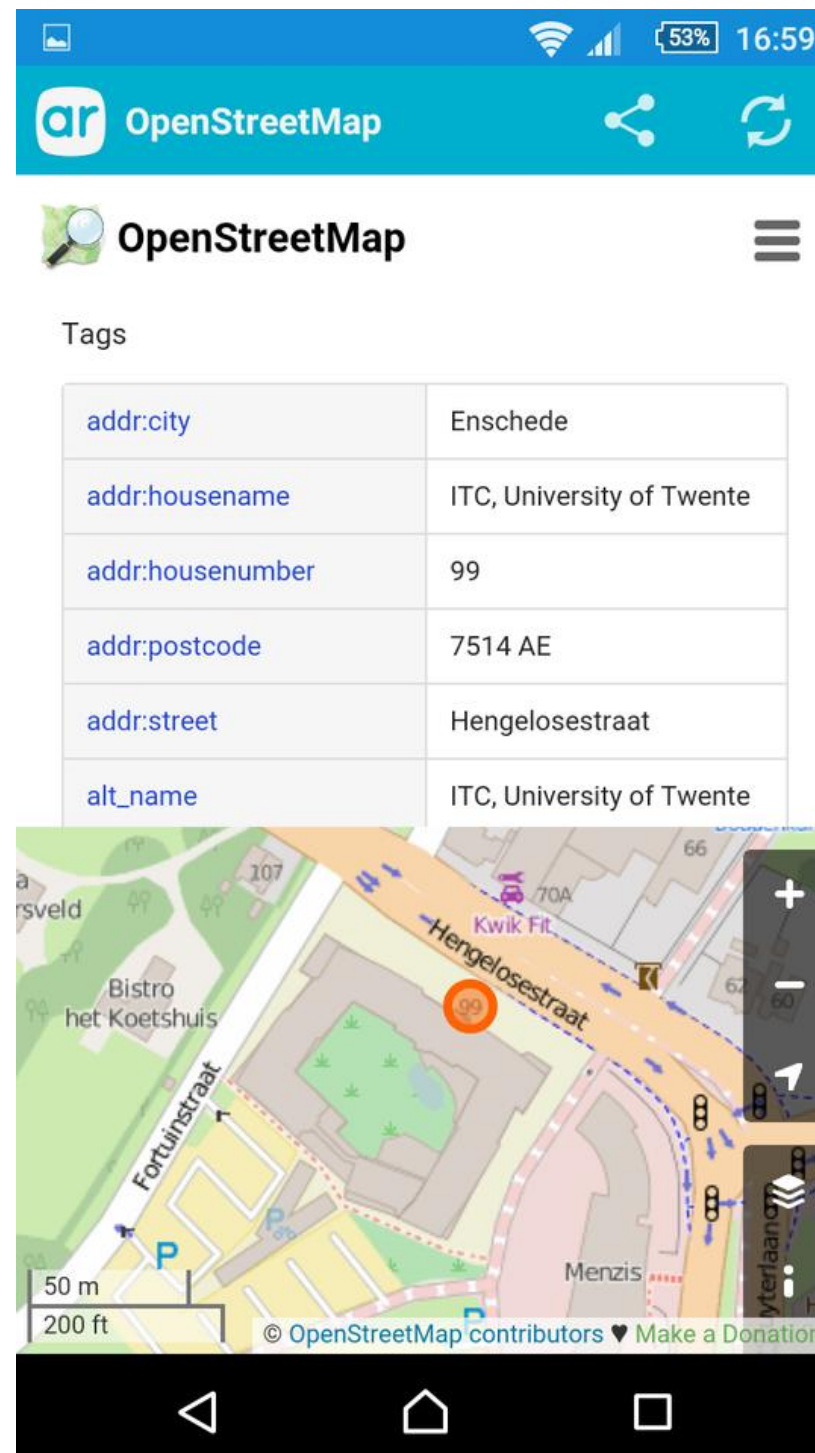
- A vast potential to be used in **situational education**, like **geography fieldwork**



Augmentation



# Background – How does augmented reality(AR) work?



# Problems and research objectives

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- Till now, **not yet** in **geography fieldwork**  
(but used in two recent fieldwork cases: ecosystem fieldwork and cultural science fieldwork, useful).
- Many **options** and **user interfaces**, different **functionalities**.
- Always an issue – adoption of latest and usable technological potential in regular education.

