Geollery: A Mixed Reality Social Media Platform

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UNIVERSITY OF MARYLAND

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THE AUGMENTARIUM
VIRTUAL AND AUGMENTED REALITY LAB
AT THE UNIVERSITY OF MARYLAND

COMPUTER SCIENCE
UNIVERSITY OF MARYLAND, COLLEGE PARK

Introduction

Social Media

image courtesy: plannedparenthood.org

Introduction

Social Media + Topics

image courtesy: huffingtonpost.com

Motivation

Social Media + XR

Motivation

Social Media + XR

image courtesy:
instagram.com,
facebook.com,
twitter.com

Motivation

2D layout

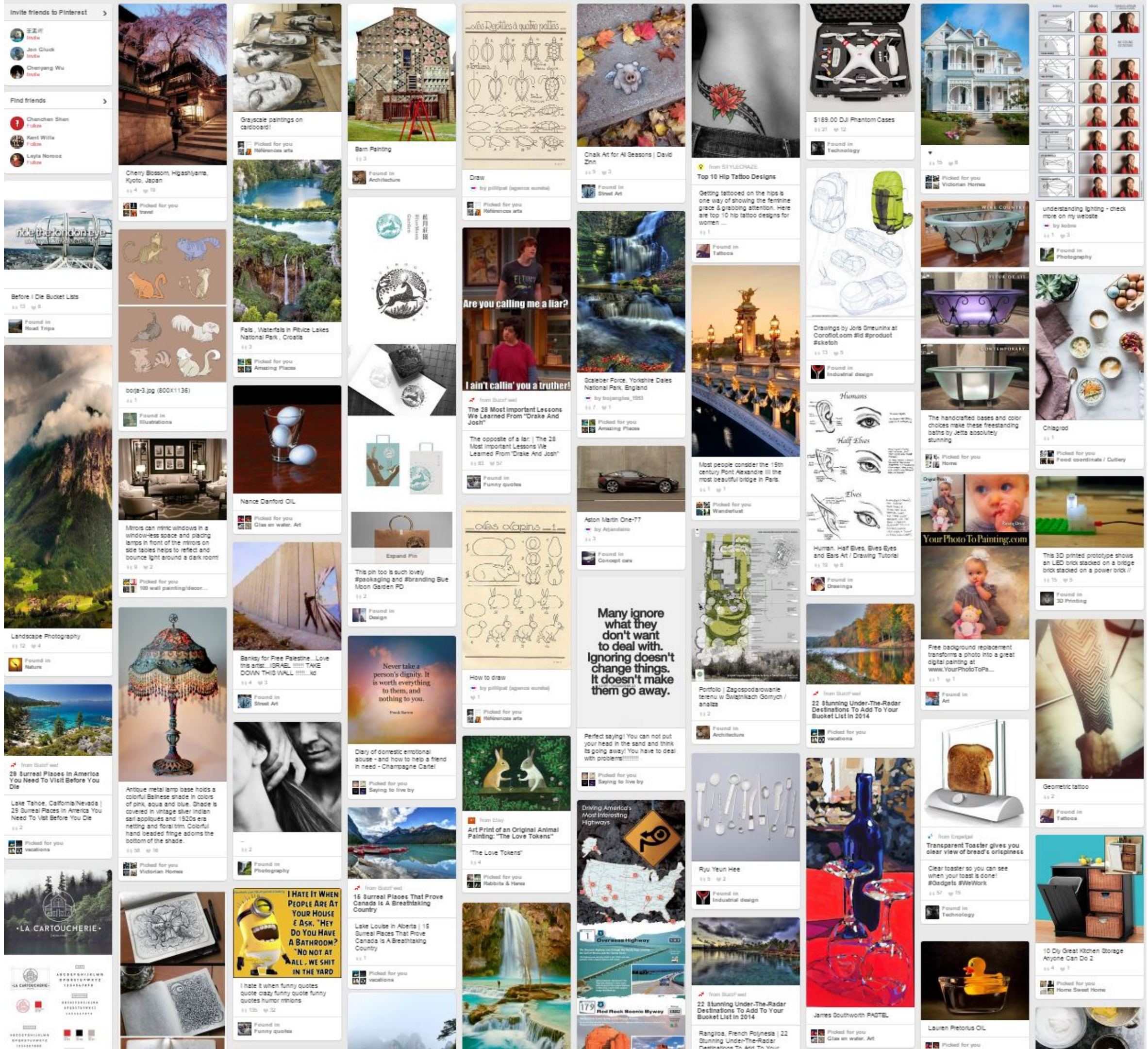


image courtesy: pinterest.com

Motivation

Immersive Mixed Reality?

