The Best Interactive System is a Non-Interactive System

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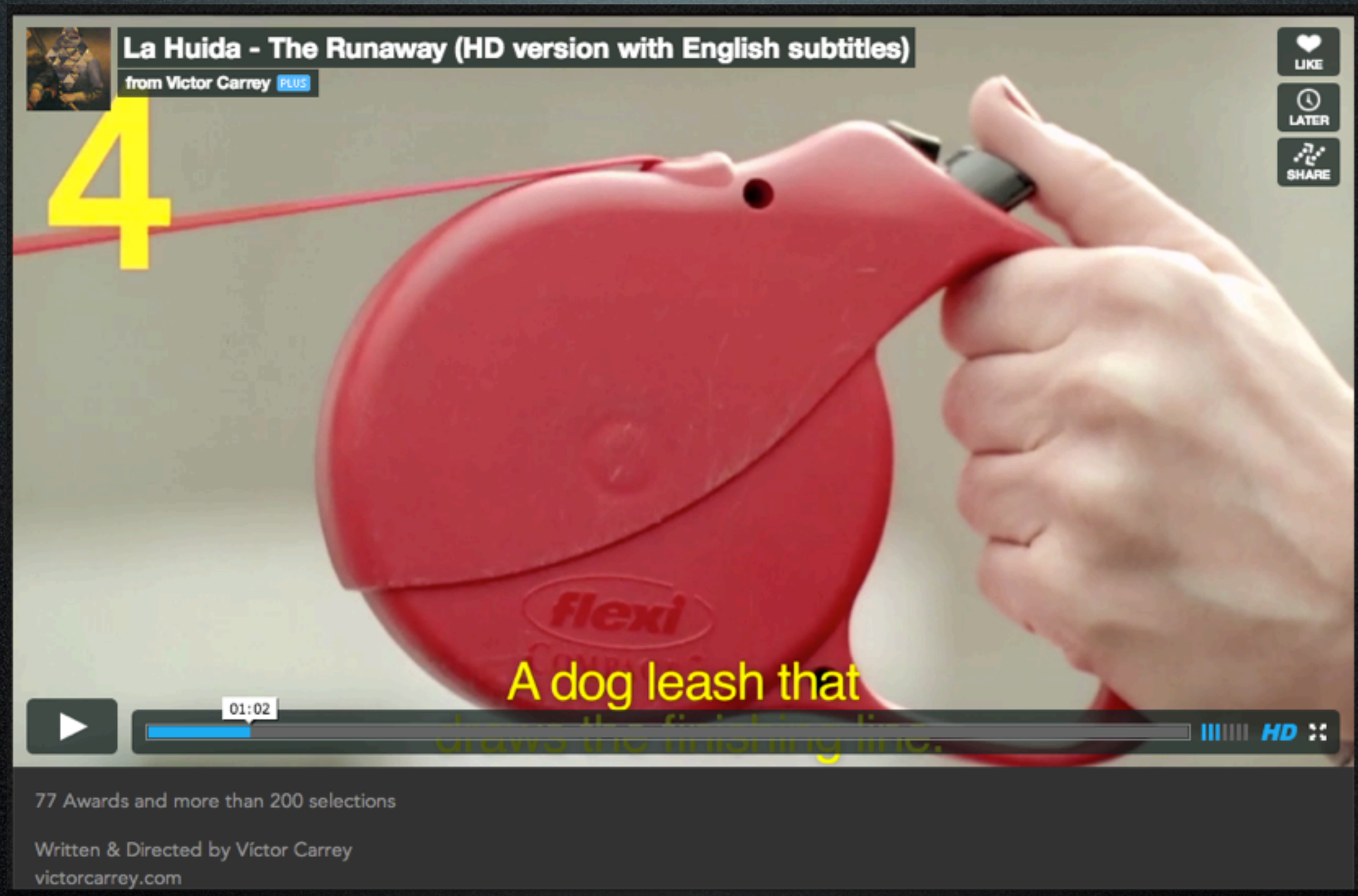
National University of Singapore

Examples of Interactive Media Systems



Screenshot from vimeo.com

Demo of Jiku Player


Screenshot from 3dsom.com

Google Earth File Edit View Tools Add Window Help

Google Earth

Search

Como, Italy

Search

ex: Museums in New York, NY

Get Directions History

Como Province of Como, Italy

50 Hotels in Como

Ads

Half-Price Hotels

Book your Hotel in Como online

www.booking.com/Como-Hotels

Places

My Places

Temporary Places

Layers

Earth Gallery

Primary Database

Borders and Labels

Places

Photos

Roads

3D Buildings

Ocean

Weather

Gallery

Global Awareness

Sign in

Tour Guide

Indonesia

Java

Philippines

Mount Kinabalu

00:38

Celebes

Bali

Mindanao

Mount Apo

00:38

Mount Lokon

00:38

DESTINATIONS

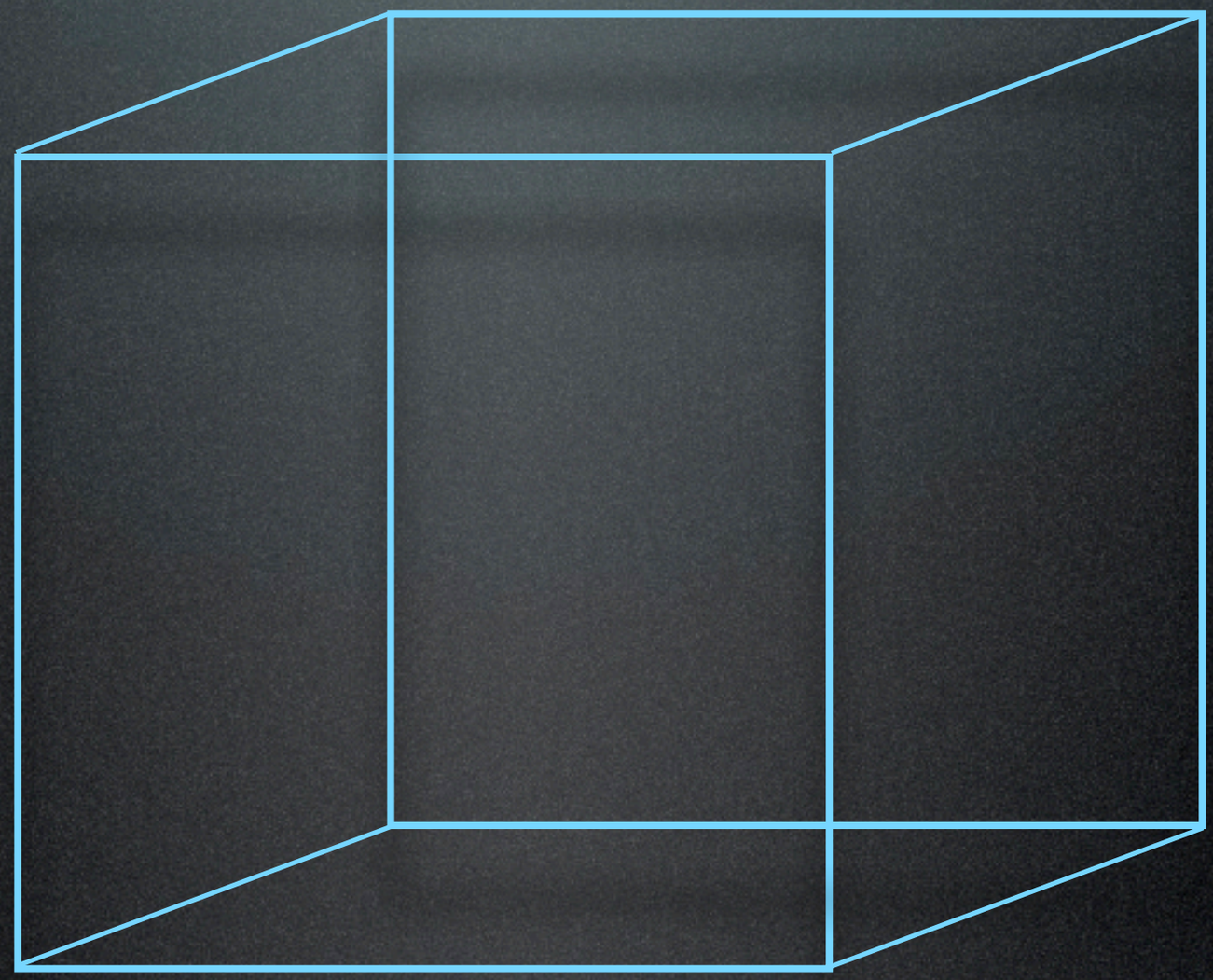
Int Short

Other Examples:

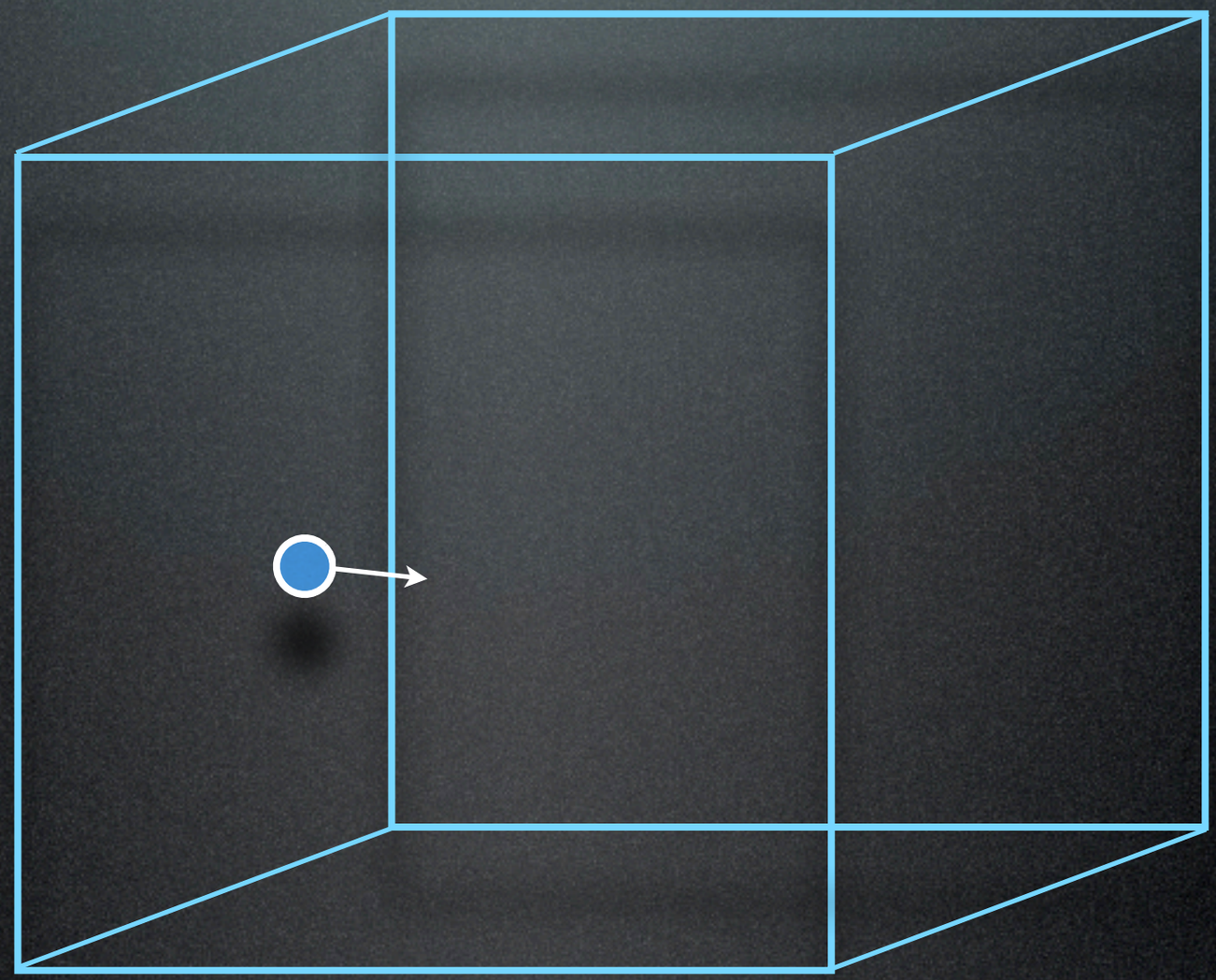
free viewpoint video
maps / huge images
3D teleimmersive system
volume visualization