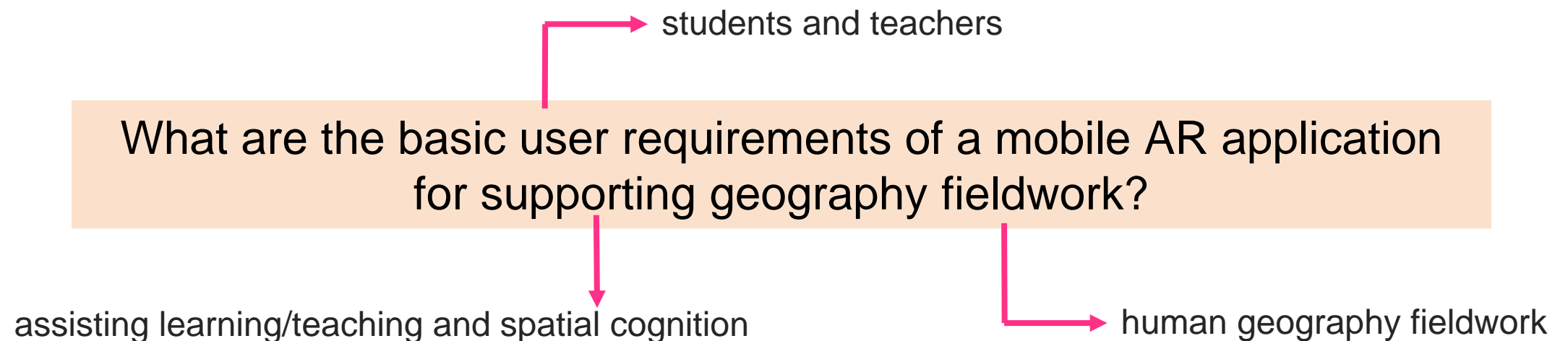
To develop and integrate a usable mobile AR application for supporting geography fieldwork

**User-Centered Design (UCD)** - the first stage is **identifying user requirements**

To identify the basic user requirements of a mobile AR application

# Research questions

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- Students' profile (age, gender, educational background)?
- How do students and teachers conduct the fieldwork currently?
- The current problems?
- Expectations?