image courtesy: viralized.com

Motivation

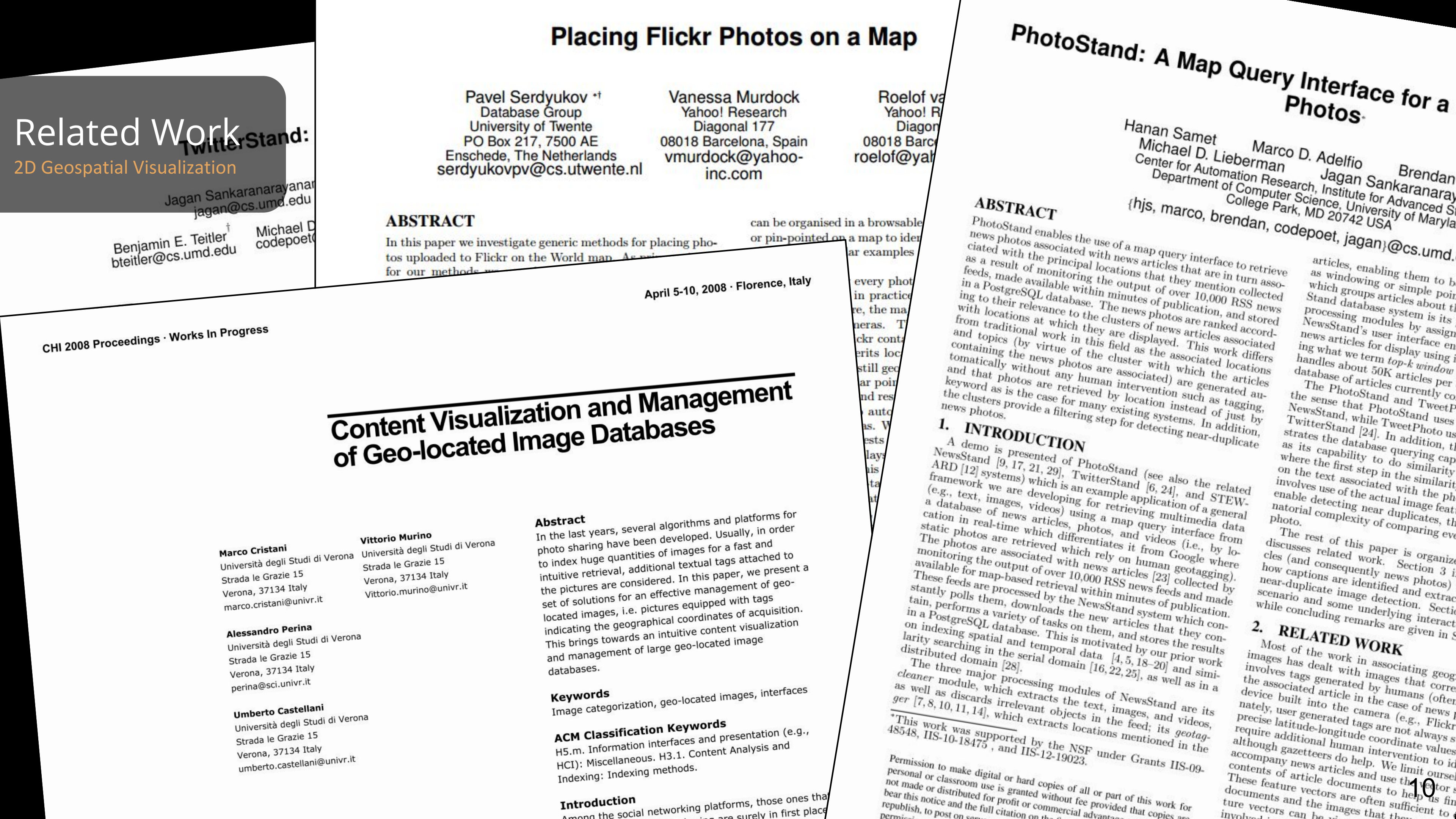
Pros and cons of the classic

Motivation

Pros and cons of the classic

Related Work

2D Geospatial Visualization

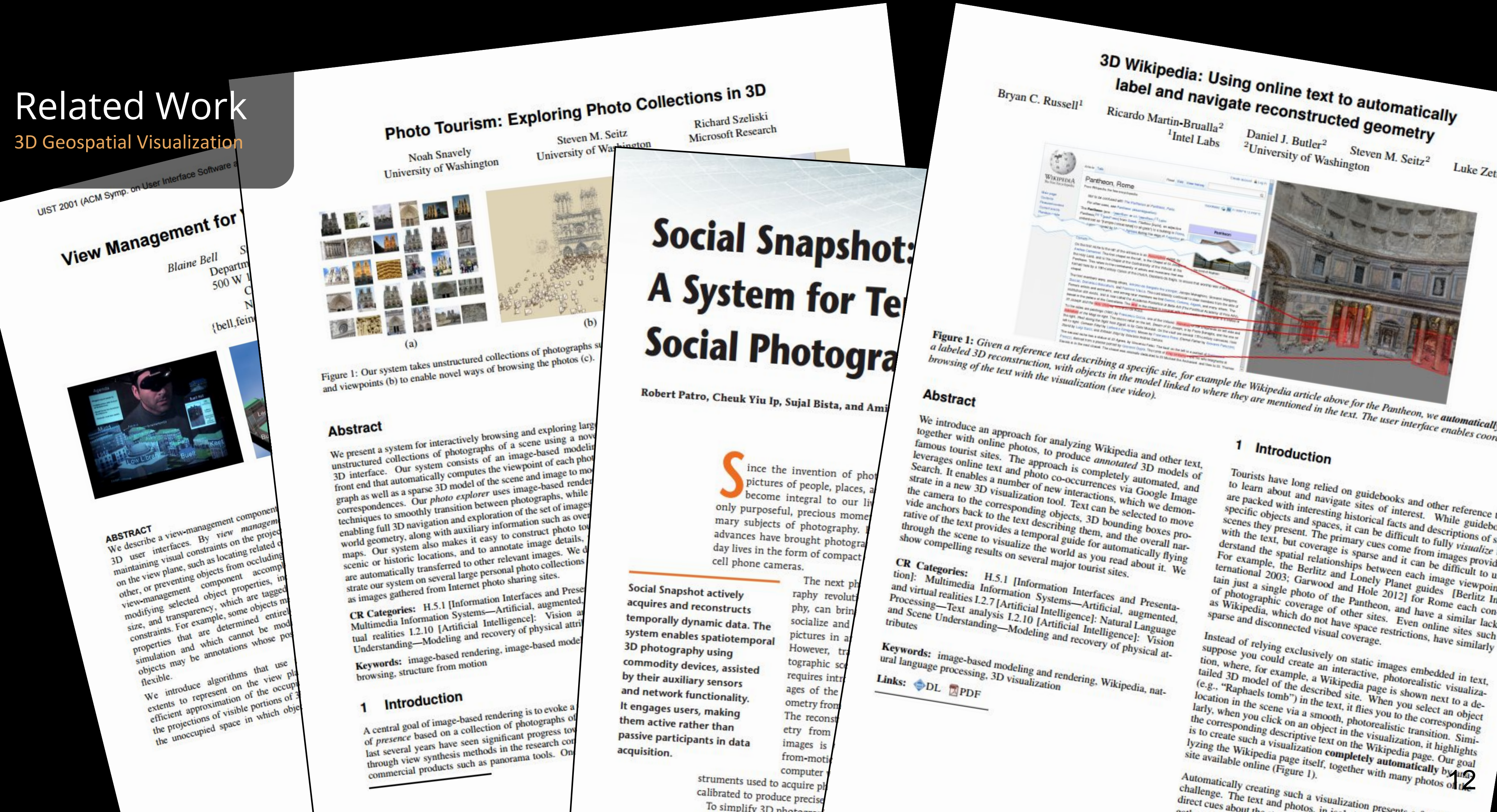


Related Work

2D Geospatial Visualization

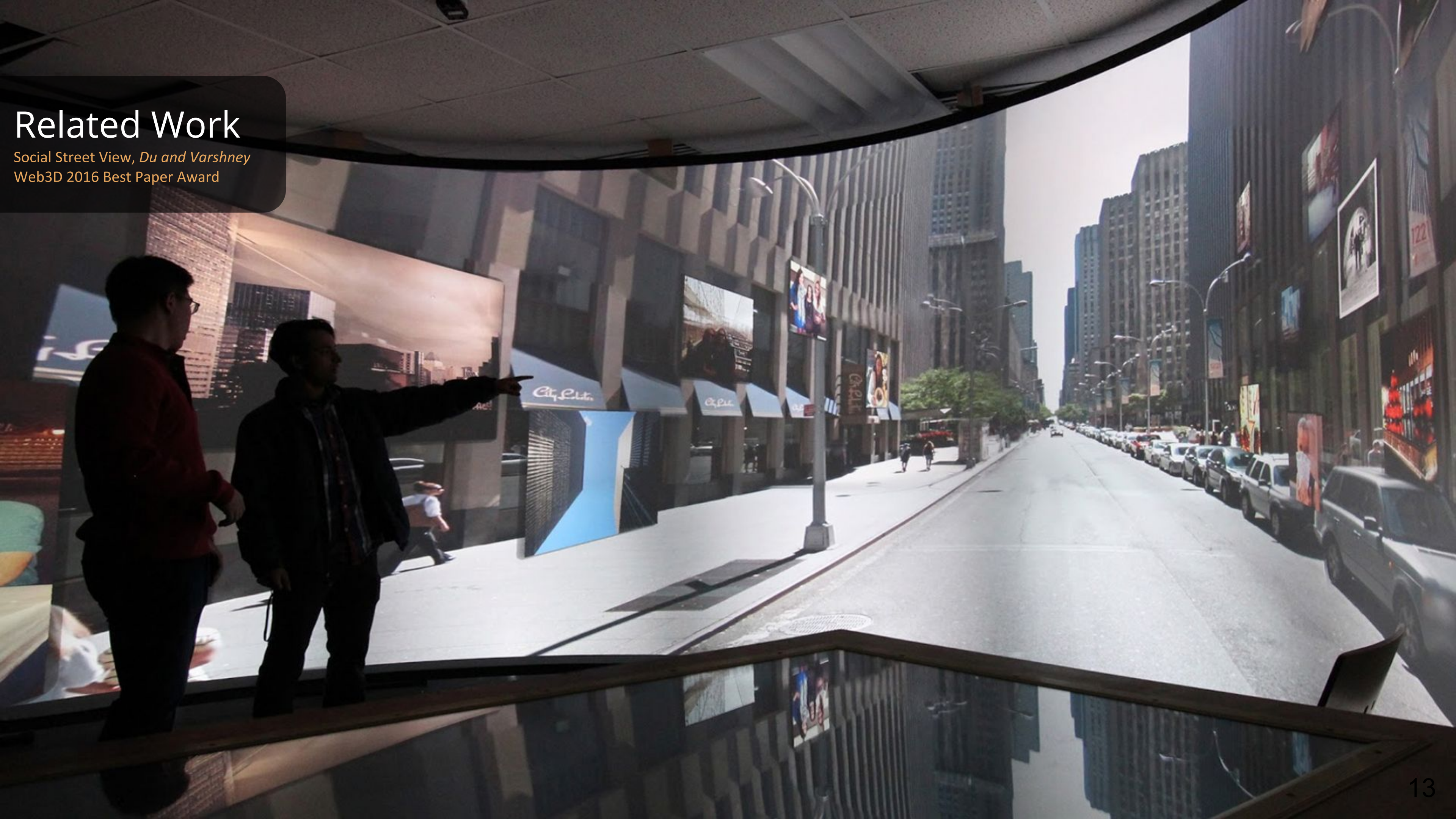
Related Work

3D Geospatial Visualization



Related Work

Social Street View, *Du and Varshney*
Web3D 2016 Best Paper Award



Related Work

Social Street View, *Du* and *Varshney*
Web3D 2016 Best Paper Award

Related Work

Social Street View, *Du* and *Varshney*
Web3D 2016 Best Paper Award

Related Work

3D Visual Popularity

Bulbul and *Dahyot, 2017*

Related Work

Virtual Oulu, *Kukka et al.*
CSCW 2017

Related Work

Immersive Trip Reports
Brejcha et al. UIST 2018

Related Work

High Fidelity, Inc.

Related Work

Facebook Spaces, 2017

What's Next?

Research Question 1/3

What may a social media platform look like in mixed reality?

What's Next?

Research Question 2/3

What if we could allow social media sharing in a live mirrored world?

What's Next?

Research Question 3/3

What use cases can we benefit from social media platform in XR?

Geollery.com

A Mixed-Reality Social Media Platform


Real-time Texturing
Our system allows users to see, chat, and collaborate with remote participants with the same spatial context in an immersive virtual environment.

Conception, architecting & implementation

1

Geollery

A mixed reality system that can depict geotagged social media and online avatars with 3D textured buildings.

Extending the design space of

2

3D Social Media Platform

Progressive streaming, aggregation approaches, virtual representation of social media, co-presence with virtual avatars, and collaboration modes.

Conducting a user study of

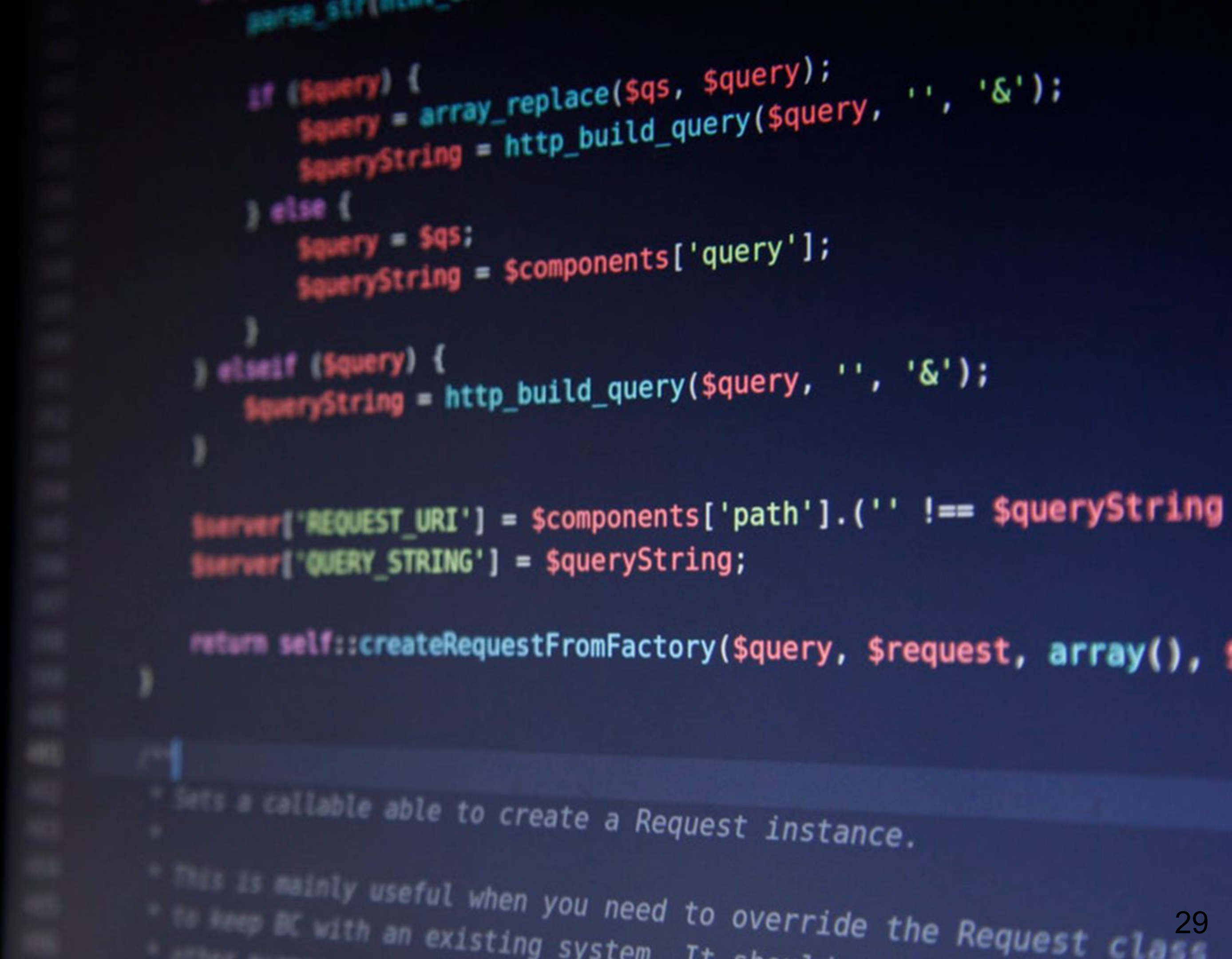
3

Geollery vs. Social Street View

by discussing their benefits, limitations, and potential impacts to future 3D social media platforms.

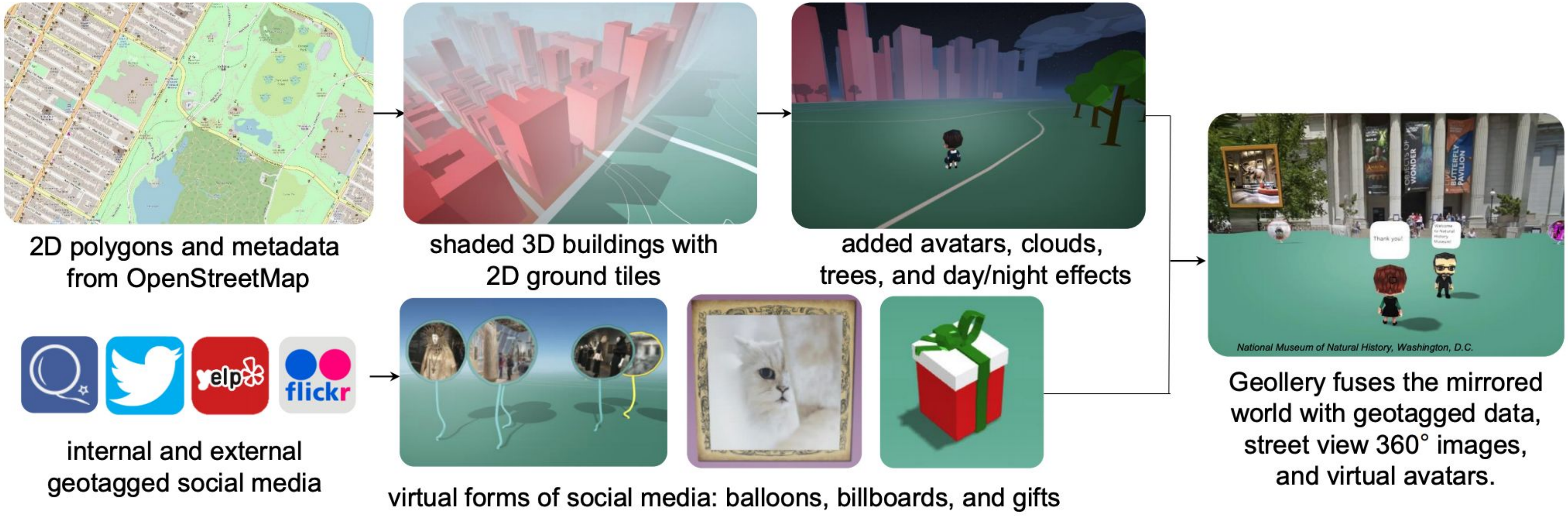
System Overview

Geollery Workflow



System Overview

Geollery Workflow

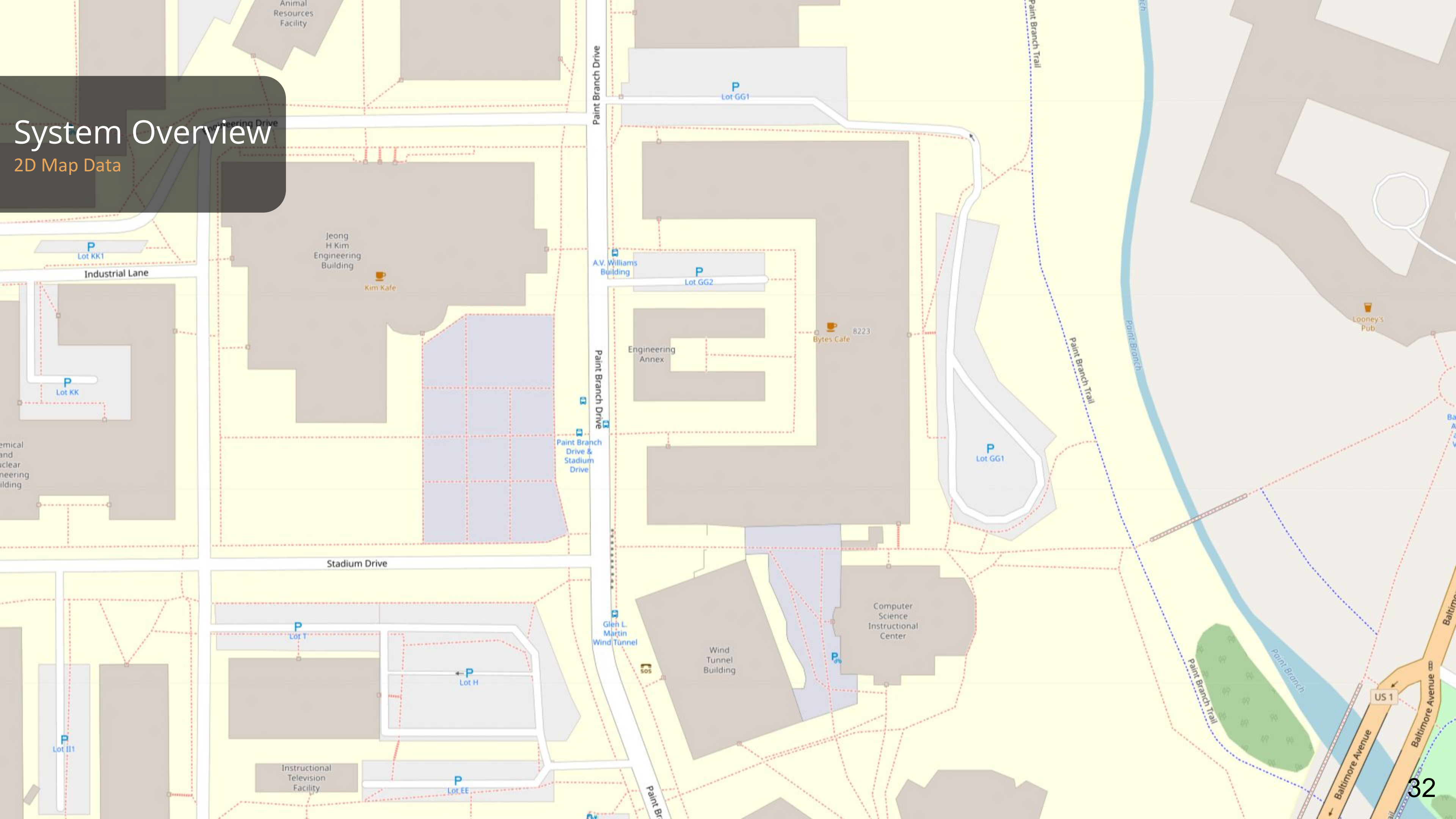


System Overview

Given (latitude, longitude)