What is common among them?

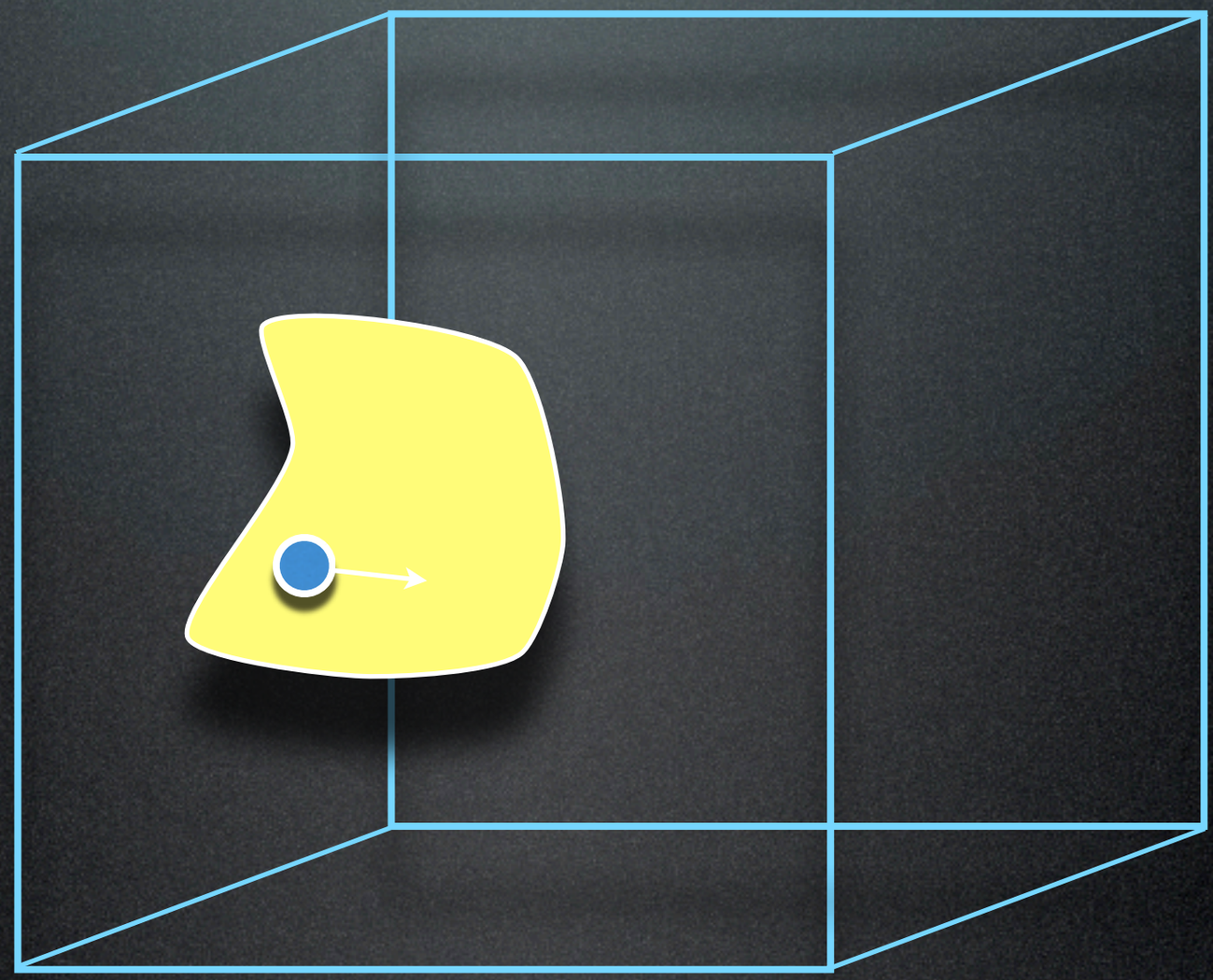
Media data occupies an **n-dimensional space**