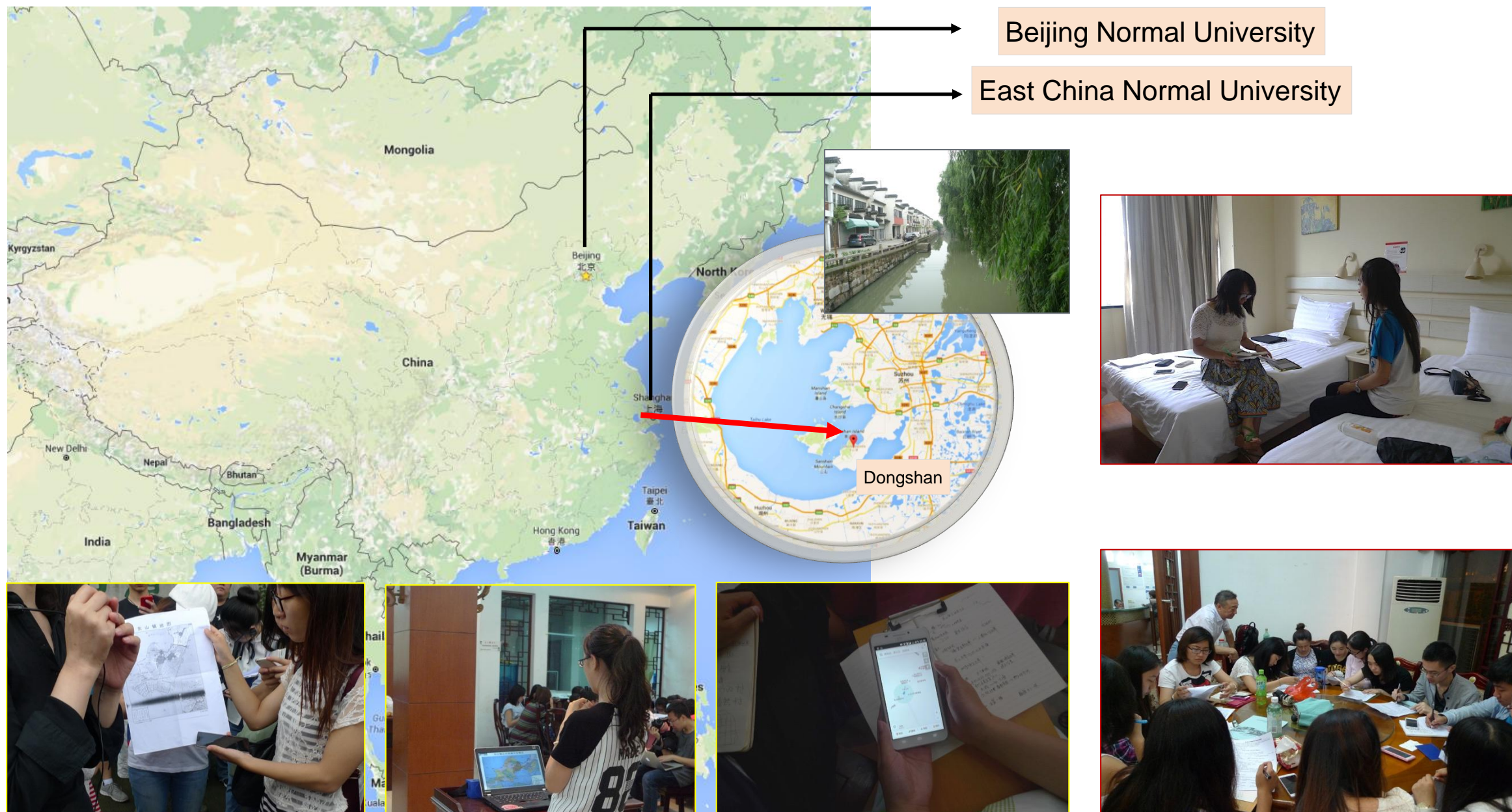


# Methodology

Questionnaire survey  
Interview  
Observation

- In a real undergraduate human geography fieldwork

- ✓ To learn about the space structure
- ✓ To investigate relations between natural environment and human activities



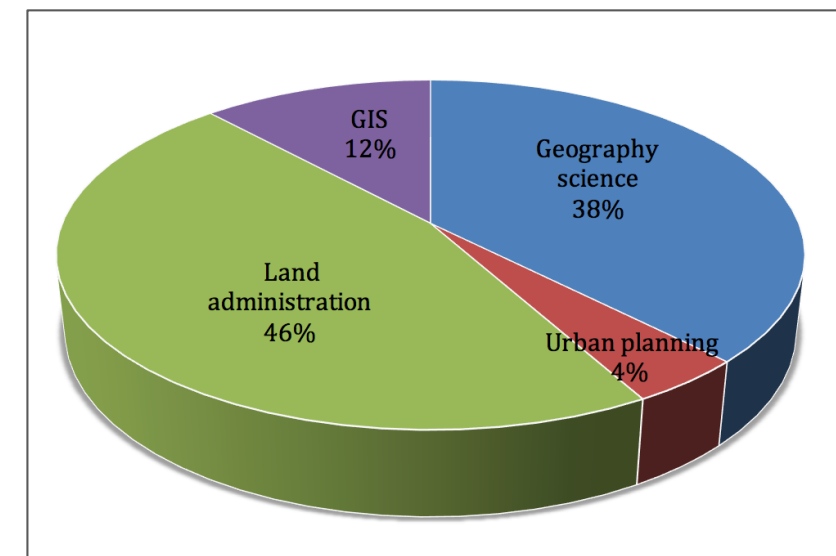
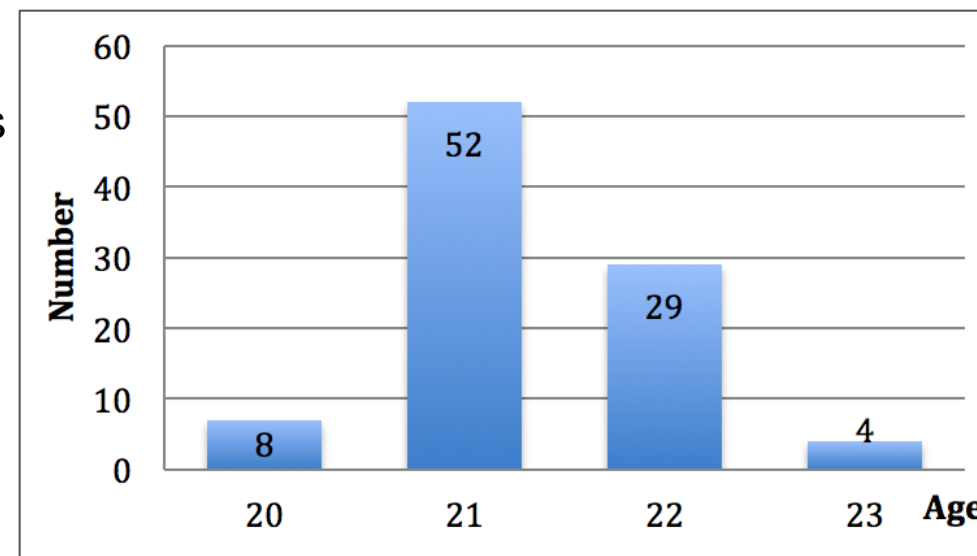
# Results