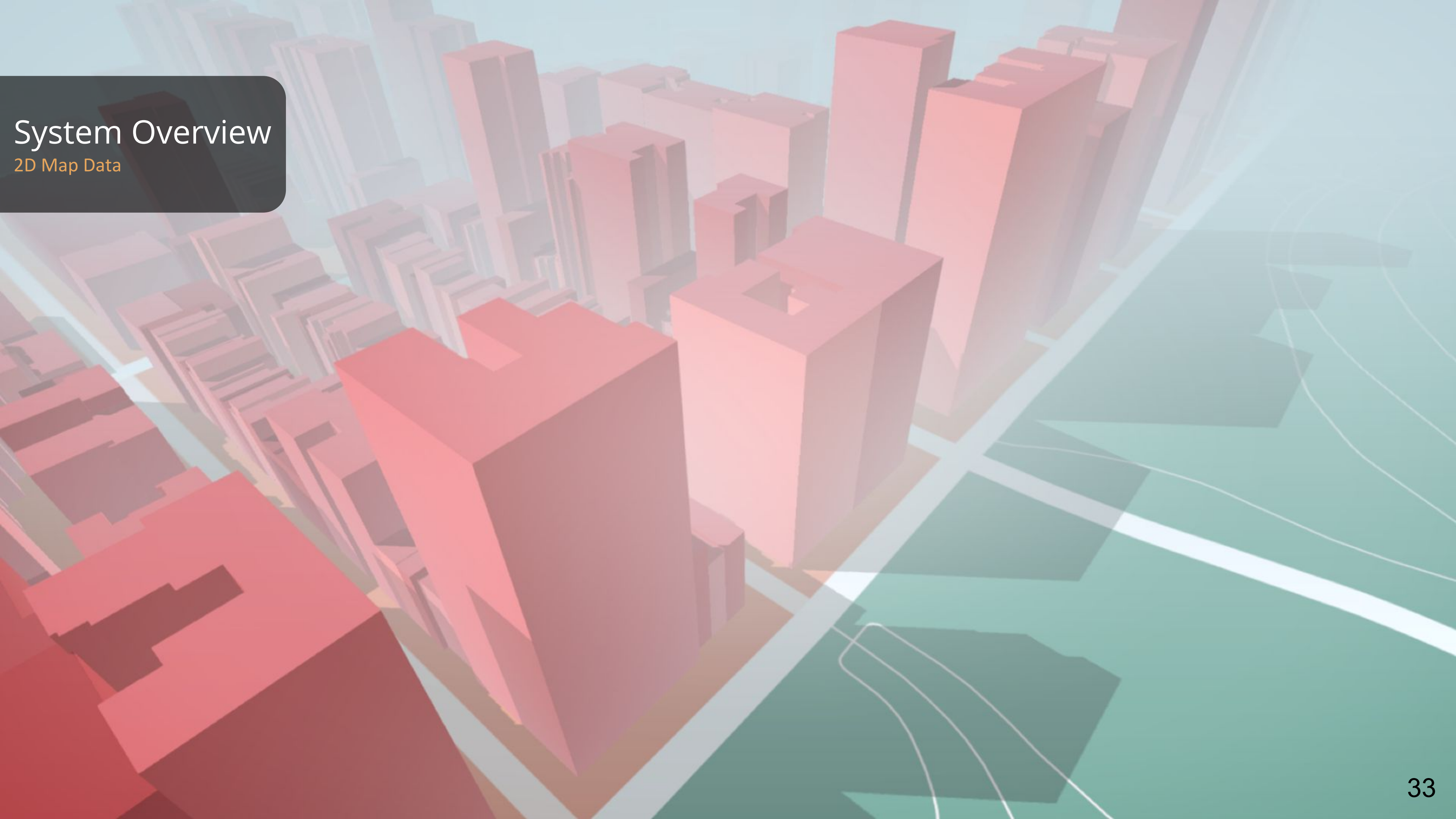
System Overview

2D Map Data

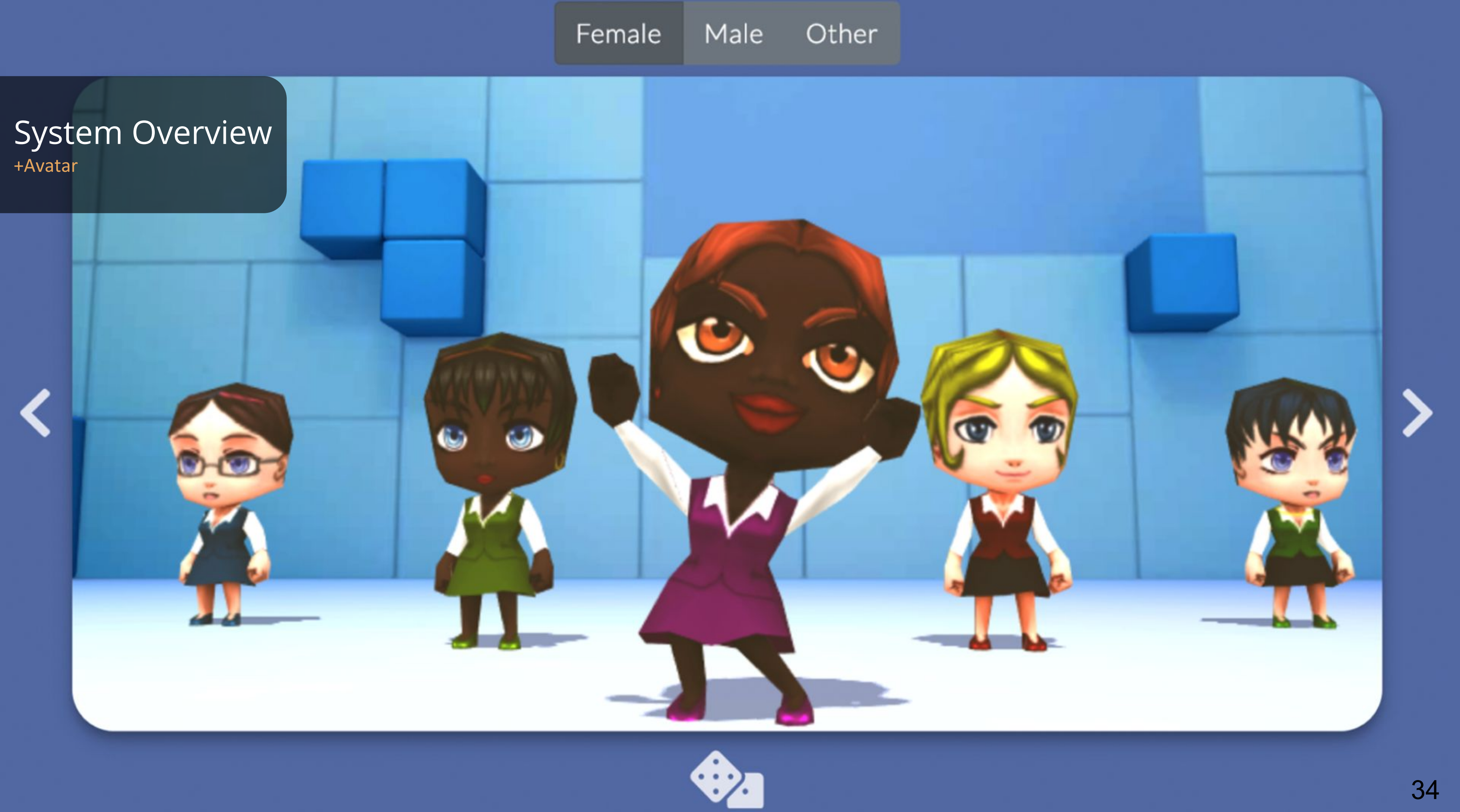


System Overview

2D Map Data



System Overview
+Avatar



System Overview

+Avatar +Trees +Clouds

System Overview

+Avatar +Trees +Clouds +Night

System Overview

Street View Panoramas

System Overview
Street View Panoramas

System Overview

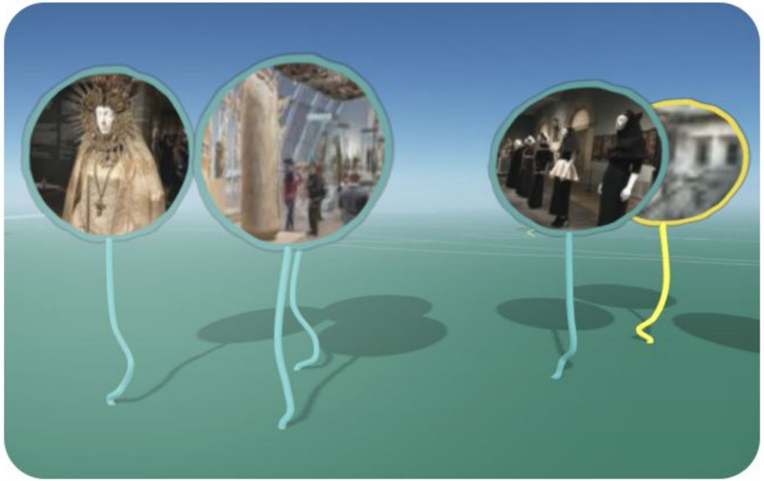
Street View Panoramas

System Overview

Street View Panoramas

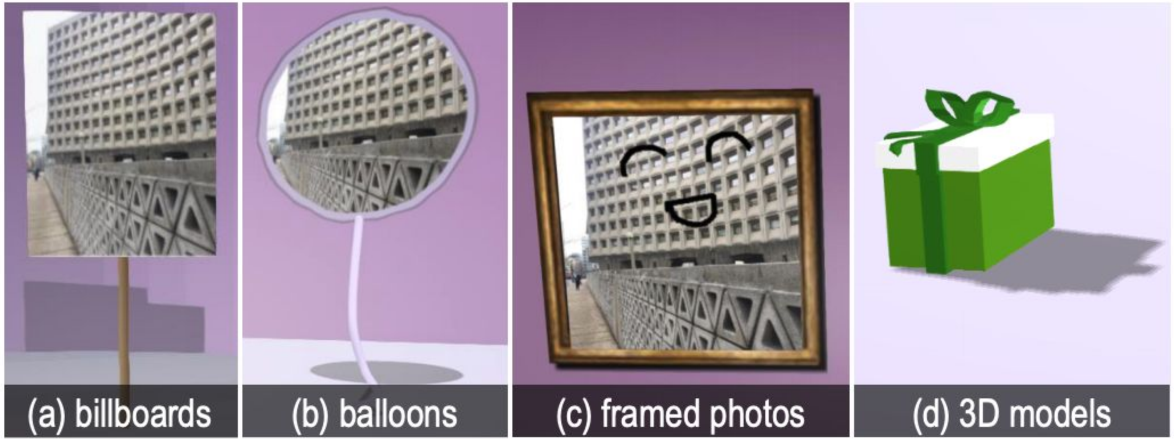
System Overview

Geollery Workflow



System Overview

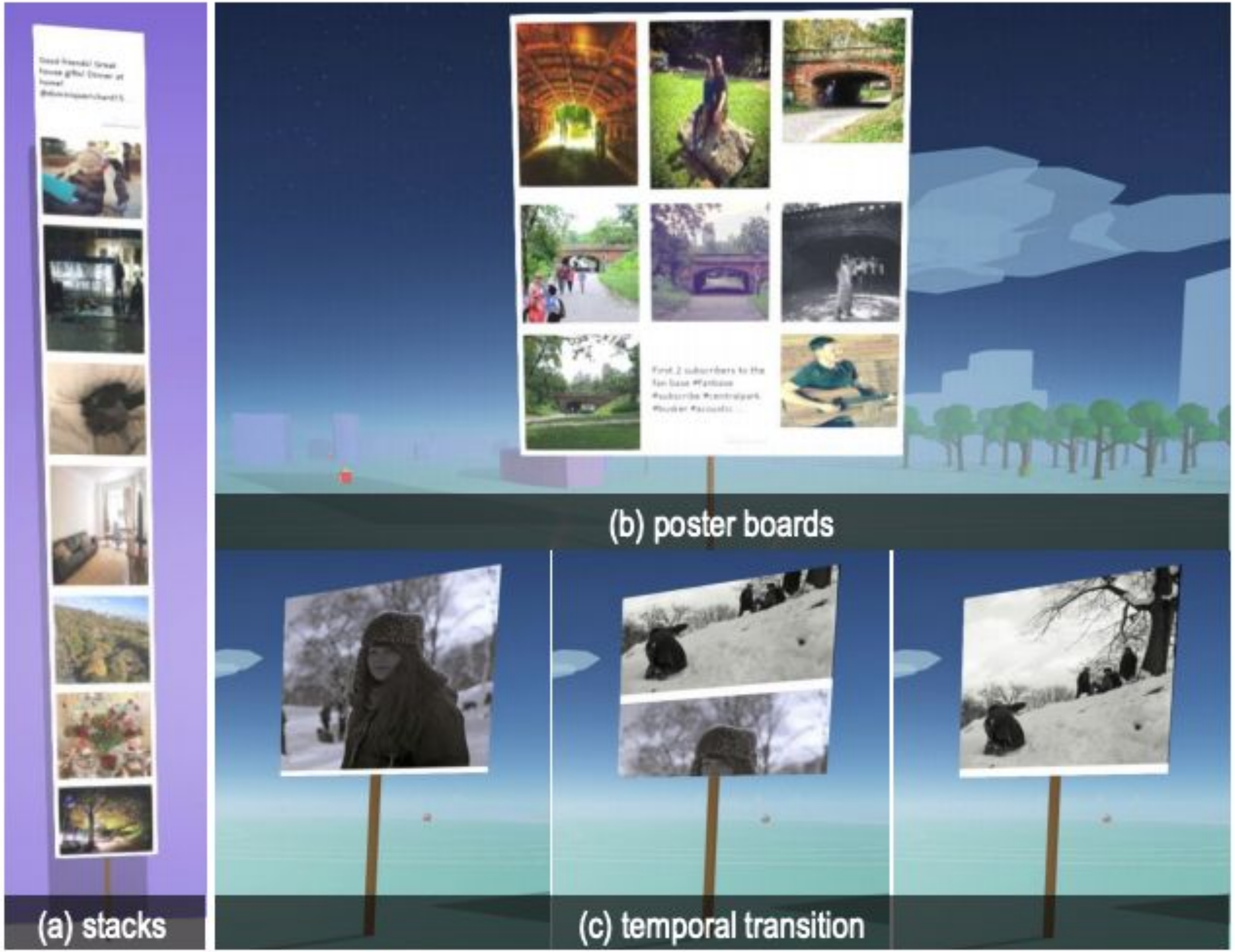
Geollery Workflow



(a) billboards (b) balloons (c) framed photos (d) 3D models

System Overview

Geollery Workflow



Design Space

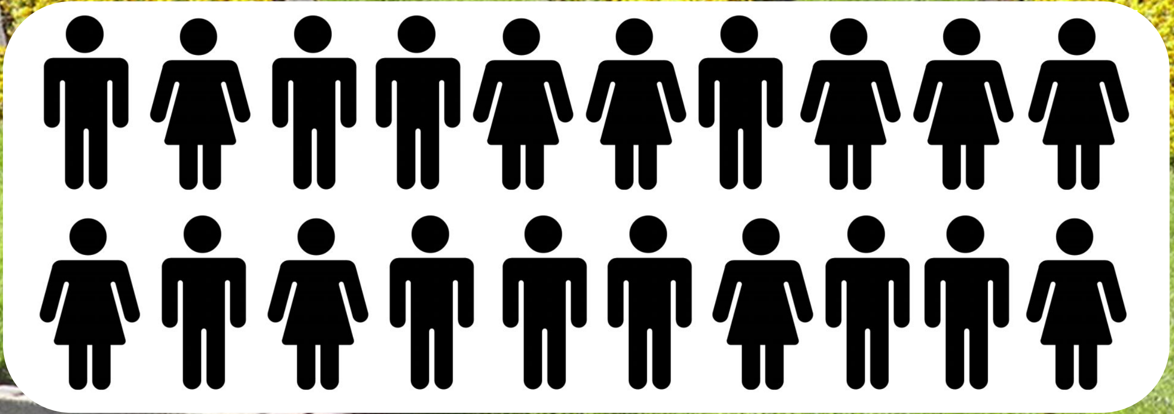
Geollery vs. Social Street View

Variable	Geollery	Social Street View
Mesh	Ground, 3D Buildings, trees, and clouds	Sphere
Textures	Geollery v1: No texture Geollery v2: With 360° street views	Textured by 360° street views
Availability	Almost always available	Only available for the locations with 360° street view data
Motion	6 DoF	3 DoF + Teleport
Virtual Avatar	Available	Not applicable
Collaboration	Available	Not applicable
Social Media Location Accuracy	Almost the exact location in the world	Estimated by distance and orientation
Virtual Representation	Billboards / Balloons / Framed photos / Doodles / Gifts	Billboards (v2: added balloons and gifts)
Aggregation	Based on spatial relationship	Based on direction and distance

User Study

Introduction

20 participants (10 females; age range: 21 - 30, with an average of 25.75 and standard deviation of 3.02) via campus email lists and flyers



User Study

Introduction

User Study

Four Stages, 45-60 minutes

- A background interview
- An exploration of Geollery and Social Street View
- A quantitative evaluation
- A discussion session about the future of 3D social media platforms

User Study

Background Interview (5 min)

User Study