A **viewpoint** sits in the n-dimensional space

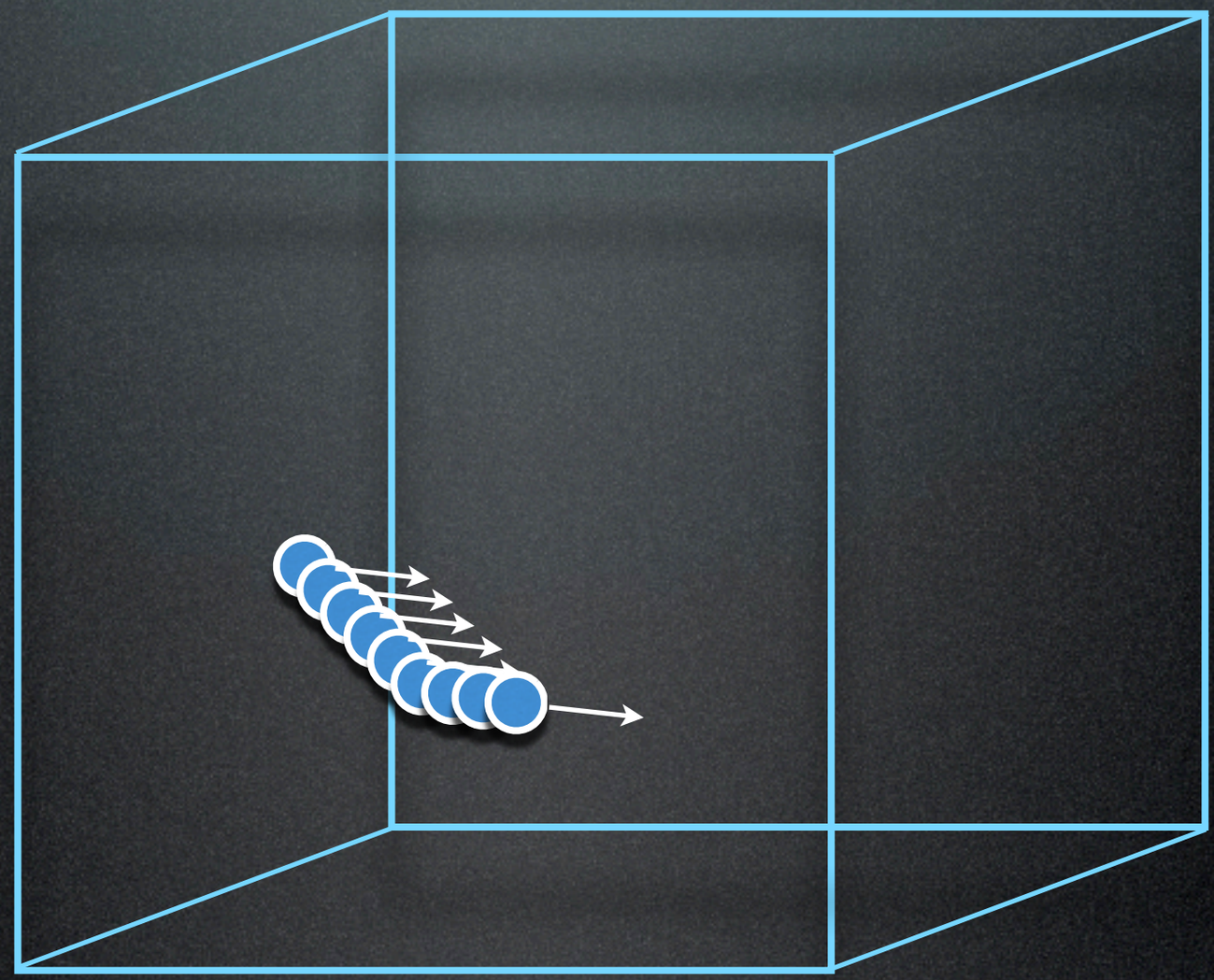


A **view** is a region of space visible from the viewpoint

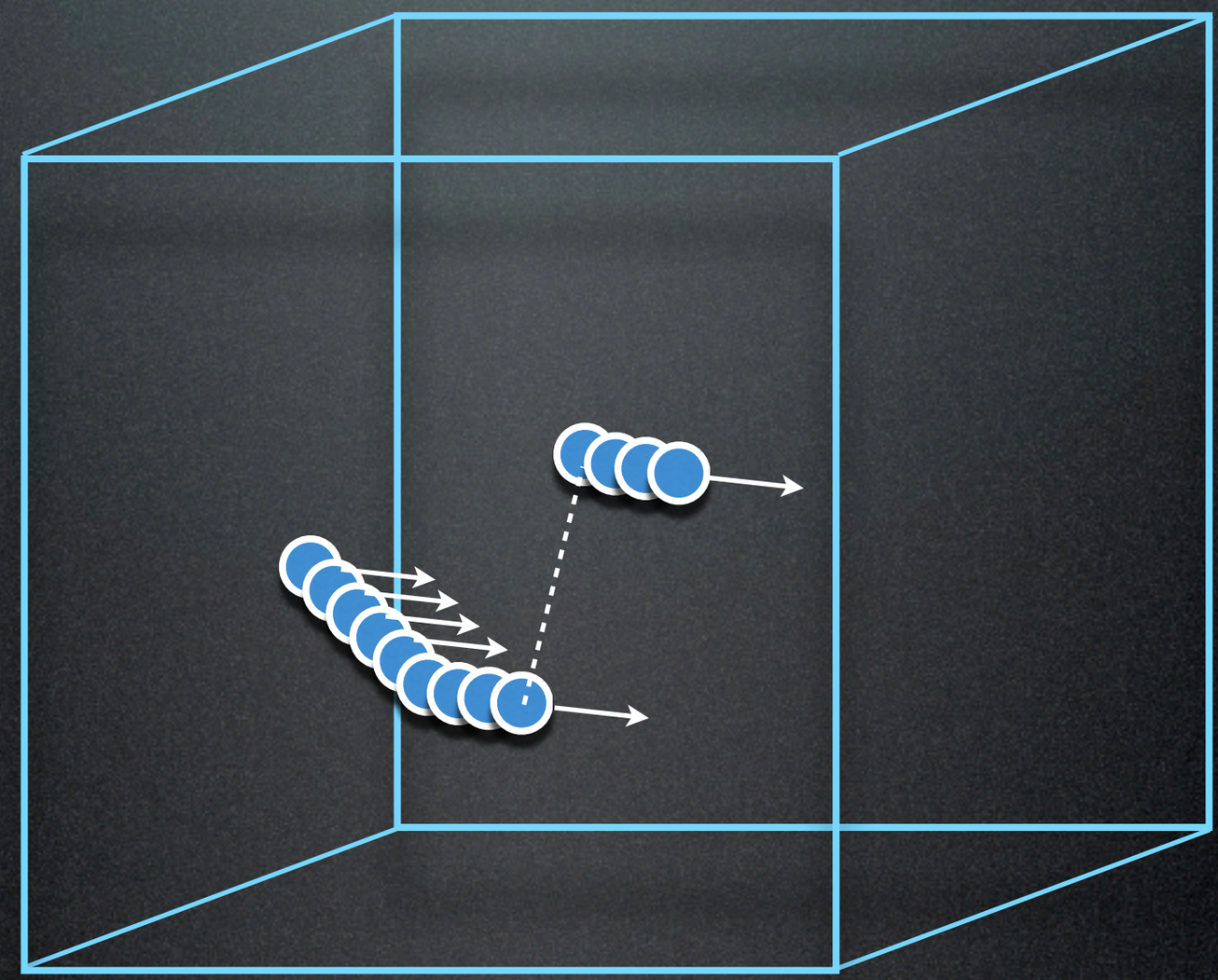



rotate
move
zoom
measure
normal size
reset

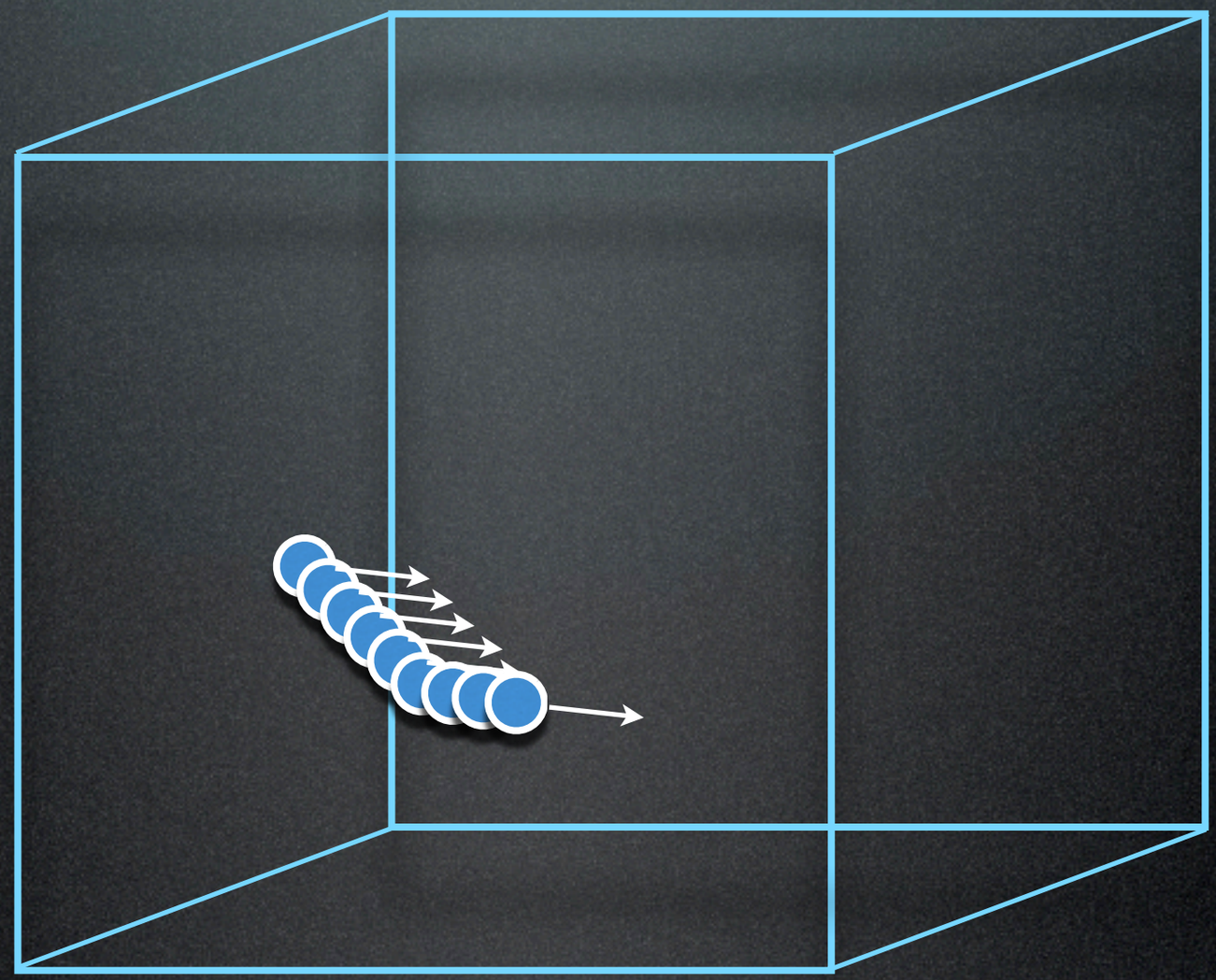
Interaction controls a **path**
of viewpoints over time



(the path need not be continuous)



For **a non-interactive** system, the path is fixed.



Video on Demand

1D (time)

Google Street View
2D (long, lat)

Free viewpoint video

2D (angle, time)

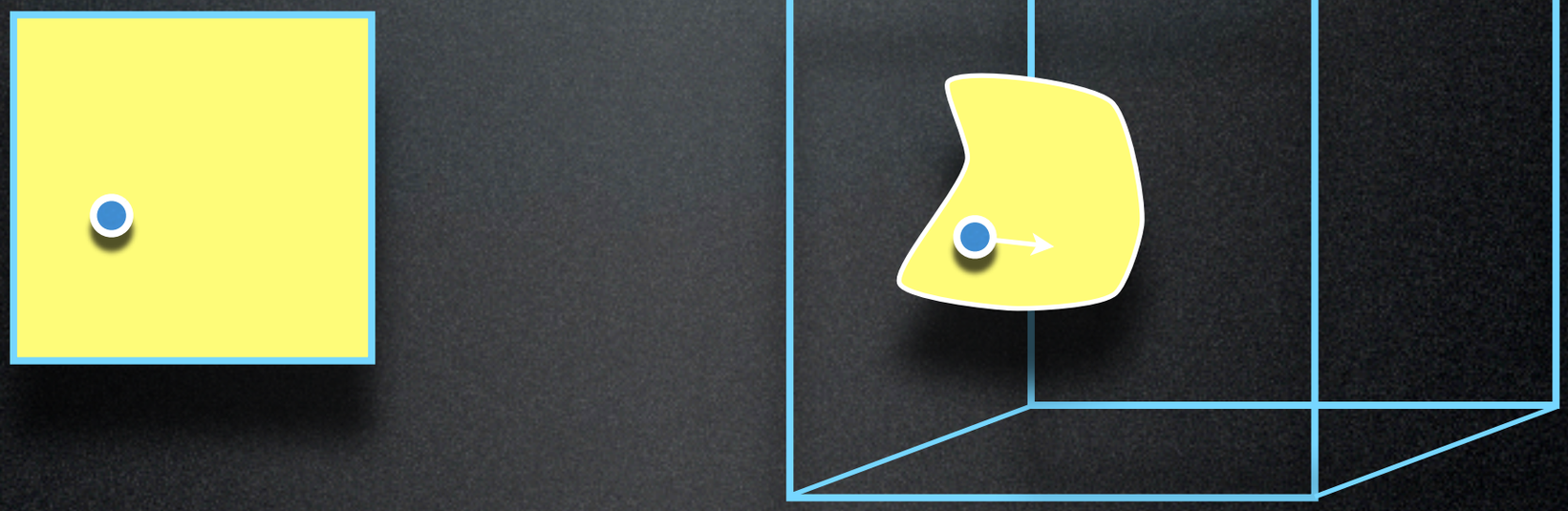
Virtual Earth

3D (long, lat, height)

Zoomable Video
4D (x, y, zoom, time)