93 questionnaires/100 students

## Basic information

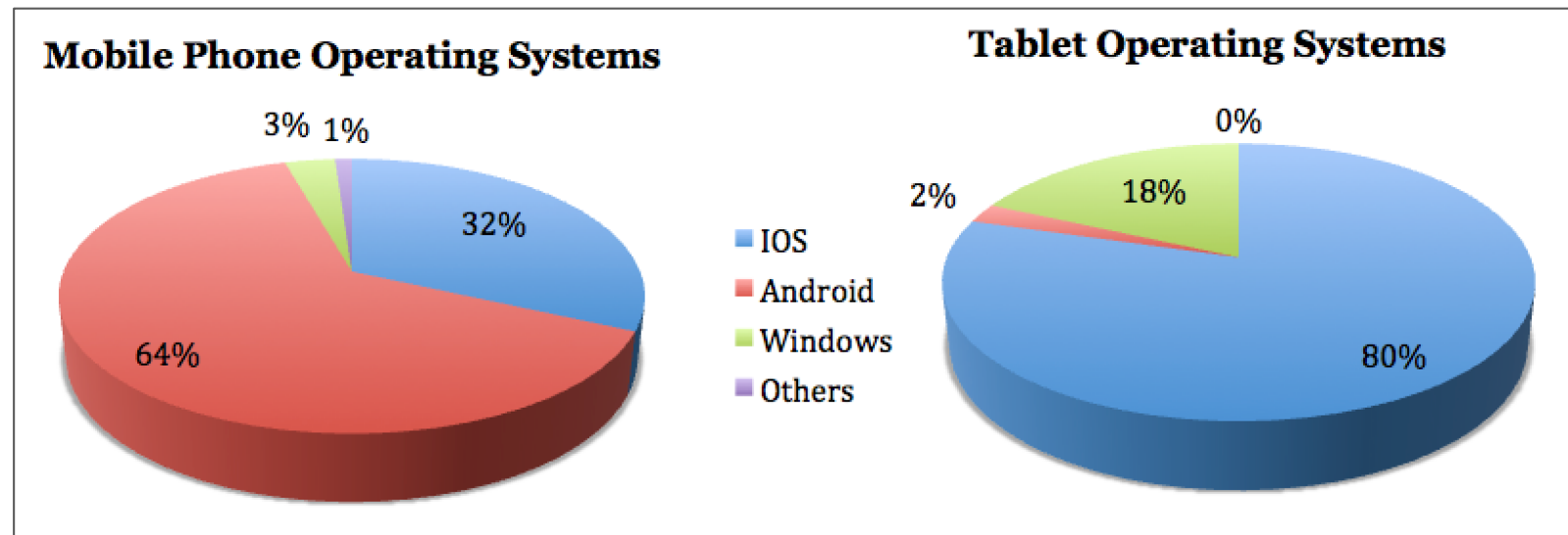
3<sup>rd</sup> year undergraduates

Gender	Number
Male	21
Female	72



## Mobile phone and tablet

	Mobile phone	Tablet
Yes	93	44
No	0	49



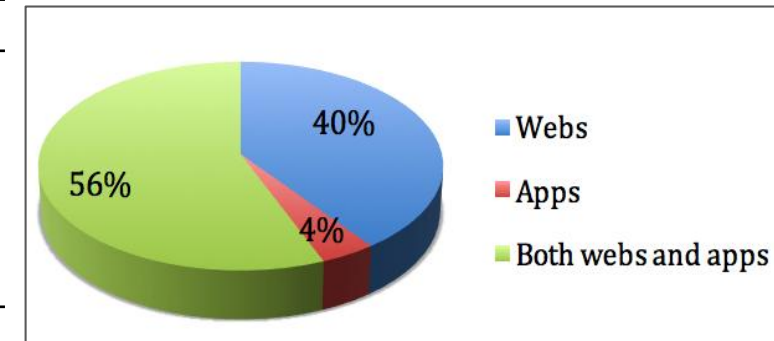


# Results

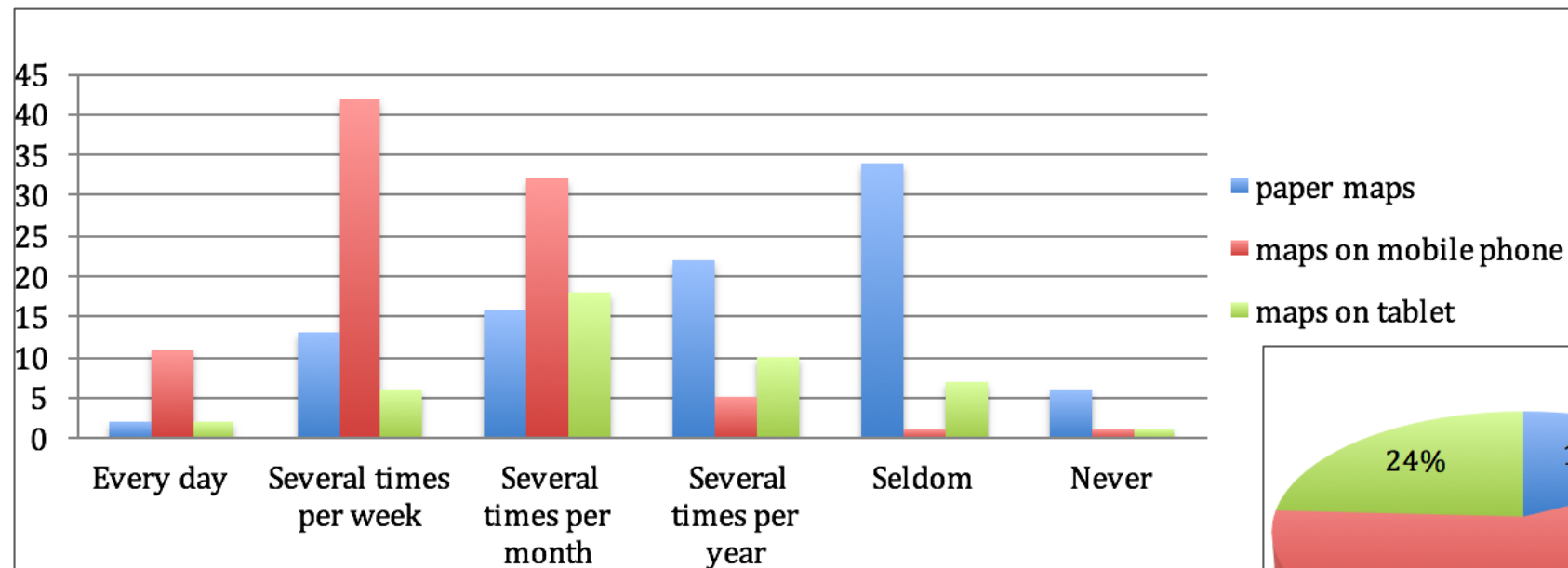
## The use of mobile phone and tablet

Activities	Numbers/93
Entertainment (e.g., use camera, listen to music, watch video, play games, etc.)	91