Background Interview (5 min)

Geollery & Social Street View Study

Semi-structured Interview and In-person User Study

[Introduction]

[Start timing!] Hello, my name is __________. I'm __________ in __________ at the __________. First, I would like to thank you for your participation. Today, you will be a participant in a user study with a semi-structured interview. Our goal is to explore your experience using *Geollery* and *Social Street View*, the **challenges** and **limitations** of the interfaces, as well as the types of **decisions** it could influence and potential **impacts** it might have. Then, we will **compare** and **rate** the advantages and disadvantages of both systems in different aspects.

Before we begin the interview, we need to complete a consent form. After this, we will begin. Your data will be kept anonymous. Additionally, as a researcher I have no position on this topic and ask that you be **as open, honest, and detailed** in your answers as possible. Do you have any questions before we begin?

[Begin Interview Study]

- The interview is broken down into three components:
  - Your background in using social media platforms.
  - User study of the Geollery and Social Street View platfoms
  - Survey about future of 3D social media platforms.

[Background]

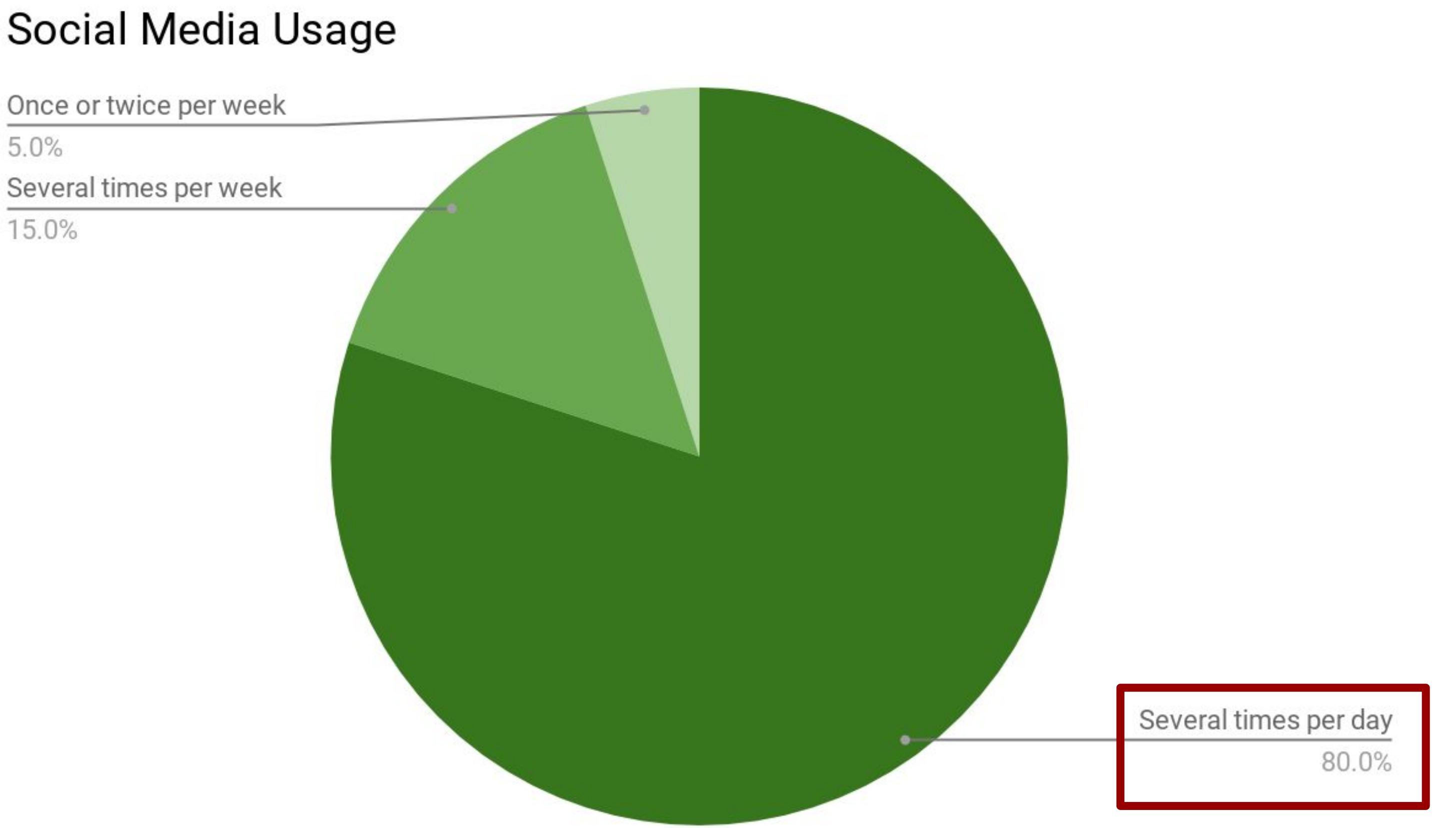
Main goals:

(1) Get people comfortable with answering questions and creating a rapport.
(2) Assessing how they are accessing social media in real life, and gain an understanding of their experience.

1. What are your views on social media platforms like Twitter and Facebook, how important are they to you?
2. Can you talk about your social media experience? How often do you use social media platforms? And how often do you post on social media websites?
3. What do you usually use social media platfoms for?
4. Have you ever viewed social media in a map?

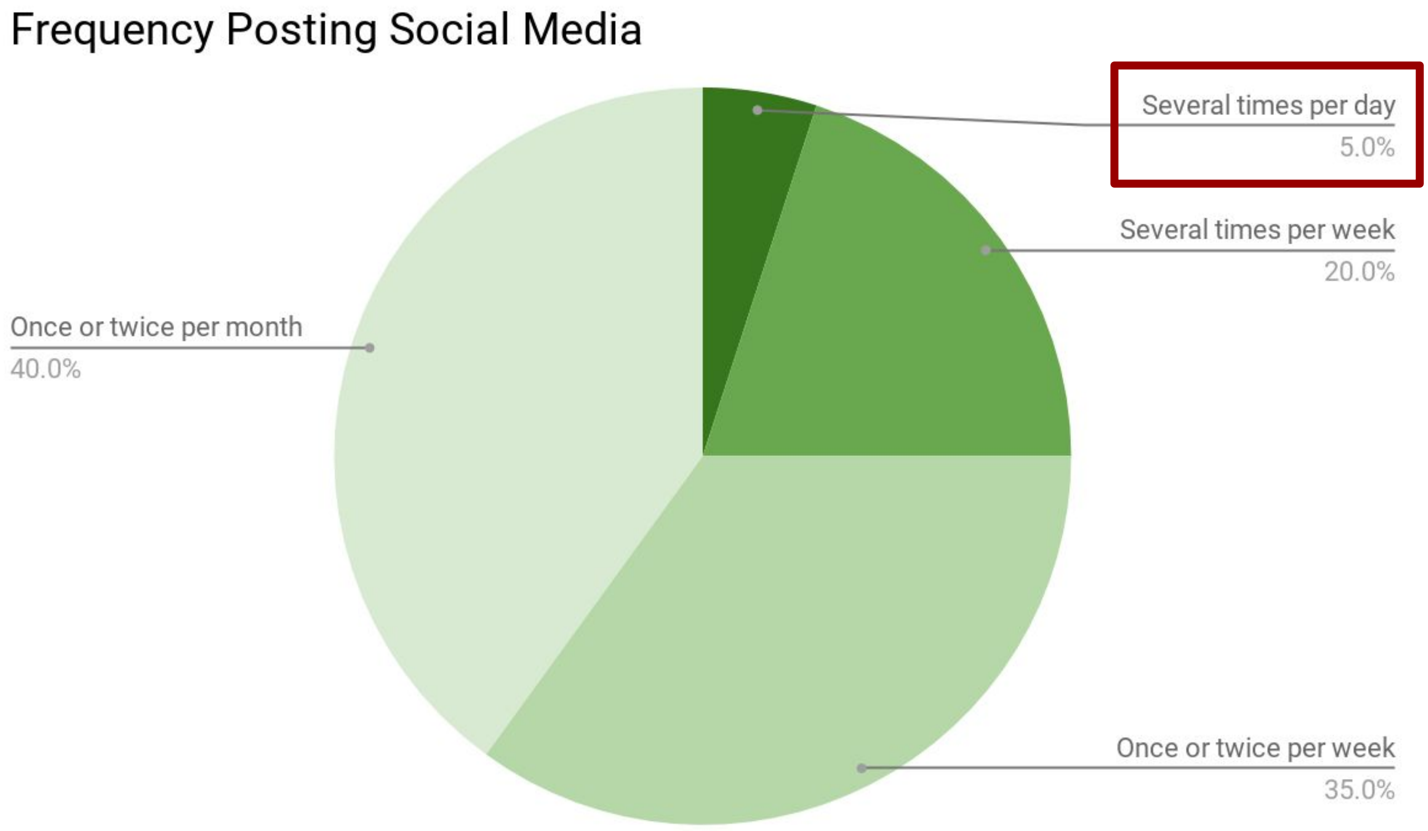
User Study

Background Interview (5 min)