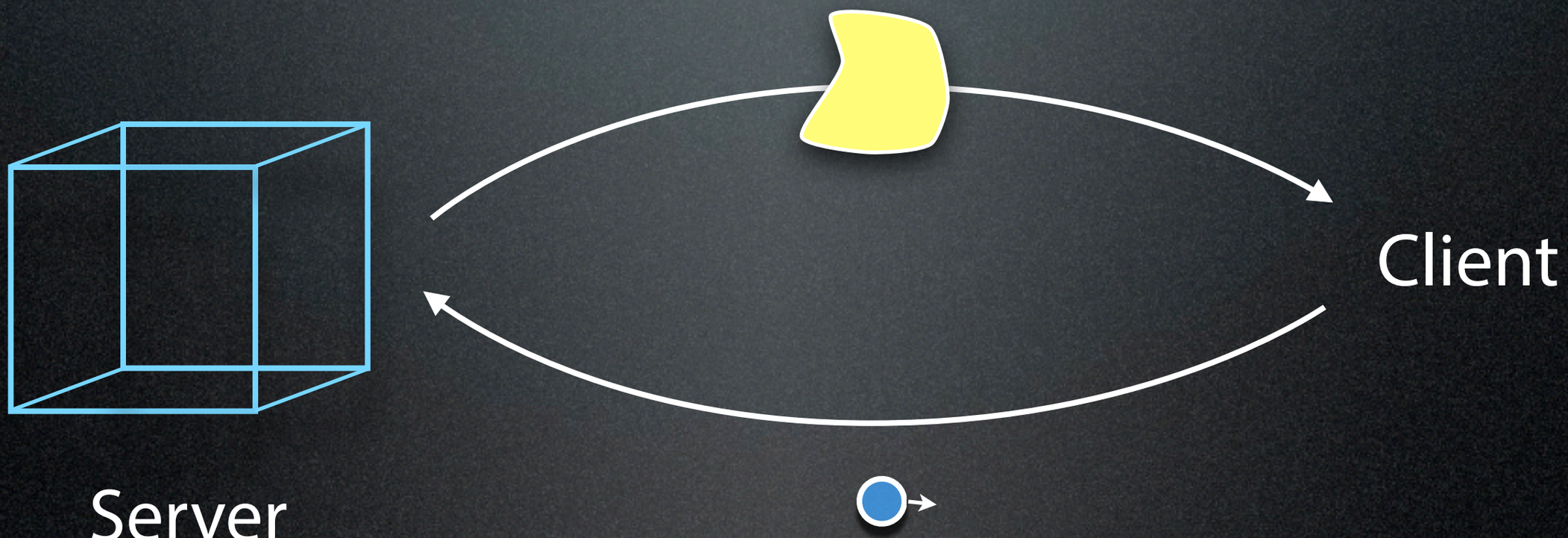
Why Interact?

1.
Too much data to display / perceive at one time



Sometimes too much data to **download** quickly as well

Interactive Media Streaming



how to keep interaction delay low?