Communication (e.g., message, email, chat, etc.)	88
Learning assistance (e.g., translator, read books, etc.)	80
Others (e.g., check news, online shopping, etc.)	78

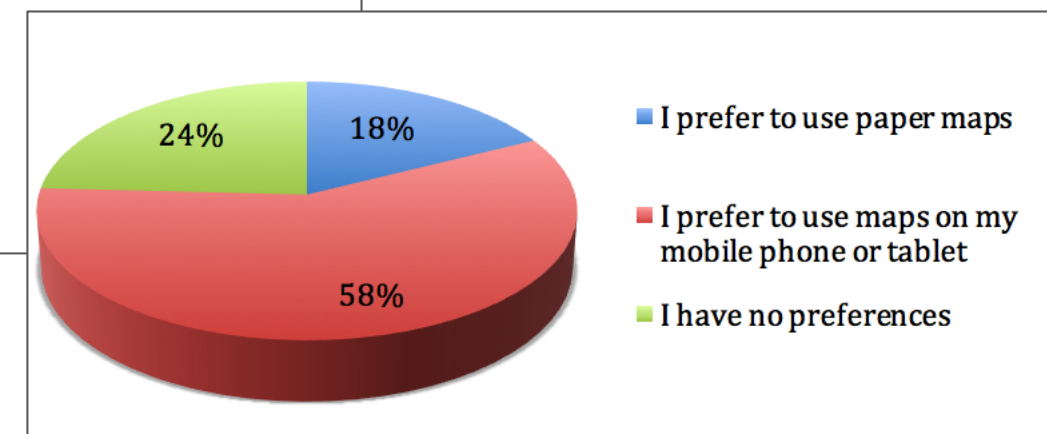
Geo-related activities on mobile phone and tablet



## Cartographic background



- 1<sup>st</sup> year: Cartography course
- 2<sup>nd</sup> year: GIS courses





# Results

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Have you heard of augmented reality?

Yes (5/93)

Examples:

