Reconstructing the World in 3D: Bringing Games with a Purpose Outdoors

Kathleen Tuite\textsuperscript{1}, Noah Snavely\textsuperscript{2}, 
Dun-Yu Hsiao\textsuperscript{1}, Zoran Popović\textsuperscript{1}

\textsuperscript{1}University of Washington 
Center for Game Science 
Computer Science and Engineering Department

\textsuperscript{2}Cornell University 
Science
Foldit – protein folding
Goal:
Reconstruct the world in 3D
Photo Tourism
Exploring photo collections in 3D

(a)

(b)

(c)

Rome in a Day

PMVS
Problem: internet photo collections have ‘holes’
Can we make a game out of filling in the holes?
PhotoCity game
Go outside and take pictures of buildings

Capture flags for your team and conquer buildings

Look for flags on the map

Add pictures to flags

Computer vision algorithms

Go outside and take pictures of buildings
Game mechanics reinforce purpose

Flags tell players where the models need work
Players start their own seed models

Players can start their own seed models from small photo collections
Competition and collaboration

Owning flags and models leads to engaging territorial battles
UW vs. Cornell Round One

![Graph showing points vs. days for UW and Cornell]
Cornell Arts Quad (4k images)
Cornell Arts Quad (4k images)
109,000 photos!

Total, UW + Cornell
Over 60% of photos are *useful* (used in a 3D model)

vs. 10% of Flickr photos tagged ‘rome’
Game only rewards useful photos

1058 new points!

Players only earn points for taking useful photos
Coverage

PhotoCity photos

Geotagged Flickr photos
Acknowledgements

Nadine Tabing, Sylvia Tashev, Juliet Bernstein, Adam Smith, Ali Rahimi, Sameer Agarwal, Yasu Furukawa, PhotoCity players!