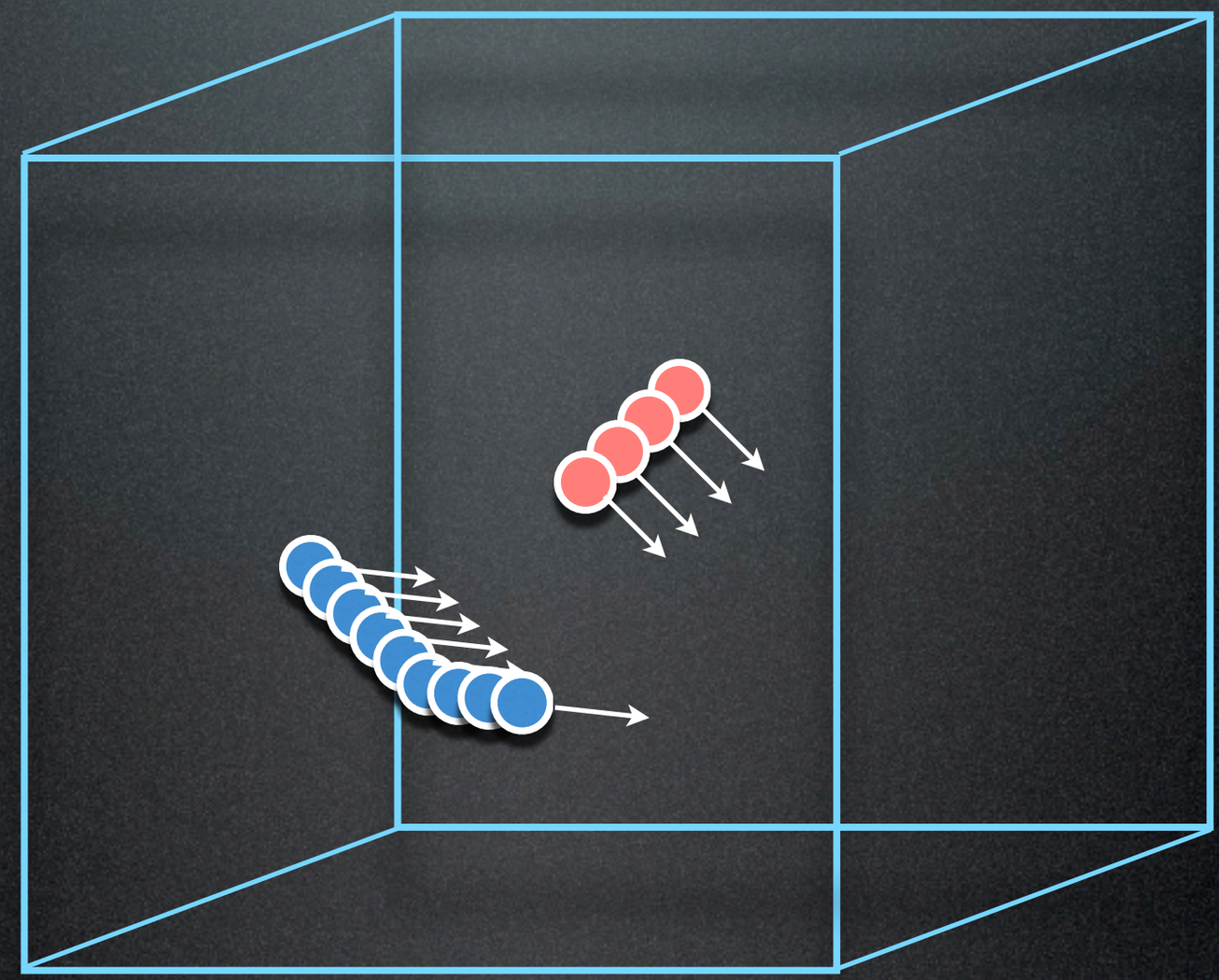
a. Use a closer server

b. Use caching proxy

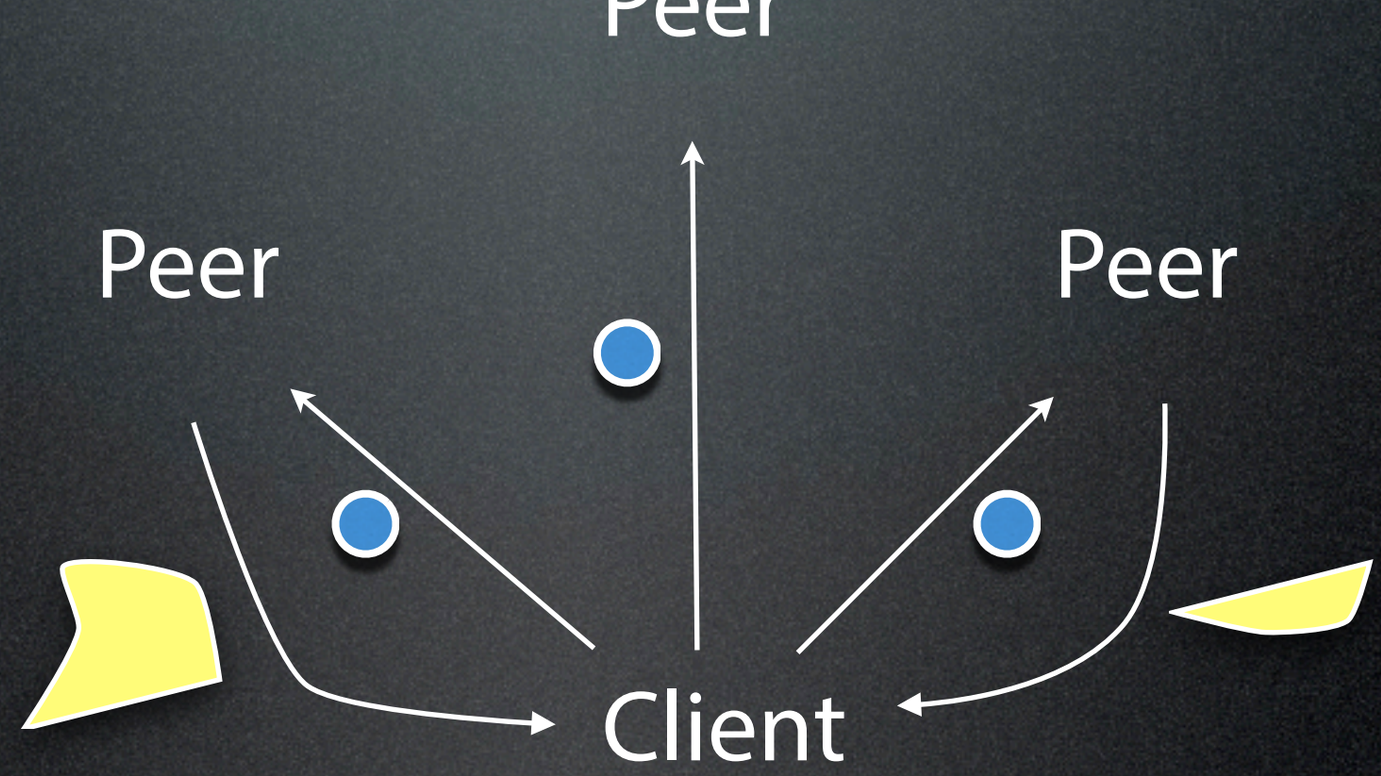
c. Use peer-to-peer

d. Prefetch data

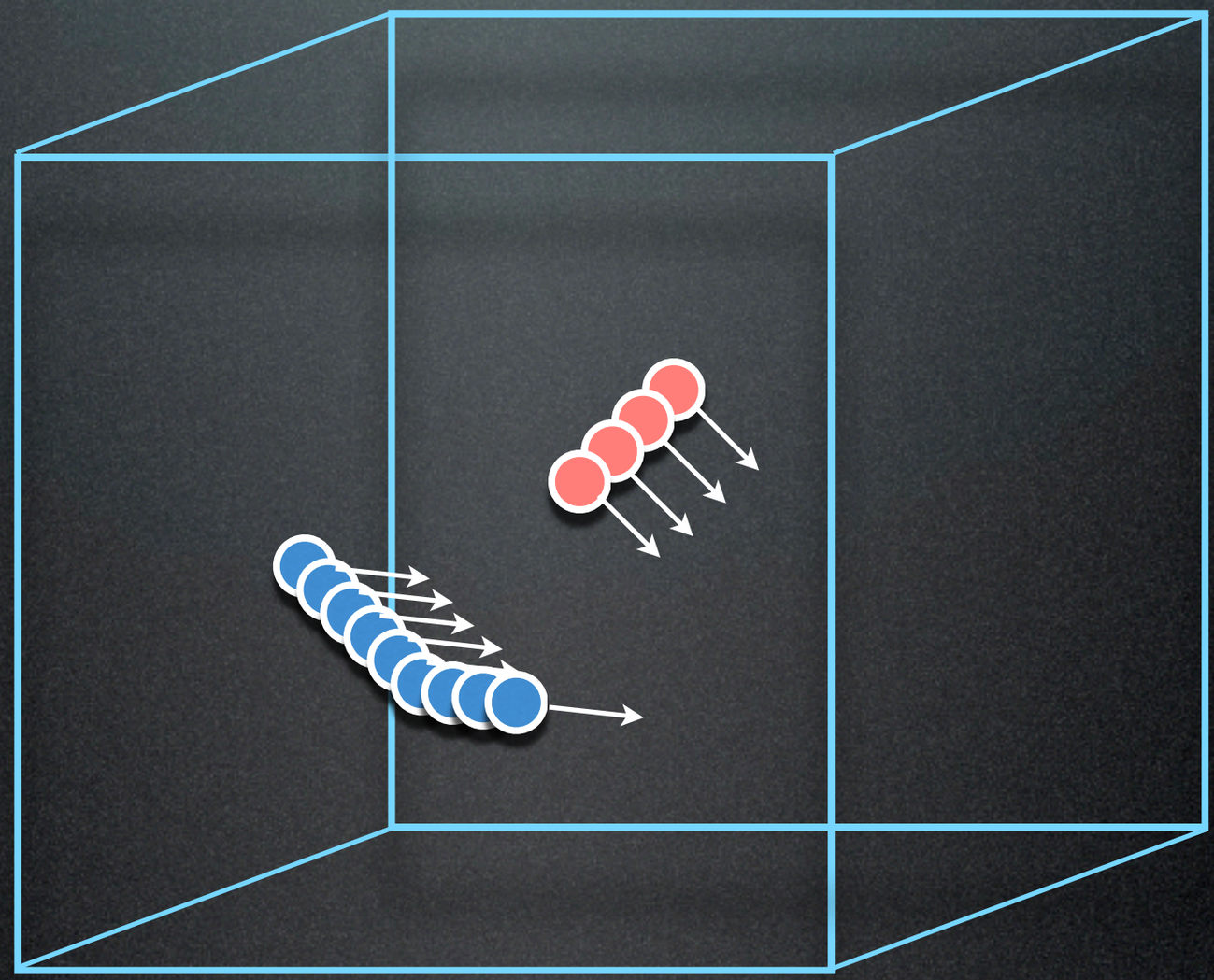
Caching is challenging since nearby clients may follow different paths



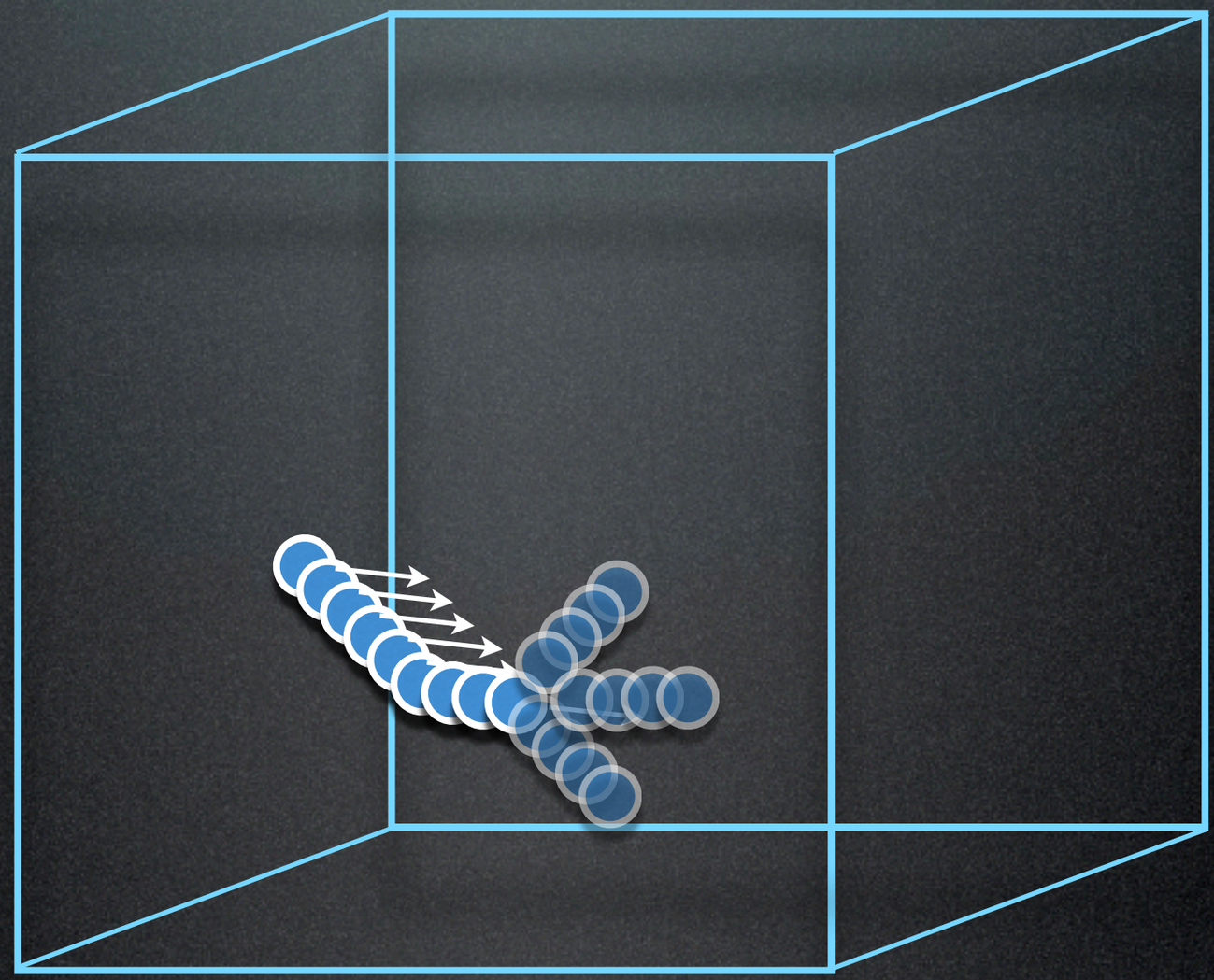
P2P Interactive Media Streaming



Content discovery is challenging since peers likely follow different paths



Prefetching is challenging since the path the client follows can change.



Hypothesis: the path depends on the content, context, and user habits.

Idea: learn from access **patterns** to predict a path

With great **freedom** comes great **uncertainty**

idea: limit the freedom of interaction or **guide** the interaction

Video on Demand
1D (time)

Google **Street View**
2D (long, lat)
(along fixed path)

are easier to predict

than

Google Earth
3D (long, lat, height)

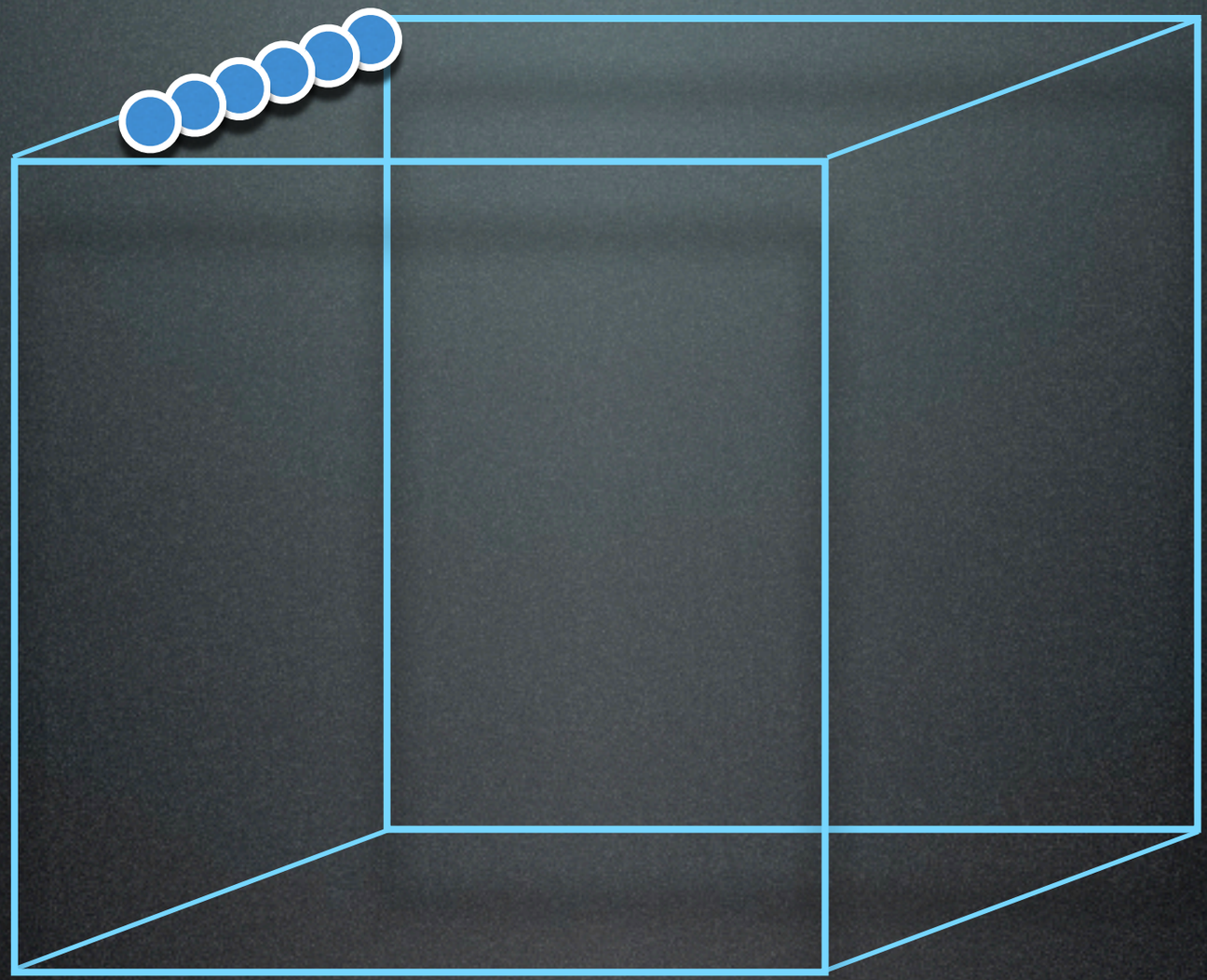
Zoomable Video
4D (x, y, zoom, time)

How to limit / guide interaction?

Why Interact?

1.

Too much data to display / perceive at one time



2.