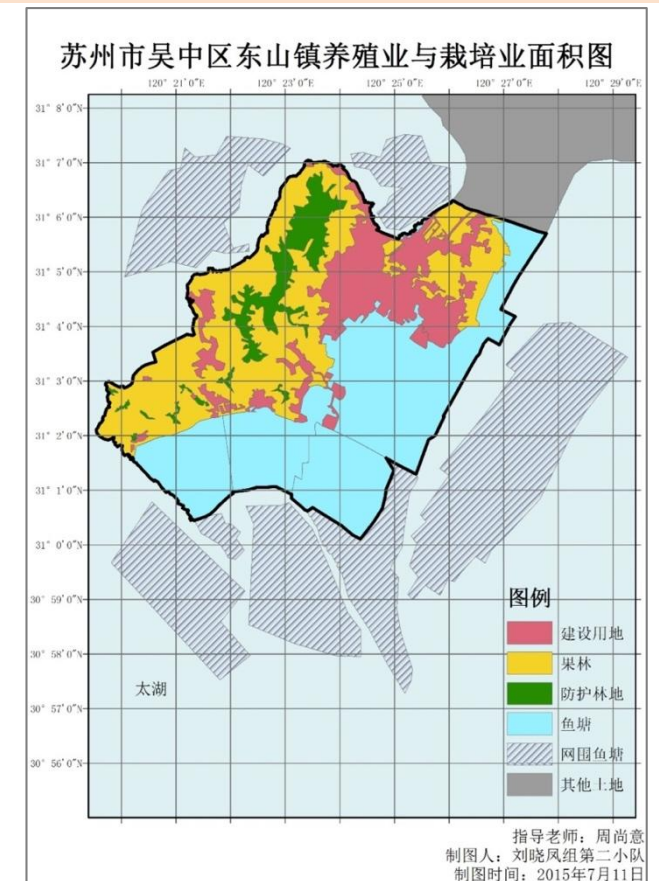
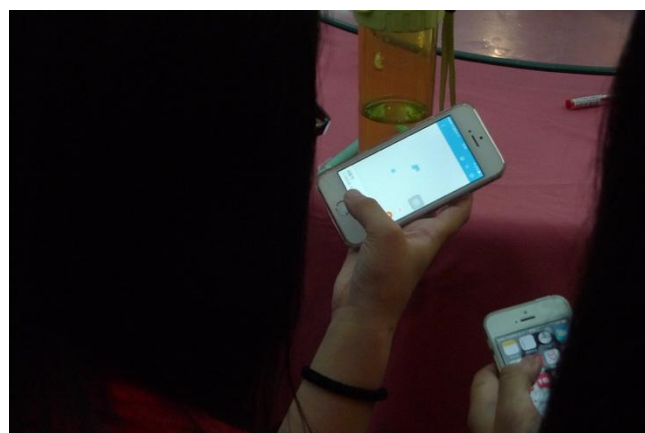
“Realizing 3D and modeling the environment through digital technology”;

“Enhancing multiple senses, like vision, hearing, touch, etc.”;

“Adding real-time object information in the reality”;

# Results

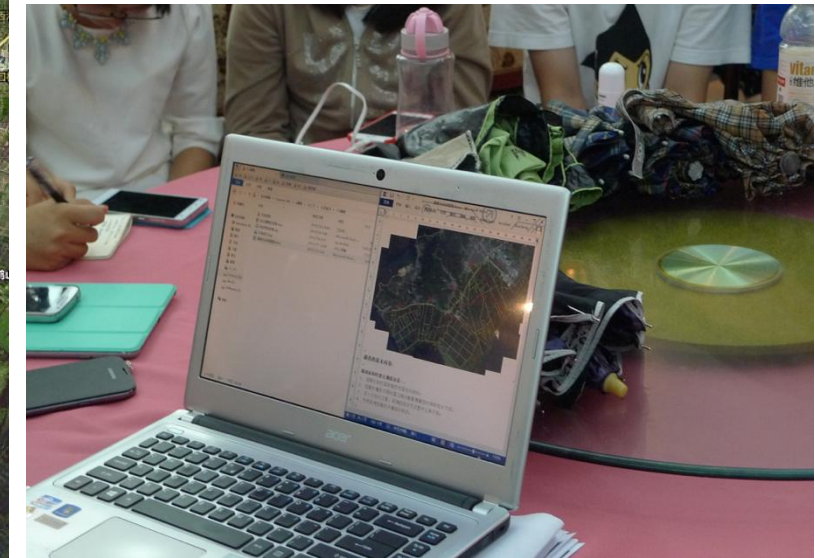
## The use of cartographic visualization tools (maps)





# Results

The use of cartographic visualization tools (satellite images and photos of reality)



实习点3: 尚锦村东口  
观察内容: 江南民居特点, 注意与北方庭院、窗户朝向等的对比

尚锦村聚落沿路布局, 即沿山麓等高线分布, 位于山坞出口。原因是山谷末端形成洪积扇, 地面开阔, 地下水丰富。该村建筑密度大, 房屋占地面积小, 因为平地面积小, 水多。

思考问题: 如何区分自然村? 可从地形角度何人文景观角度考虑。

这里的房屋多背山面水, 民居随地势、水势而建, 建筑风格是粉墙灰瓦马头墙、肥梁胖柱小牛津, 一般二三层左右, 以灰、白、黑三色为其主色调。其一大特色即是马头墙, 马头墙在古代用来防窥、防火, 故又称封火墙, 现代主要起装饰作用。此外, 江南民居为了通风采光, 墙壁充分地开窗, 因此在野外可以通过窗户朝向判断方向。