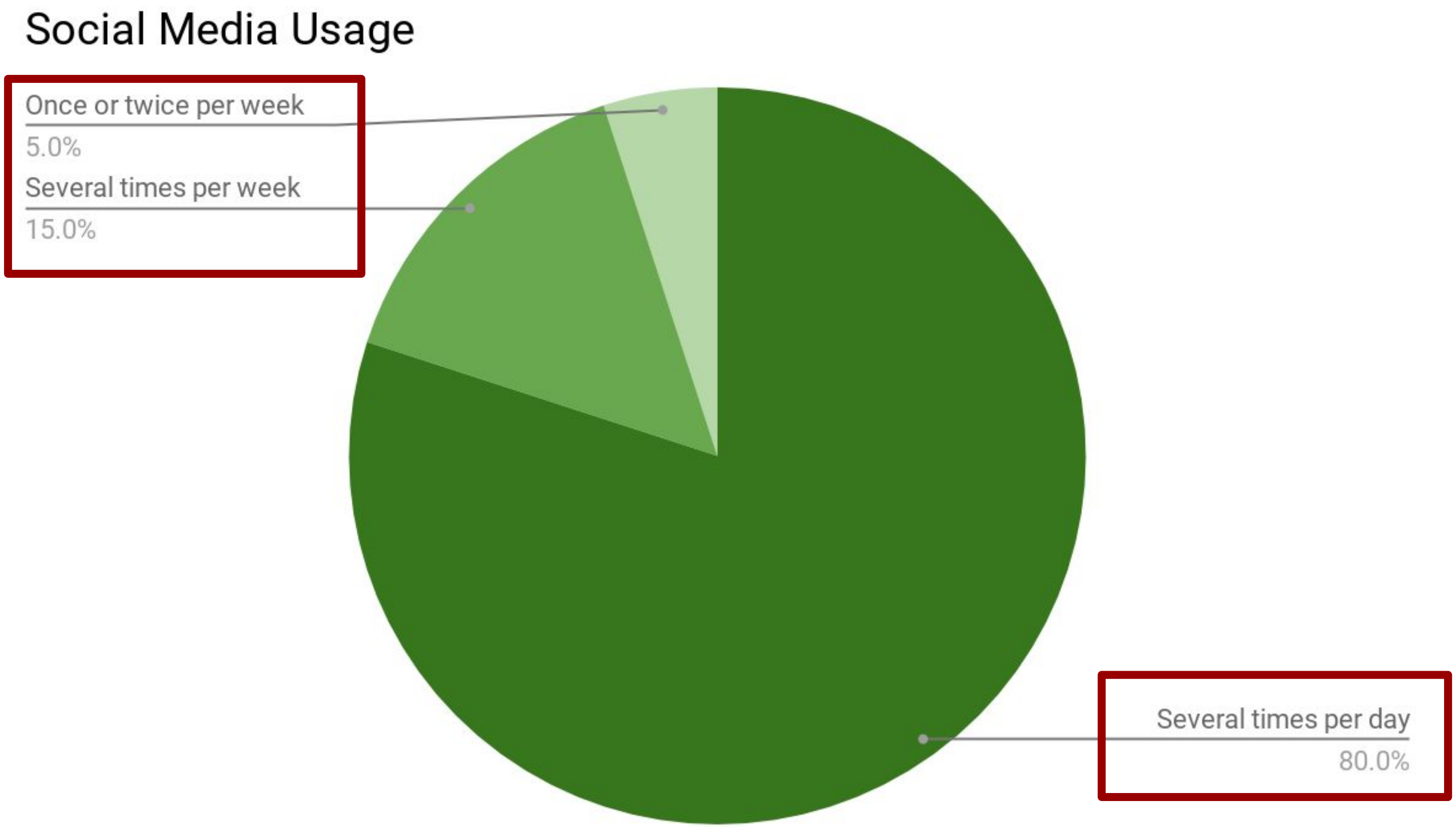
User Study

Background Interview (5 min)



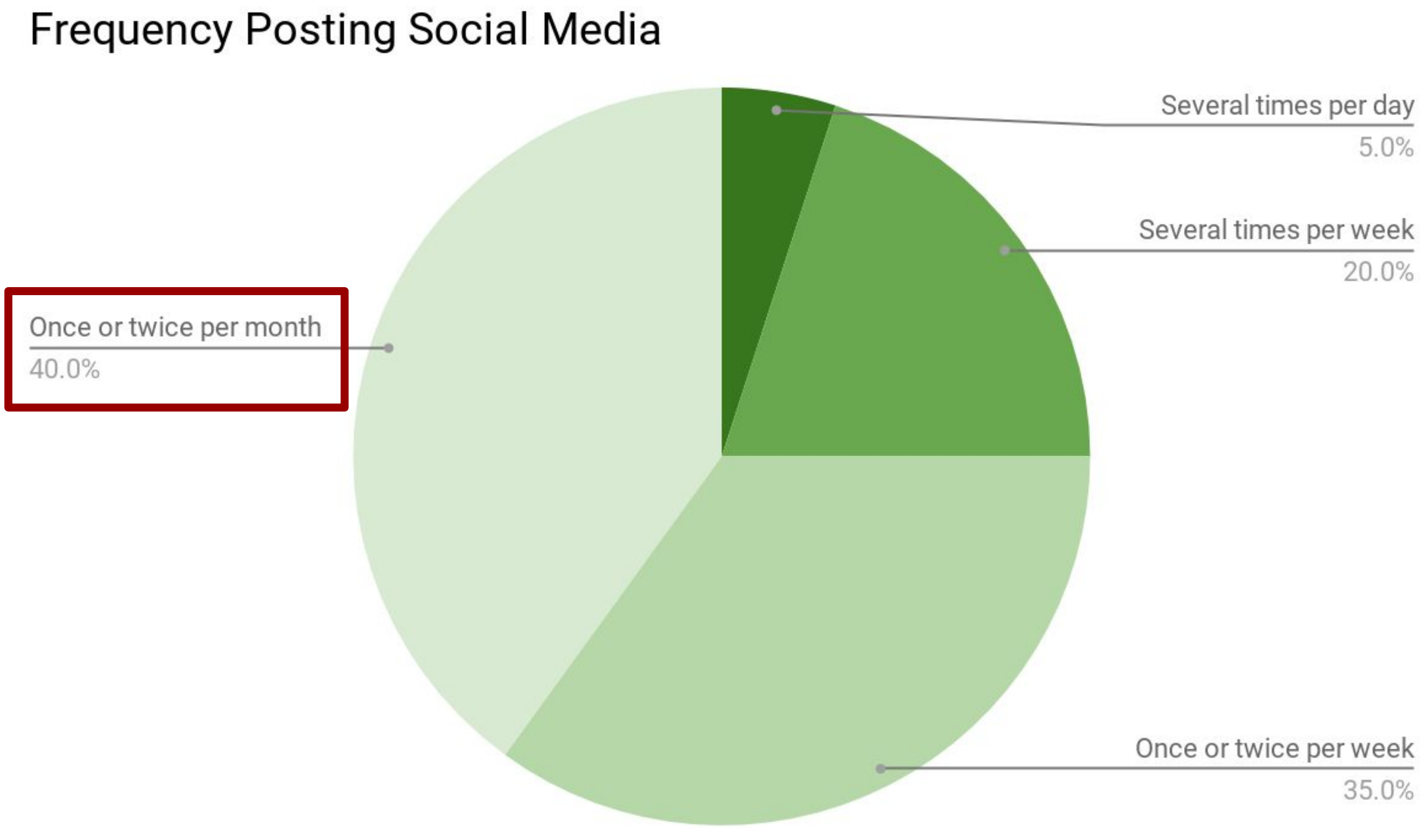
User Study

Background Interview (5 min)



User Study

Background Interview (5 min)



“I post news about sports and games every day.”

P7 / M

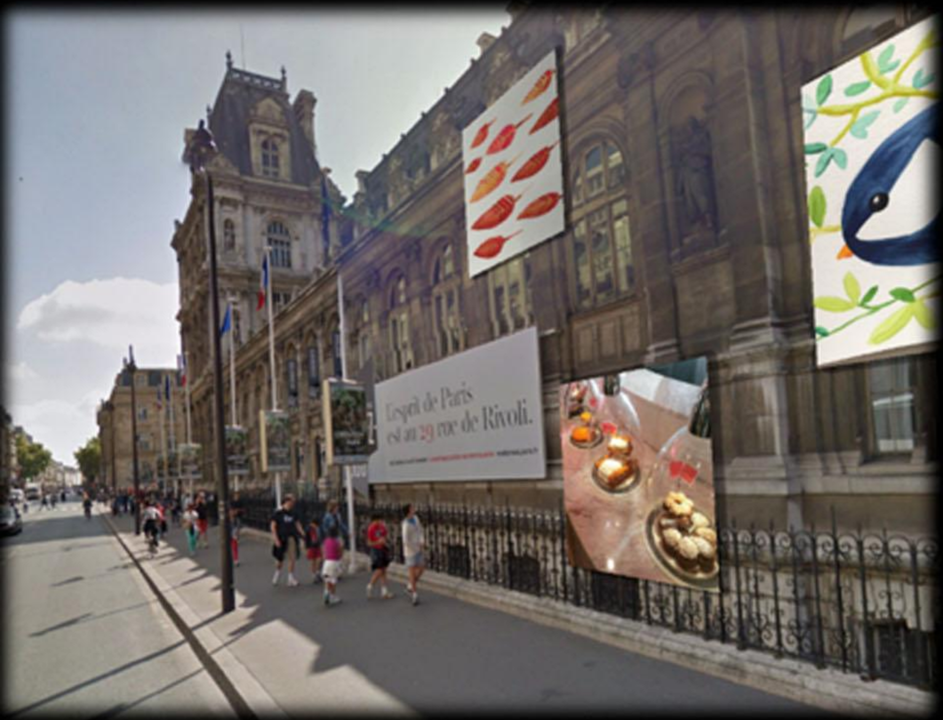
I majorly use Instagram, I post from my own portfolio.

P17 / F

User Study
Exploration (30-40 min)

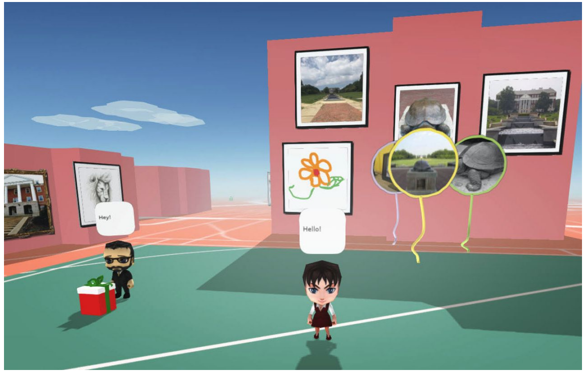
User Study

Social Street View vs. Geollery



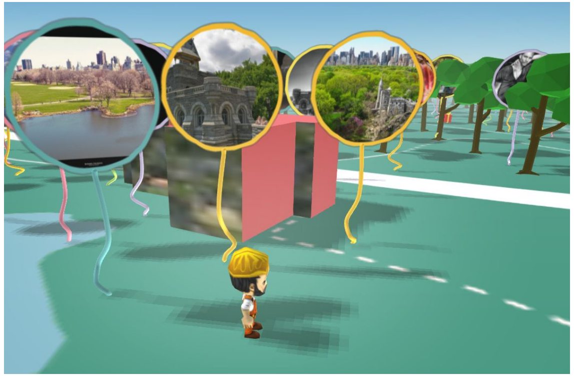
User Study

Latin Square Design



University Campus

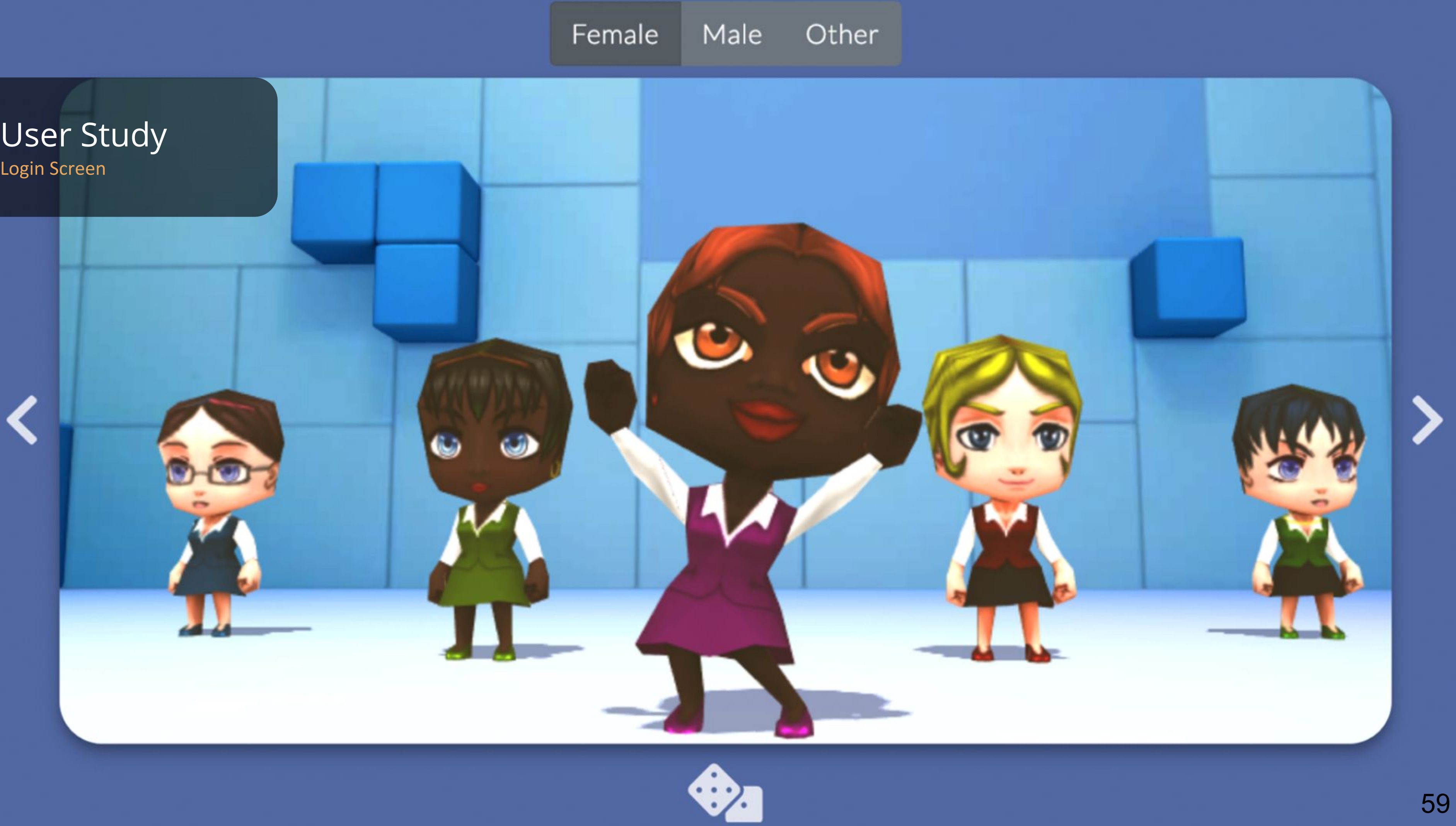
New York City



Washington D.C.

User Study

Login Screen



What's your first impression?

First Impression

Geollery

I think it’s a very good start, it’s very good experience to walk around.

P6 / F

“I believe I am in a museum.”

P16 / M

“I like that the buildings are forming while I am walking.”

P16 / M

It's cool to see posts by people in *real time*, along with the *establishment* they're in.