To access data they are **interested** in

How to limit / guide interaction?

Simplify access to data users might be interested in

Screenshot from hulu.com

Google Earth

▼ Search

095357484 (Christ the Redeemer) Search

ex: Tokyo, Japan

Get Directions History

▼ Places

- Sightseeing Tour
  Make sure 3D Buildings layer is checked
  - Start tour here
  - The Eiffel Tower
    Located in Paris, France
  - Christ the Redeemer
    Located in Rio, Brazil
  - The Grand Canyon
    Located in Arizona, USA
  - Sydney
    New South Wales, Australia
  - St Peters Basilica
    Located in Vatican City
  - The London Eye
    Located in London, England
  - The Titanic

▼ Layers Earth Gallery »

- Primary Database
  - Borders and Labels
  - Places
  - Photos
  - Roads
  - 3D Buildings
    - Photorealistic

Landmarks or SLurls in Second Life

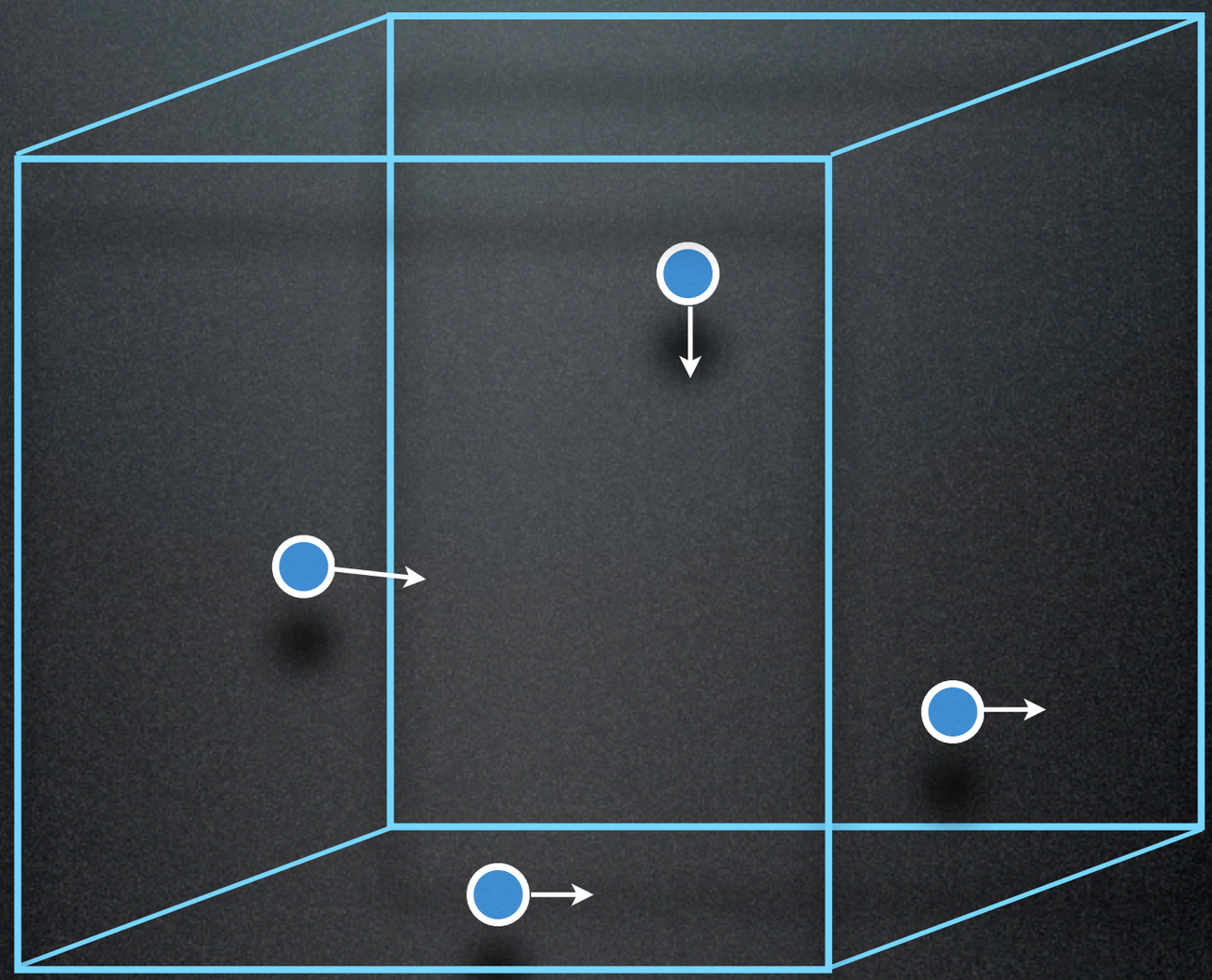
credit: moonflowerdragon

Issues:

1. too many?
2. may not be interesting?
3. interestingness change?

Challenge:

automatically determine the interesting viewpoints



idea: analyze content to find the interesting viewpoints (e.g., faces, goals, etc)

content analysis works to a certain extent ..

Image from metabunk.org

many viewers want to zoom into here instead

Image from metabunk.org

The path depends on the content, context, and user habits.

Idea: learn from access pattern to identify "hotspots"

A. Brampton, A. MacQuire, I. Rai, N. JP Race, L. Mathy, and M. Fry. **"Characterising User Interactivity for Sports Video-on-Demand,"** NOSSDAV 2007.

Bookmarks

Kick Off

Goal 1-0

Goal 2-0

Goal 3-0

Half-time

2nd Half

Goal 4-0

Goal 5-0

Goal 6-0

Full-time

User Bookmarks

riquelme-flick

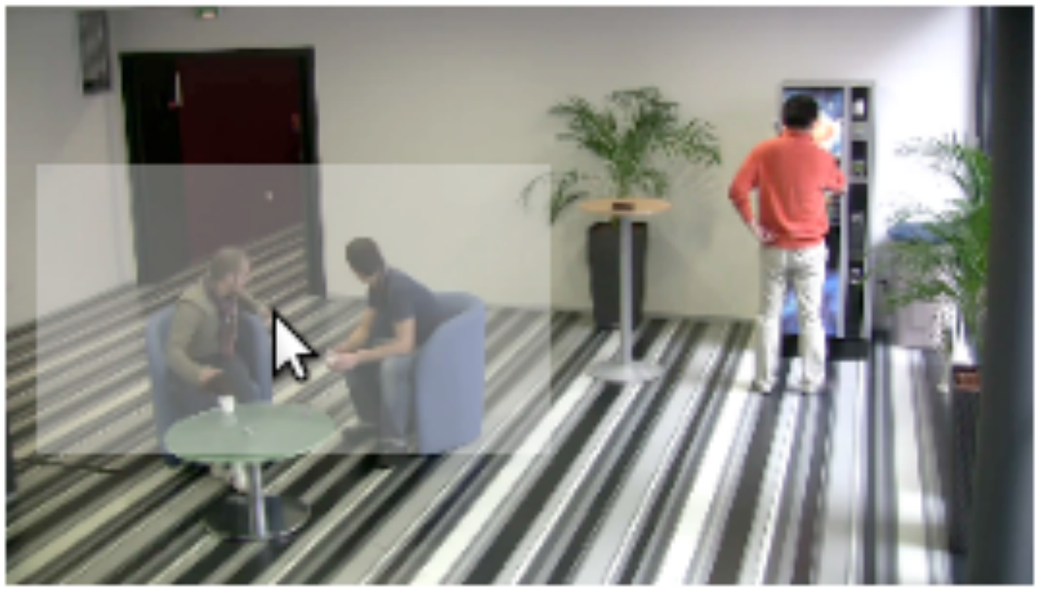
messi-foul

messi-pass

60s 30s 10s 10s 30s 60s tag

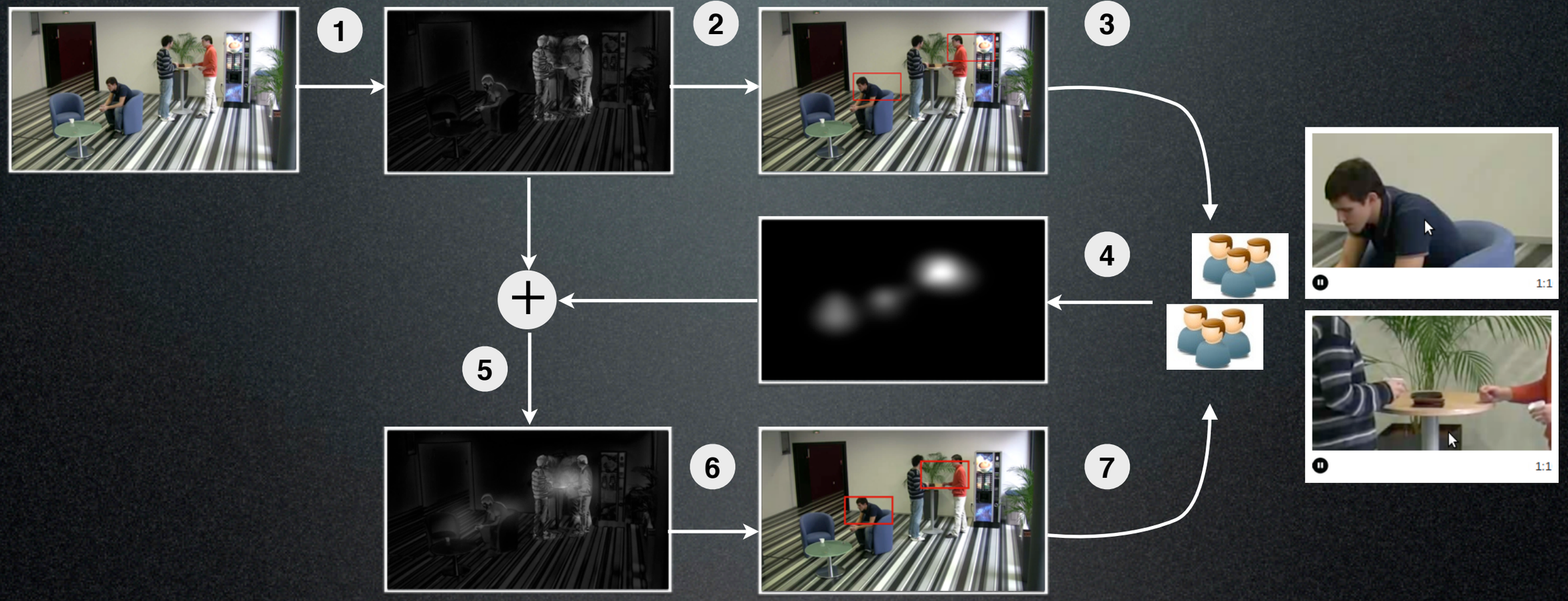
Image from Brampton et al

A. Carlier, G. Ravindra, V. Charvillat, and W.T. Ooi. "**Combining Content-based Analysis and Crowdsourcing to Improve User Interaction with Zoomable Video.**" MM'11