山路弯弯 江南民居 古尚锦村 马头墙 品碧翠春的茶社





# Results

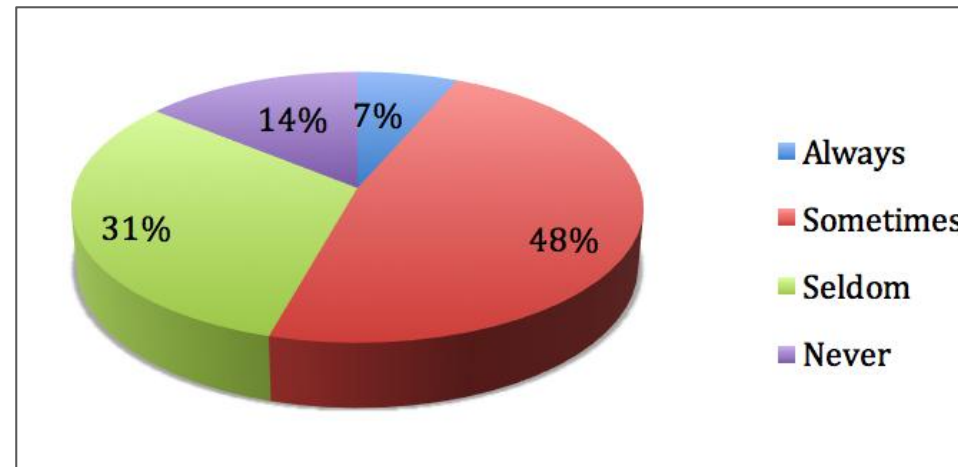
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The use of cartographic visualization tools

**Maps** are the most useful and important to assist them to complete the **fieldwork tasks** and to increase their **geographic understanding** of the fieldwork area, especially in the **fieldwork stage**.

# Results

## Problems in using cartographic visualization tools



### 1. About maps

- The inaccuracy of positioning
- The missing of a certain location
- Out of date
- The unavailability of offline maps
- Complicated operation and unfamiliar with the operation

### 2. Collected data (photos, voices, notes) lack of spatial information

- *“The data collected is so messy and it is very easy to mix the data together and forget where the data was collected.”*
- *“After the fieldwork, I forget where the photos belong to, because some of them look very similar.”*

### 3. Inconvenience to switch between different mobile applications

## Results

## Expectations and requirements of an alternative mobile tool





# Conclusions - User requirement analysis

## Possible or not?

- It is practical to make use of a mobile AR application in geography fieldwork.
- During the execution stage of the fieldwork.

## Current problems?

- What aspects should be **paid attention to** and which problems should be tried to be **avoided** and (or) should be **solved** when designing a new mobile AR application:
  - ✓ *The time required and troubles in switching between different mobile applications*
  - ✓ *The data collected in the field lacking locational details*