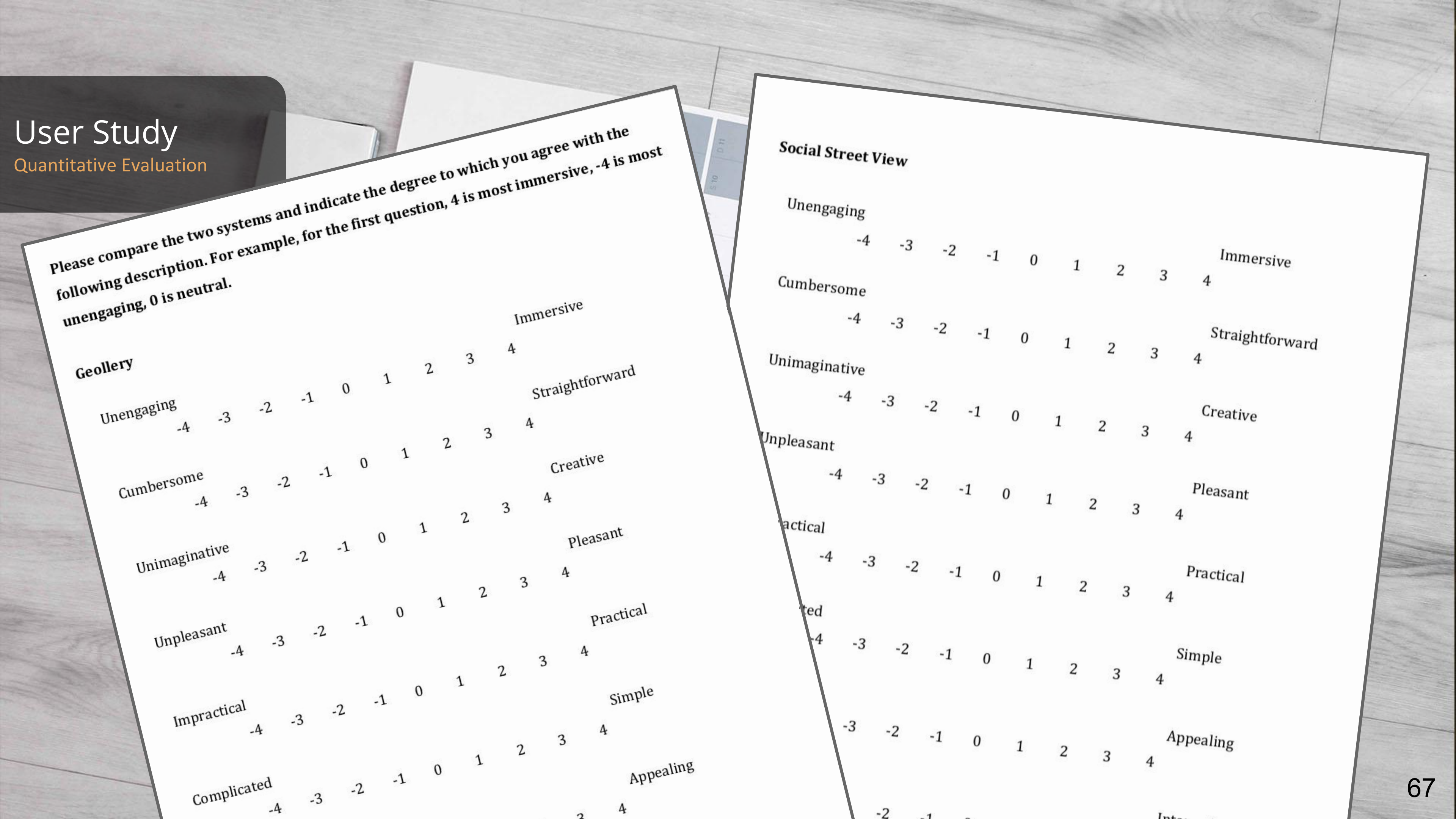
P17 / F

It’s like you don’t have to be there.

P11 / F

User Study

Quantitative Evaluation



Please compare the two systems and indicate the degree to which you agree with the following description. For example, for the first question, 4 is most immersive, -4 is most unengaging, 0 is neutral.

Geollery

Unengaging -4 -3 -2 -1 0 1 2 3 4 Immersive

Cumbersome -4 -3 -2 -1 0 1 2 3 4 Straightforward

Unimaginative -4 -3 -2 -1 0 1 2 3 4 Creative

Unpleasant -4 -3 -2 -1 0 1 2 3 4 Pleasant

Impractical -4 -3 -2 -1 0 1 2 3 4 Practical

Complicated -4 -3 -2 -1 0 1 2 3 4 Simple

Complicated -4 -3 -2 -1 0 1 2 3 4 Appealing

Social Street View

Unengaging -4 -3 -2 -1 0 1 2 3 4 Immersive

Cumbersome -4 -3 -2 -1 0 1 2 3 4 Straightforward

Unimaginative -4 -3 -2 -1 0 1 2 3 4 Creative

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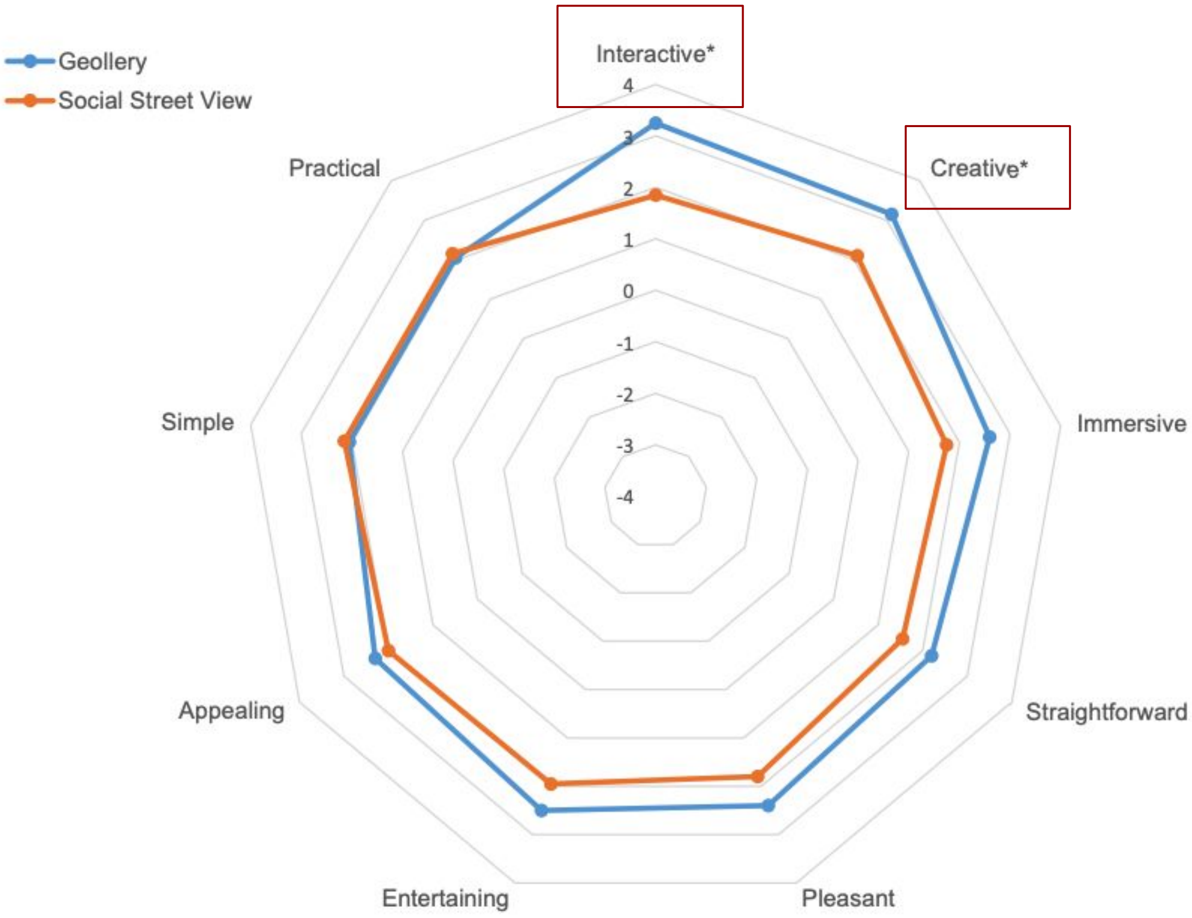
actical -4 -3 -2 -1 0 1 2 3 4 Practical

ted -4 -3 -2 -1 0 1 2 3 4 Simple

-3 -2 -1 0 1 2 3 4 Appealing

User Study

Quantitative Evaluation



User Study

Post-interview

Post Interview

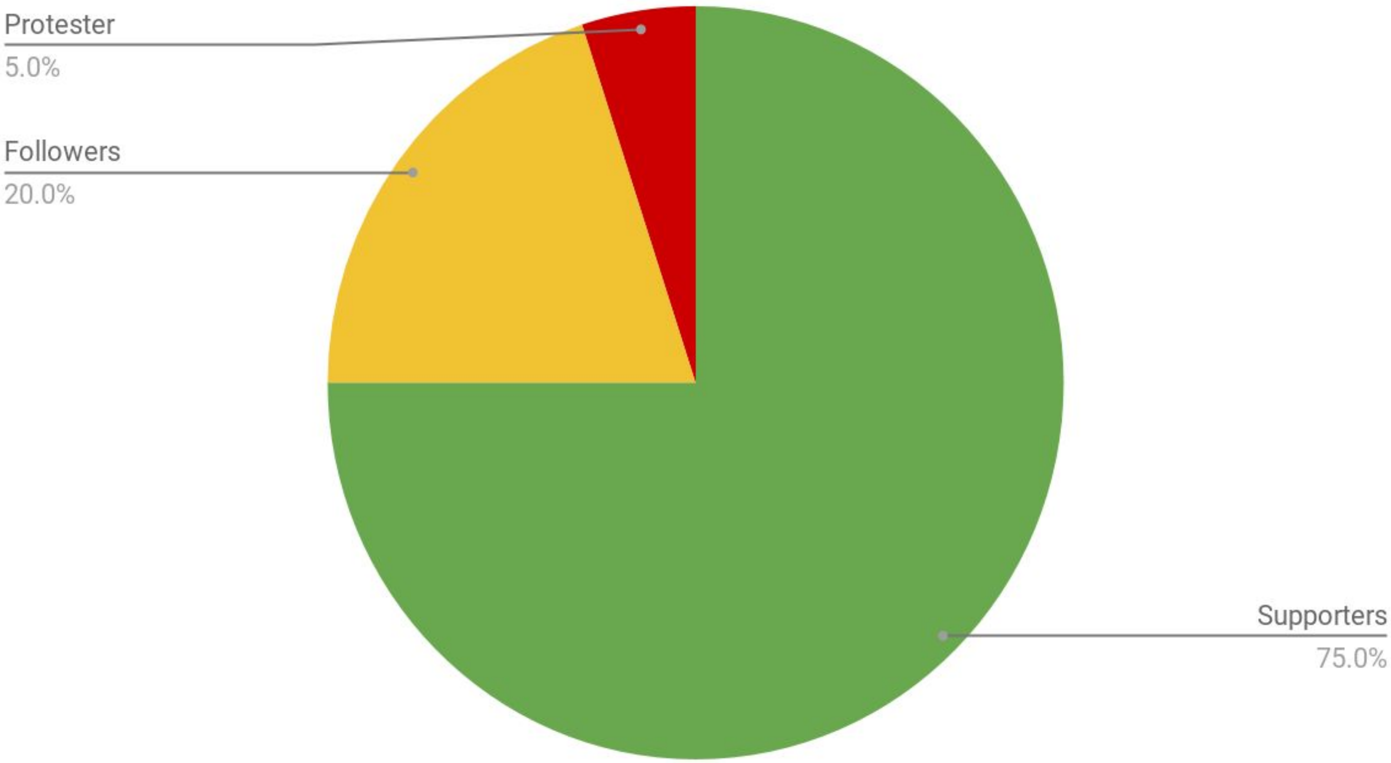
Question 1/3

Suppose that we have a polished 3D social media platform like Geollery or Social Street View, would you like to use it? If so, how much time would you like to spend on it?

Post Interview

Question 1/3

High-level Attitude Towards 3D Social Media Platform



I would like to use it every day when I go to work, or travel during weekends.

P6 / F

If it’s not distracting like Facebook and Instagram, I would use it every day on a couple of things.

P17 / F

I am a follower on most social media sites. I would only join a 3D social media platform once my friends are there.

P4 / M

If my friends are all on this, I can see myself spend a couple of hours every week.

P12 / M

“I don’t think I will use this. I prefer to use Yelp to see comments [of nearby restaurants]”

P12 / M

Post Interview

Question 2/3

Can you imagine your use cases for Geollery and Social Street View? What would you like to use 3D social media platforms for?

I would like to use it for the food in different restaurants. I am always hesitating of different restaurants. It will be very easy to *see all restaurants with street views*. In Yelp, I can only see one restaurant at a time.

P6 / F

[I will use it for] exploring *new places*. If I am going on vacation somewhere, I could *immerse myself* into the location. If there are avatars around that area, I could *ask questions*.

P1 / M

“I think it (Geollery) will be useful for families. I just taught my grandpa how to use Facetime last week and it would great if I could teleport to their house and meet with them, then we could chat and share photos with our avatars.”

P2 / F

… for communicating with my families, maybe, and distant friends, [so] they can see New York. And, getting to know more people, connecting with people based on similar interests.

P2 / F

Post Interview

Question 3/3

If you were a designer or product manager for Geollery or Social Street View, what features would you like to add to the systems?

“

A mapping of the texture, high-resolution texture, will be great.

”

P12 / M

"if there is a way to unify the interaction between them, there will be more realistic buildings [and] you could have more roof structures. Terrains will be interesting to add on."