0:14

0:16


1
2
3
4
5
6
7
1:1
1:1

TP Nghiem, A. Carlier, G. Morin, and V. Charvillat. "**Enhancing Online 3D Products through Crowdsourcing**."
CrowdMM'12

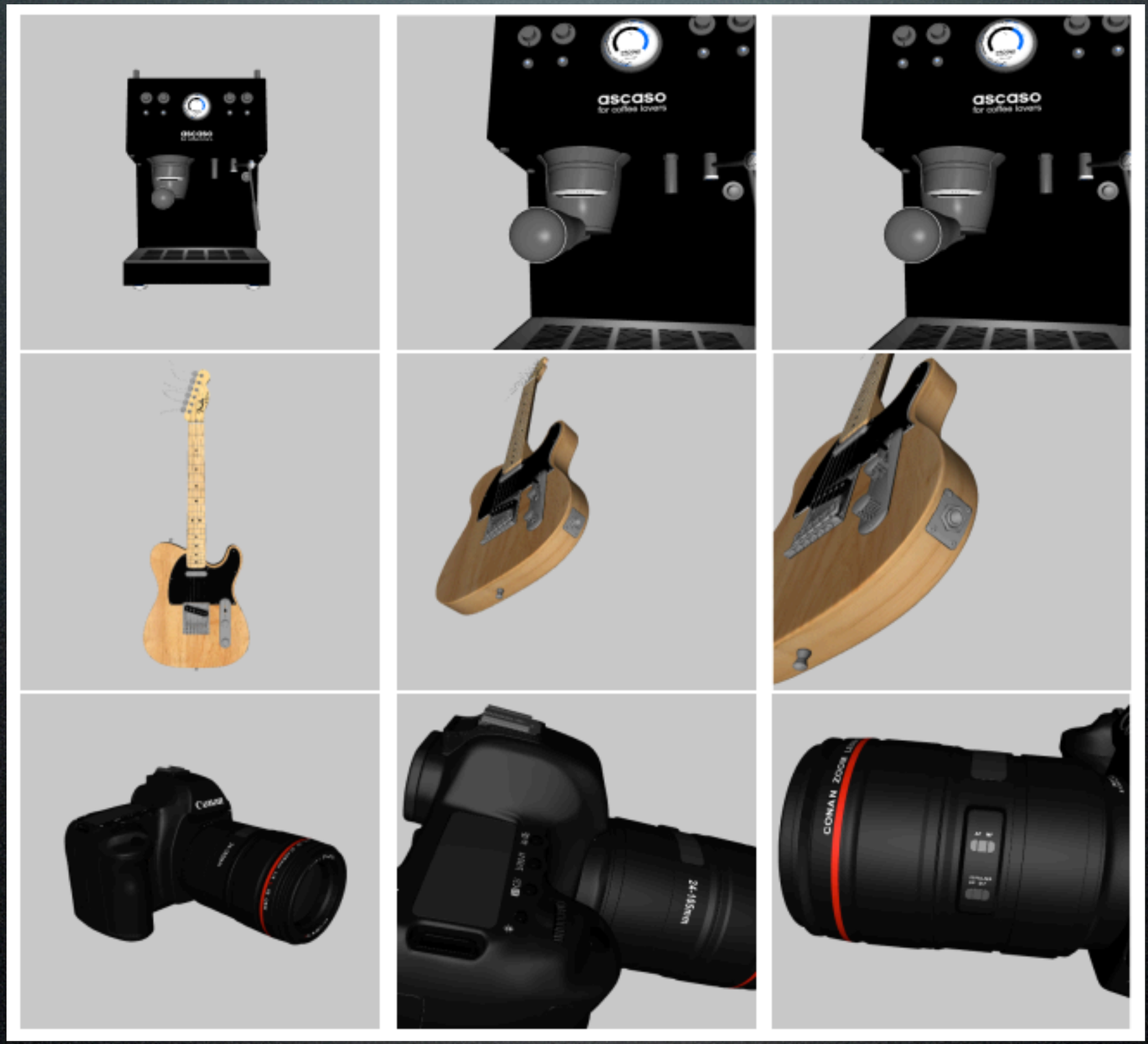


Image from Nghiem et al

Highlight interesting viewpoint ->
Allow direct access ->
Reduce interaction ->
Interaction becomes more predictable ->
Better caching/prefetching ->
Lower interaction delay ->
Better interaction system

Highlight interesting viewpoint ->
Allow direct access ->
Reduce interaction ->
Interaction becomes more predictable ->
Better caching/prefetching ->
Lower interaction delay ->
Better interaction system

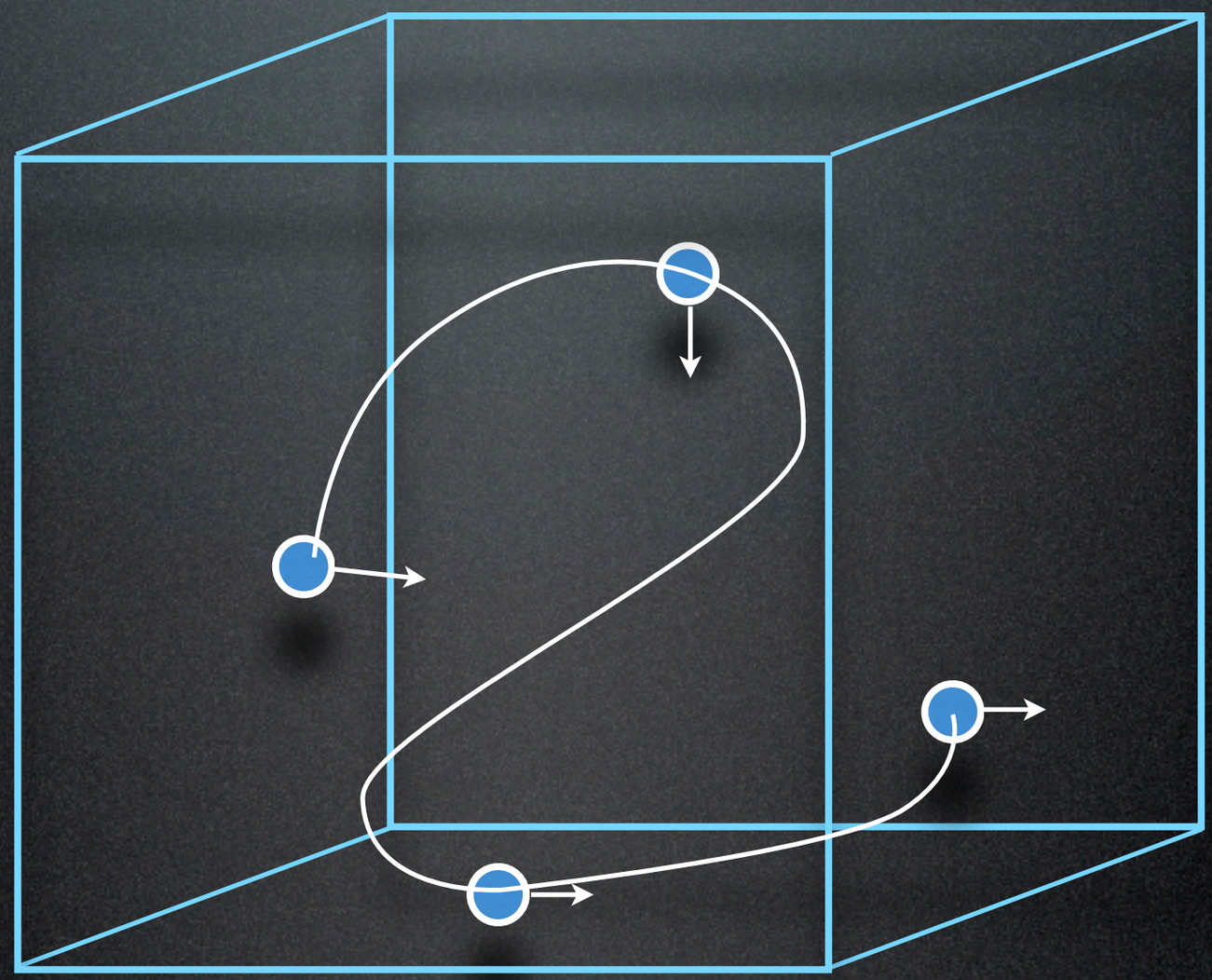
Could the best interactive system be a non-interactive one?

User interacts because there are more data than can be displayed/perceived and user wants to **view interesting data**

What if we show what is interesting to users without them interacting?

Challenge:

automatically determine the interesting **path**



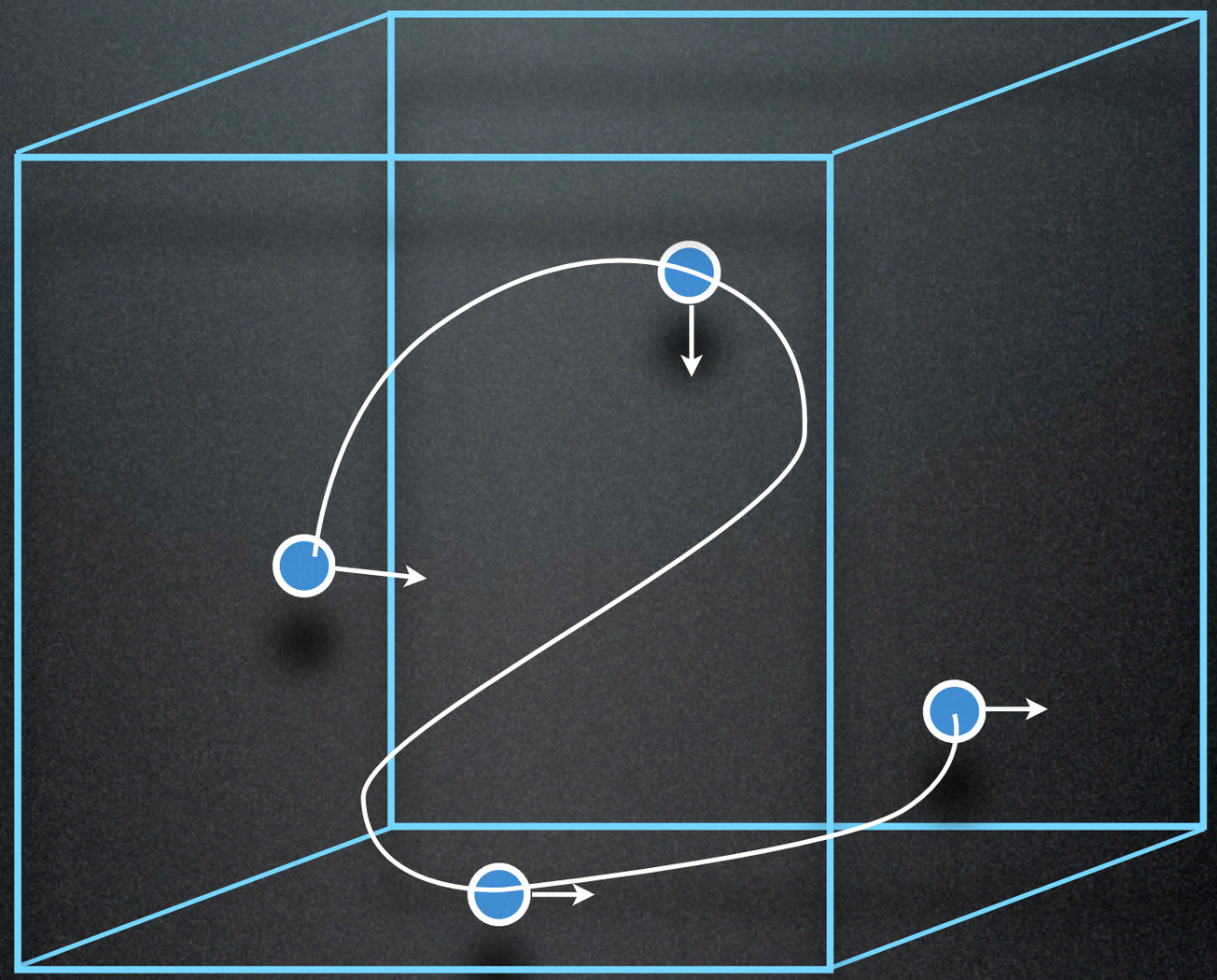
S-Y Wu, R. Thawonmas, and K-T Chen.
"**Video Summarization via Crowdsourcing**." CHI EA 2011

A. Carlier, V. Charvillat, WT. Ooi, R. Grigoras, and G. Morin. "**Crowdsourced Automatic Zoom and Scroll for Video Retargeting**."
MM'10

as well as many others in automatic camera navigation in 3D environments

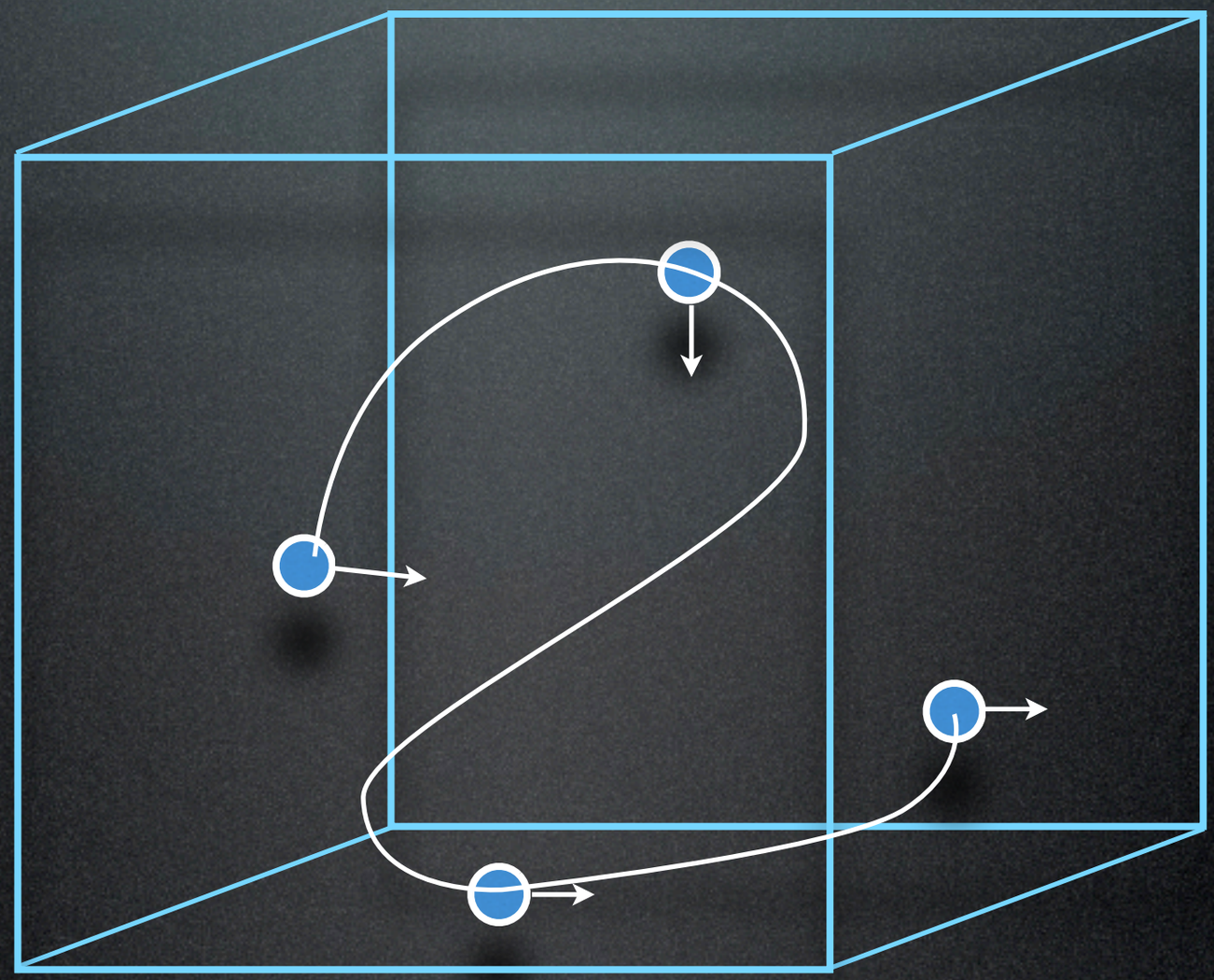
Challenge:

In what order do we visit the interesting viewpoints?



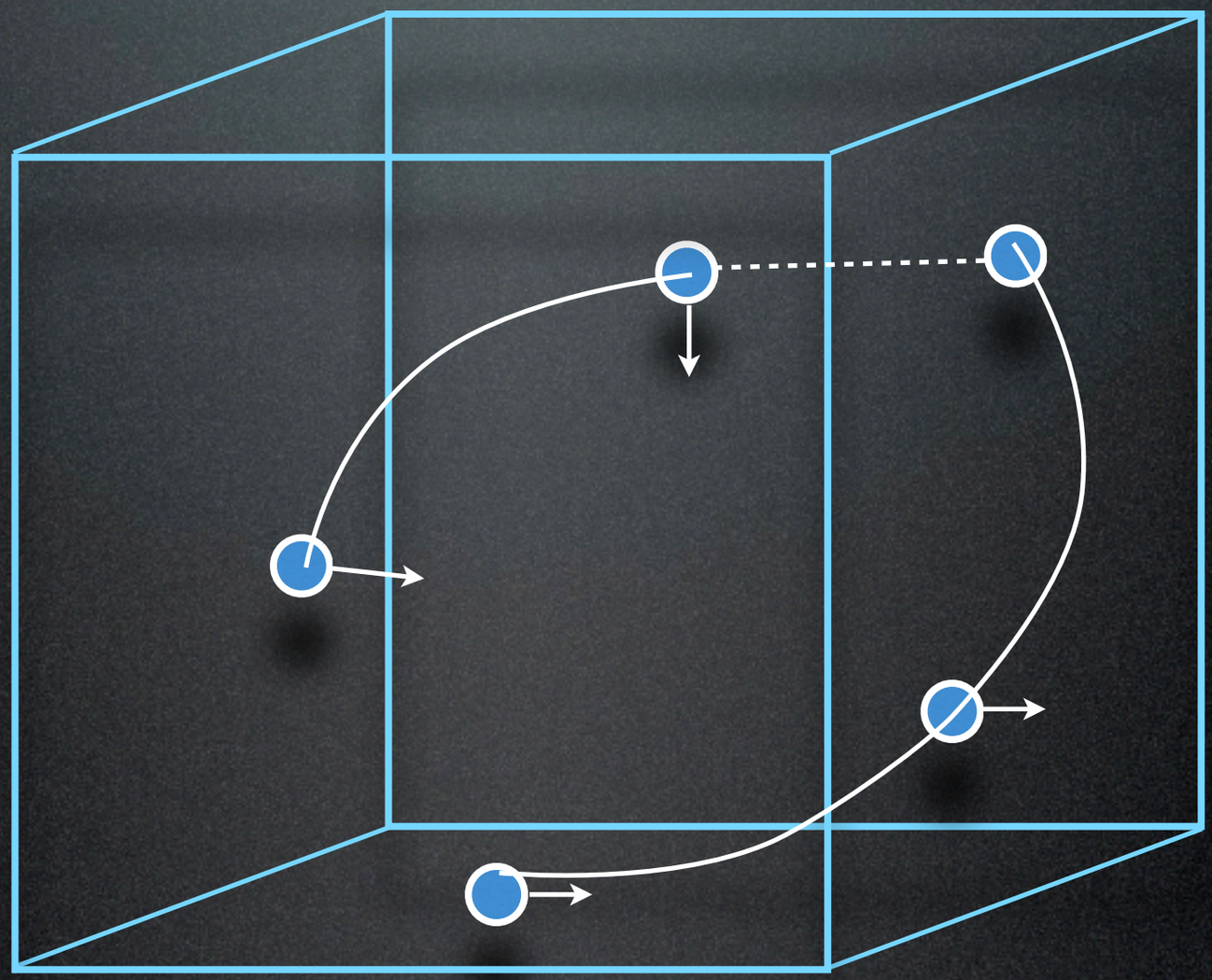
Challenge:

how to construct a smooth path between these viewpoints?



Challenge:

how to quickly react to manual override?



Concluding Messages

Restricting / guiding user interactions is useful

(how does your system do this?)

Interaction can improve passive consumption

(can your system exploit this?)

Passive-consumption-only is possible

(how can your system achieve this?)

interaction

learn from
interaction history
to limit
interaction freedom

reducing
interaction
freedom
can reduce
interaction delay

non-interaction

Thank You

(interaction time!)

UPCOMING DEADLINES:

MMSYS
19 - 21 MARCH 2014 SINGAPORE

CrowdMM'13
@ MM'13 BARCELONA, SPAIN

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NExT