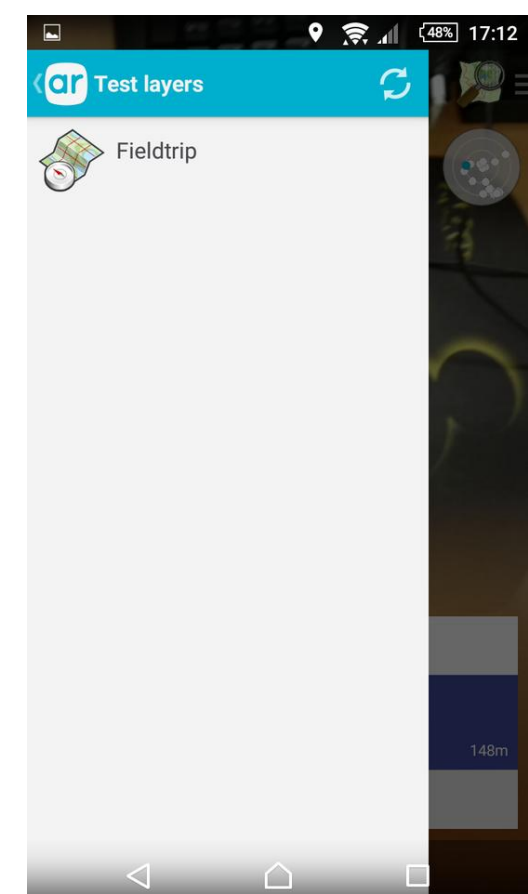
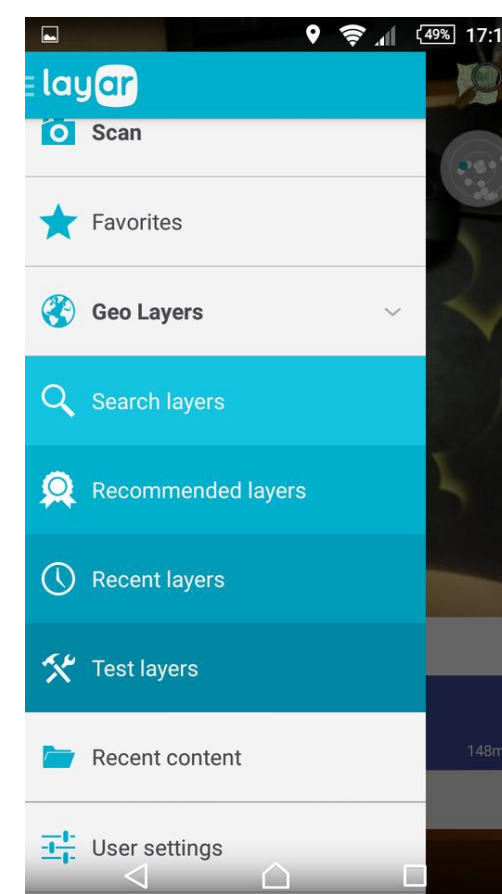
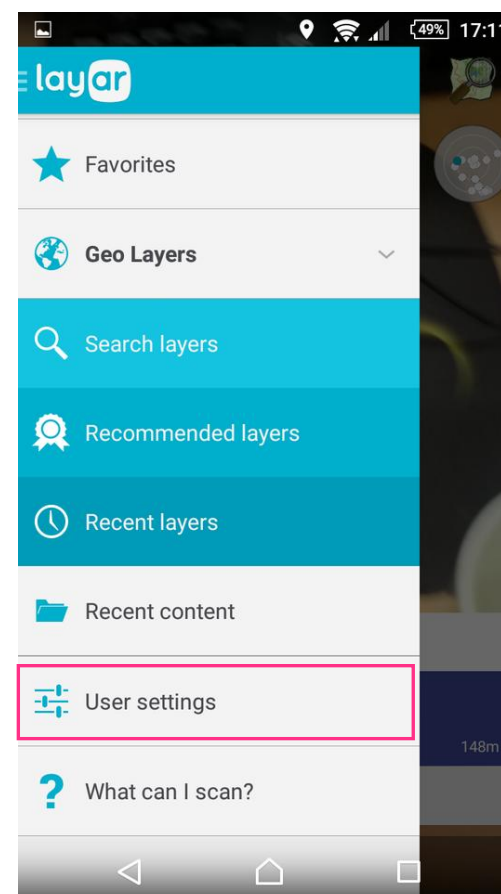
## Key requirements?

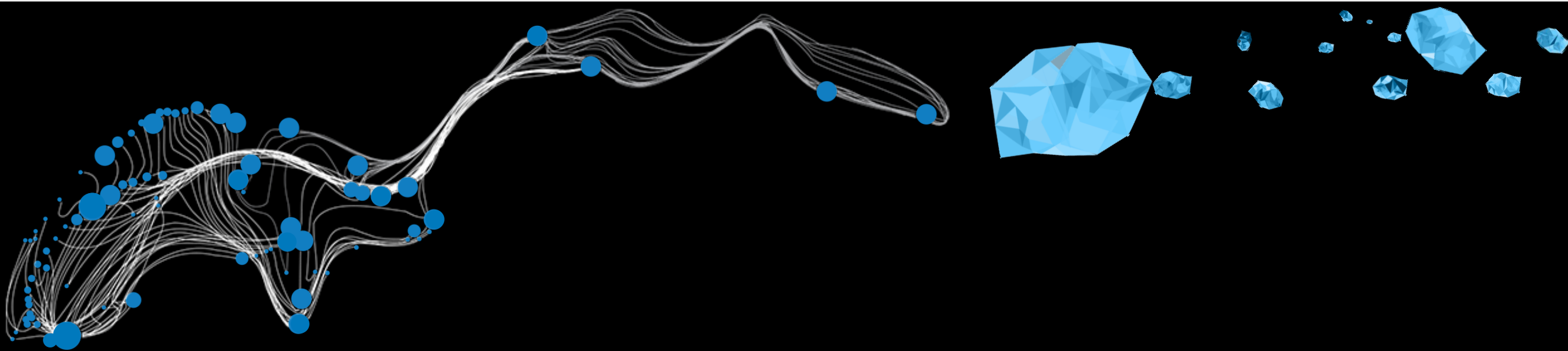
- Basic **functionalities** of a mobile AR application:
  - ✓ *Labeling geo-locations of field collected data*
  - ✓ *Making notes, recording voice and field walking routes*
  - ✓ *Optionally viewing various materials (maps, satellite images, etc.) of the fieldwork area*

# Future work

- The first stage of the User Centered Design (UCD): identifying user requirements
- **The second stage of the User Centered Design (UCD) approach**
- The third stage of the User Centered Design approach: to test the usability

To develop a mobile augmented reality tool by adding own components to an existing mobile augmented reality application





# Thank you for your attention!

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