P18 / M

“I would like to see kitties and puppies running around, and birds flying in the air”

P13 / F

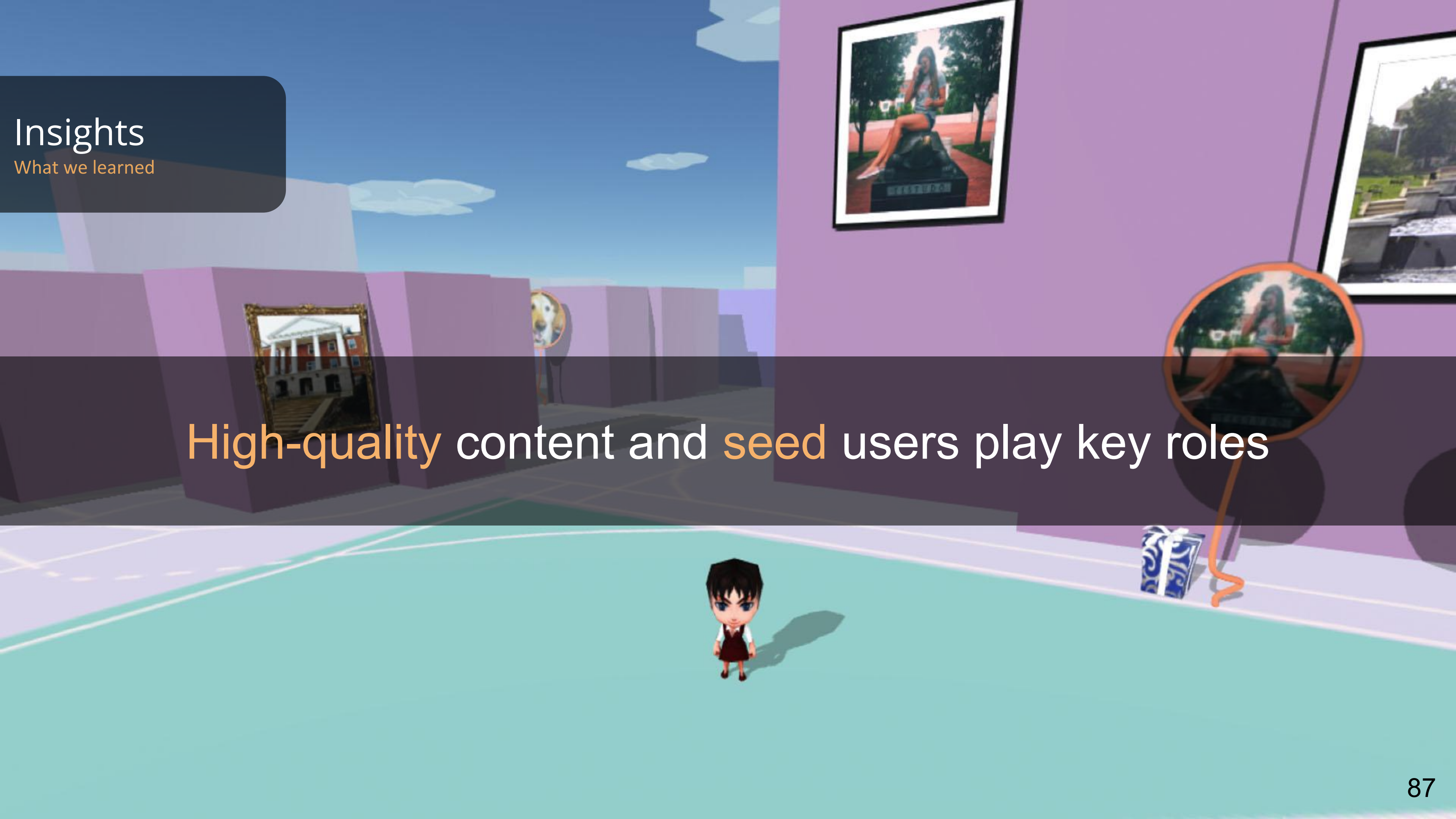
I could also add a bike, add a vehicle, a motorcycle in Geollery, this will add some fun.

P17 / F

Insights

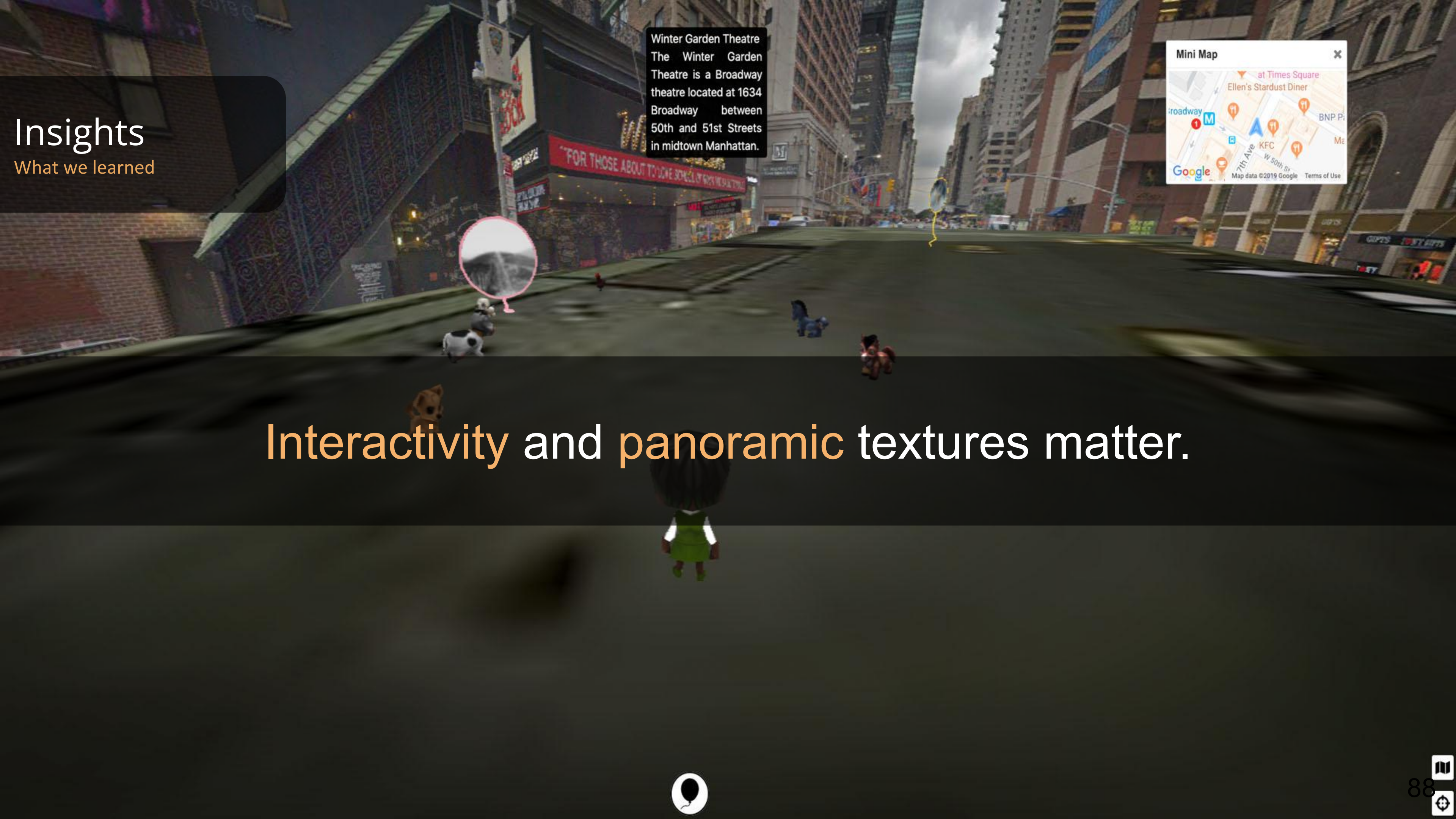
What we learned

High-quality content and seed users play key roles



Insights

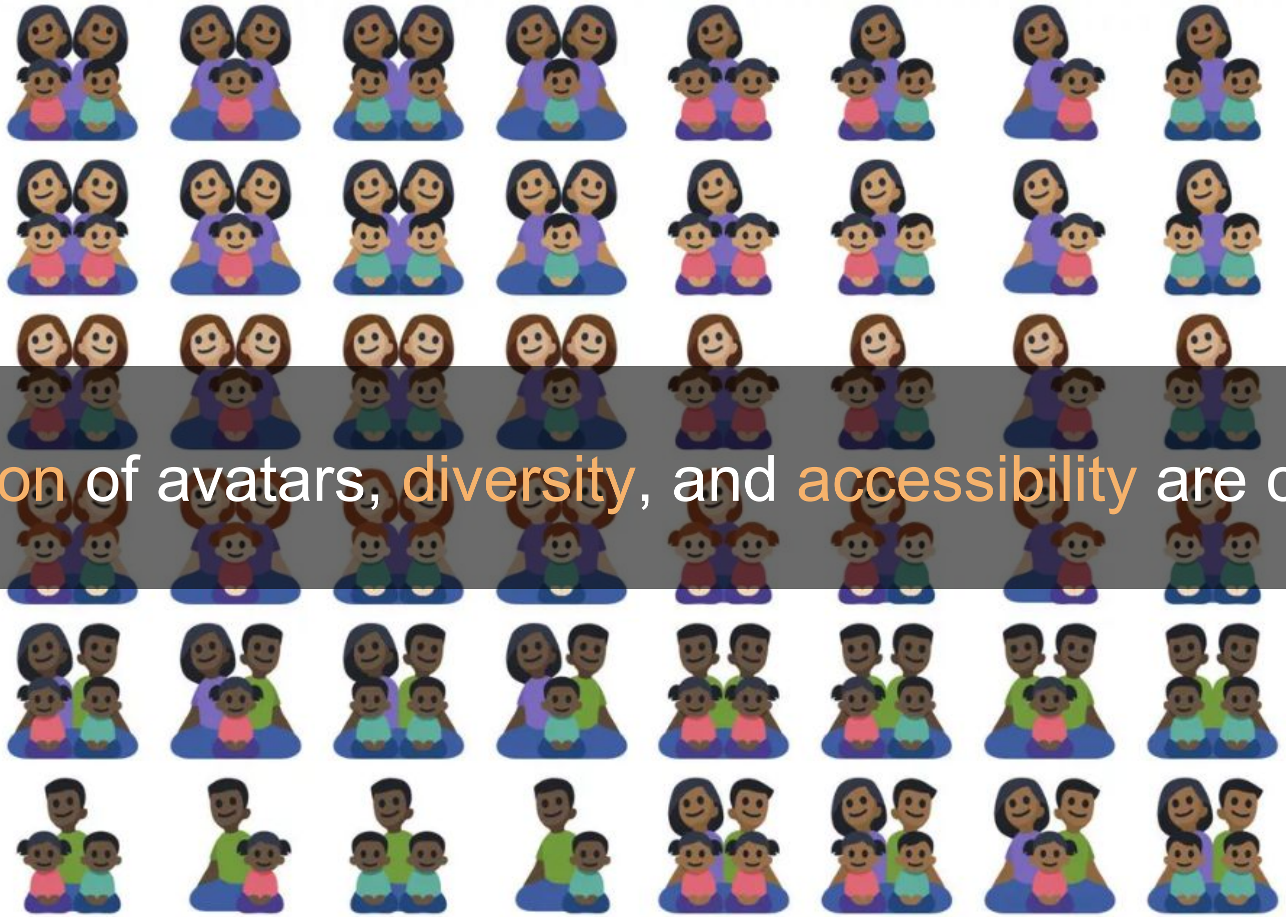
What we learned



Interactivity and panoramic textures matter.

Insights

What we learned



Customization of avatars, diversity, and accessibility are crucial.

image courtesy: Facebook Messenger

Discussion

Use Case: Audio Tour

...

Discussion

Taking the Feedback:
Geollery v2, Web3D & VR 2019

Geollery: A Mixed Reality Social Media Platform

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Amitabh Varshney, Department of Computer Science, University of Maryland, College Park, varshney@cs.umd.edu

Interactive Fusion of 360° Images for a Mirrored World

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Augmentarium, Department of Computer Science, and University of Maryland Institute for Advanced Computer Studies
University of Maryland, College Park

Experiencing a Mirrored World with Geotagged Social Media in Geollery

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ABSTRACT

We demonstrate the online deployment of Geollery [5], a mixed reality social media platform. We introduce an interactive pipeline to reconstruct a mirrored world at two levels of detail: the street level and the bird's-eye view. Instead of using offline 3D reconstruction approaches, our system streams and renders a mirrored world in real time, while depicting geotagged social media as billboards, balloons, framed photos, and virtual gifts. Geollery allows multiple users to see, chat, and collaboratively sketch with the spatial context in this mirrored world. We demonstrate a wide range of use cases including crowdsourced tourism, interactive audio guides with immersive spatial context, and meeting remote friends in mixed reality. We envision Geollery will be inspiring and useful as a standalone social media platform for those looking to explore new areas or looking to share their experiences. Please refer to https://geollery.com for the paper and live demos.

ACM Reference Format:
Ruofei Du, David Li, Amitabh Varshney. 2019. Experiencing a Mirrored World with Geotagged Social Media in Geollery. In *CHI Conference on Human Factors in Computing Systems Extended Abstracts (CHI'19 Extended Abstracts), May 4–9, 2019, Glasgow, Scotland UK.* ACM, New York, NY, USA, 4 pages. https://doi.org/10.1145/3290607.3313273

CHI'19 Extended Abstracts, May 4–9, 2019, Glasgow, Scotland UK
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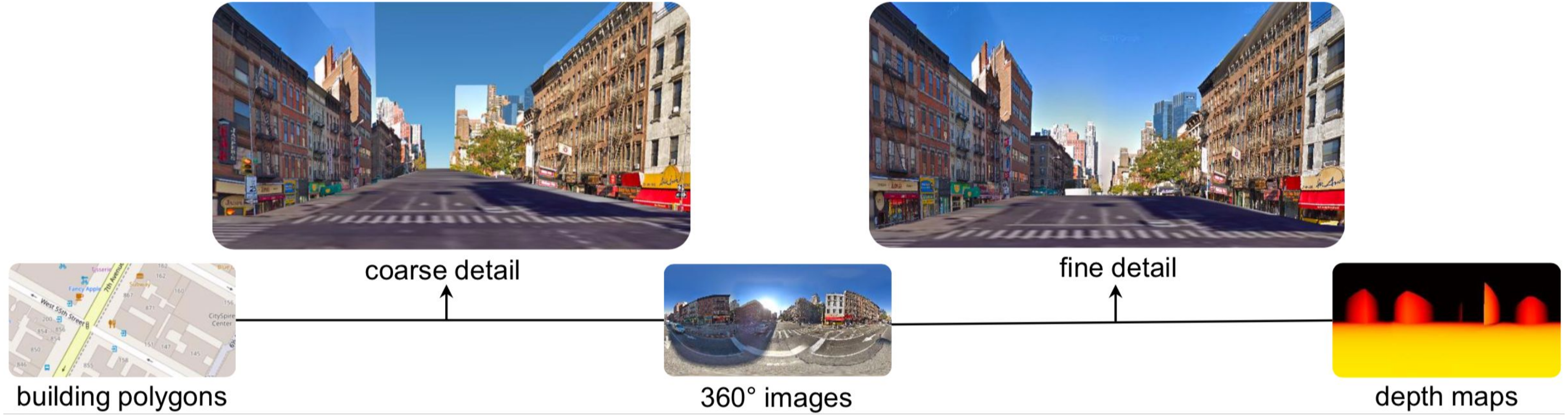
Figure 1: Geollery creates an interactive mirrored world in real time, in which users are immersed with 3D buildings, live chats, and geotagged social media. The social media are visualized as balloons, billboards, framed photos, and gift boxes, *all in real time*.

...

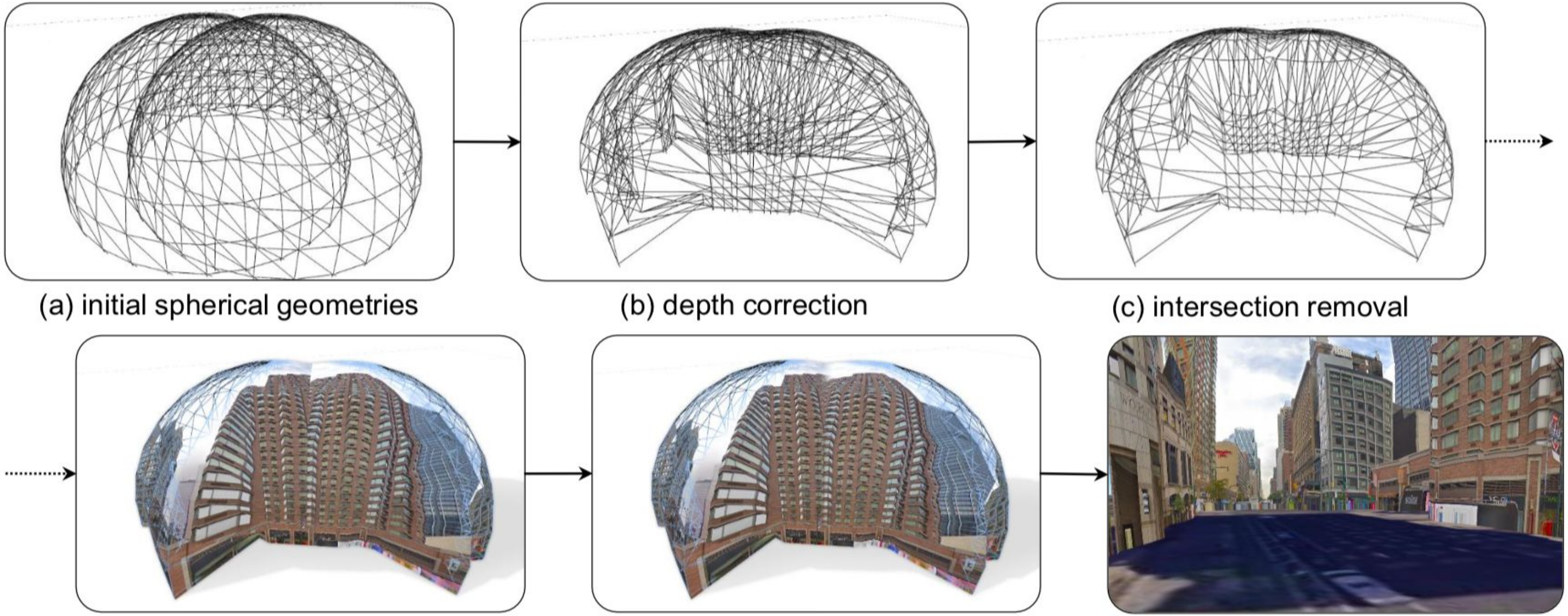
Discussion

Taking the Feedback



Discussion

Taking the Feedback



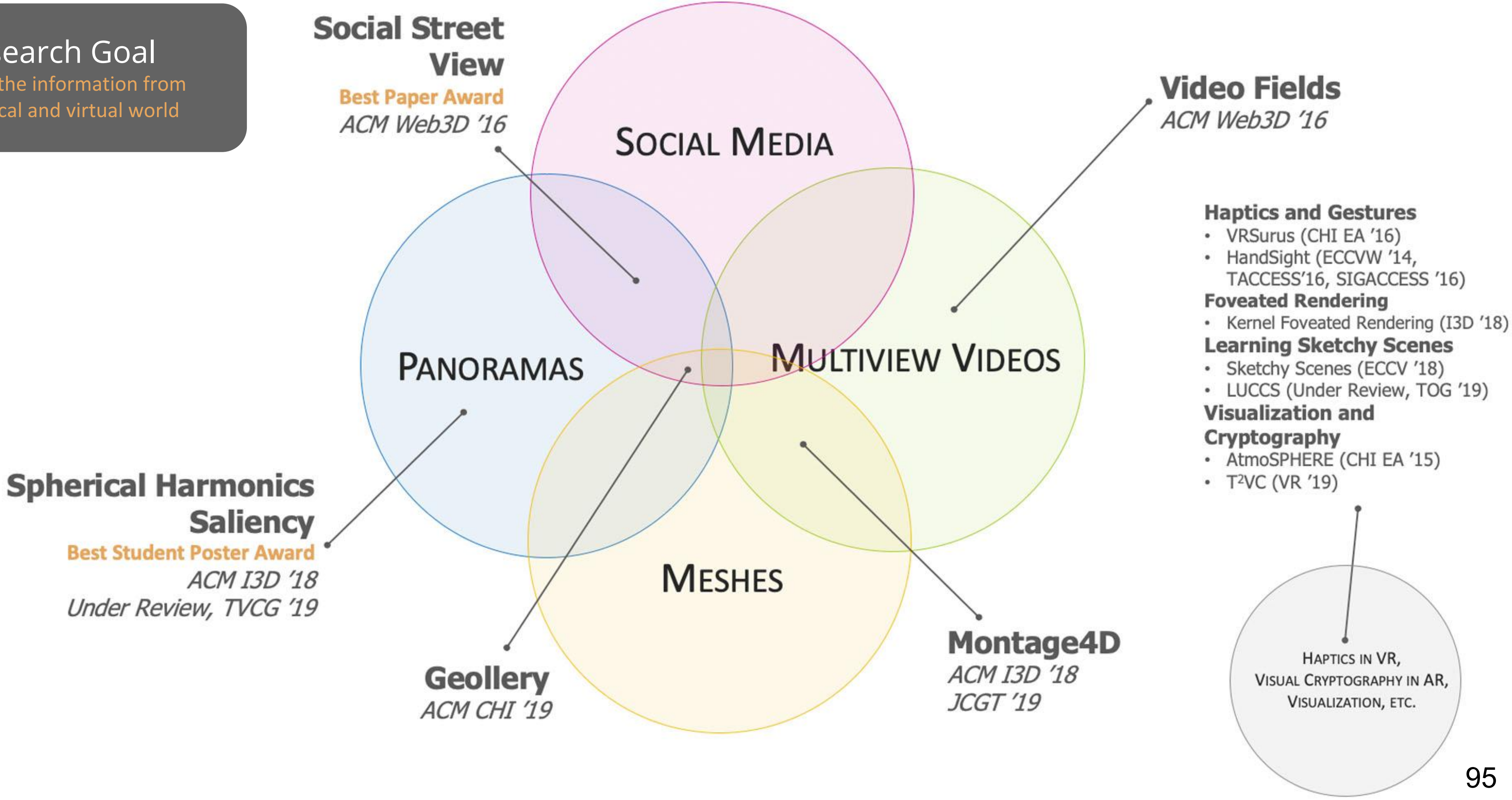
(a) initial spherical geometries
(b) depth correction
(c) intersection removal
(d) texturing individual geometry
(e) texturing with alpha blending
(f) rendering results in fine detail

Challenge

Global Market Constraints:
Weak Content for XR

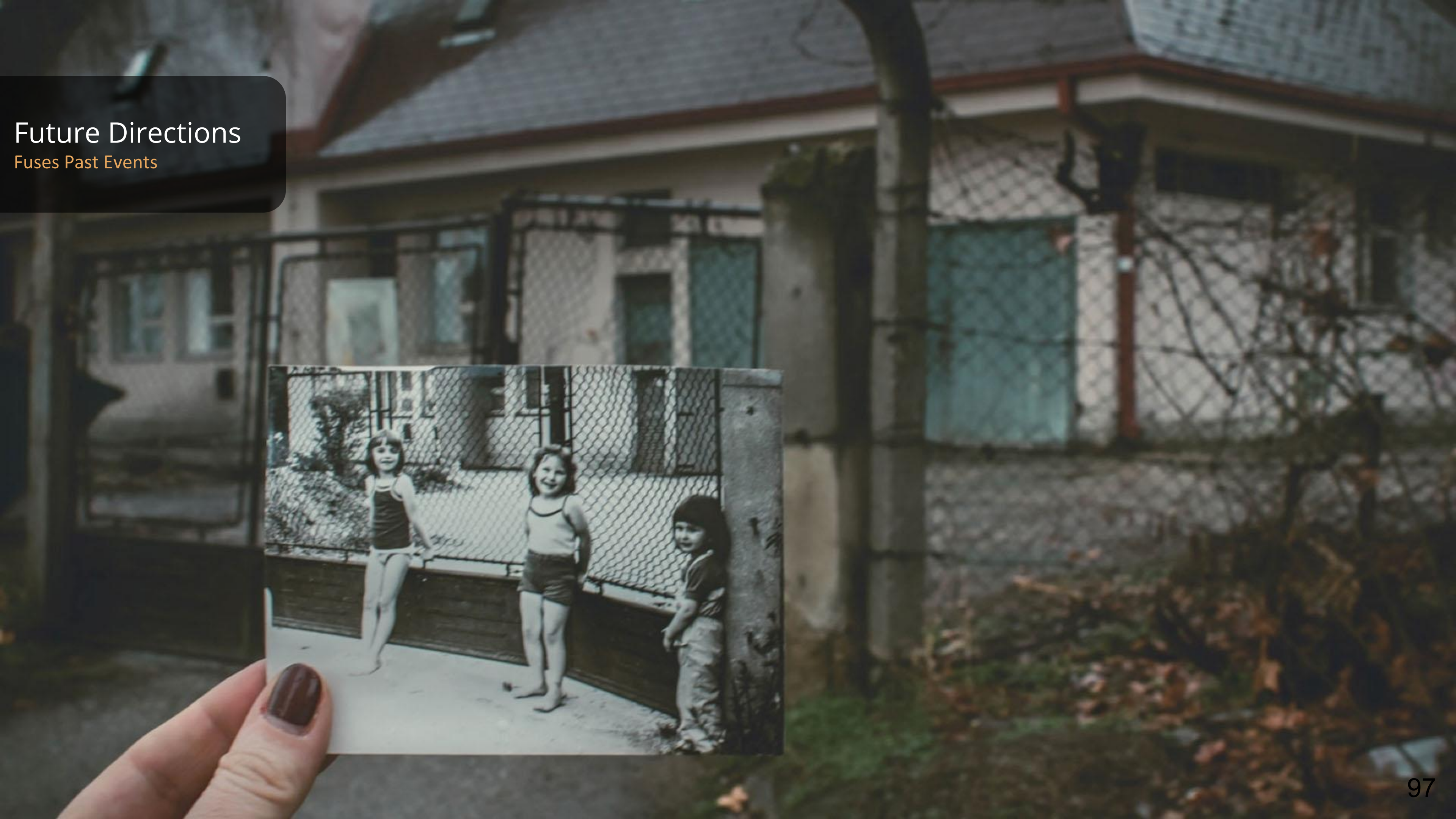
Research Goal

Fuse the information from physical and virtual world



Future Directions

The Ultimate XR Platform



Future Directions

Fuses Past Events

Future Directions

With the present

Future Directions

And look into the future

Future Directions

Change the way we communicate in 3D and consume the information

Future Directions

Consume the information throughout the world

Acknowledgement

NSF | MPower | UMIACS

Acknowledgement

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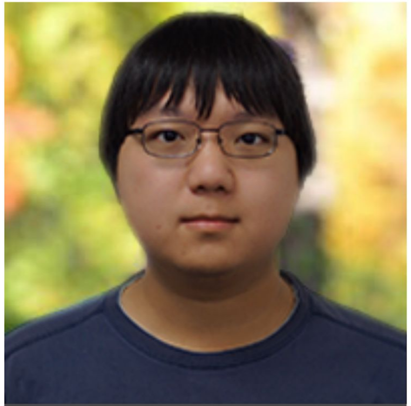

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Thank you!

Ruofei Du, David Li, and Amitabh Varshney
{ruofei, dli7319, varshney}@cs.umd.edu | www.Geollery.com | CHI 2019

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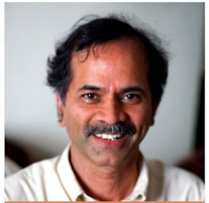
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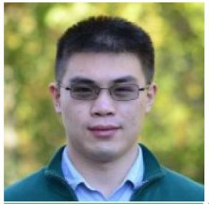
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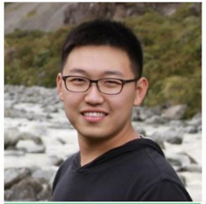
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Greetings!
Hi, friends!
Hello!