Approaches to Facilitate Research Communication for Immersive Technologies

Nico Reski (doctoral student)

Guest seminar, University of Oulu

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Linnéuniversitetet

Today

- What is a research communication?
- Challenges of research communication
- Challenges of immersive technologies
- Research communication methods
  (for immersive technologies)
  Public events, Software demonstration videos,
  360° interactive web view, Open Source
- Q&A

What is research communication?

- ability to explain the own research in a clear and understandable way

- different target audiences
  - research community
  - stakeholders / collaborators
  - colleagues
  - the (general) public

via Goubert (2017)

What is research communication?

- not limited to presenting results in the end (“dissemination”)
- involves communication of (potentially) all steps of the research process “along the way”
- ideally raises public awareness and engagement in order to to establish a “conversation” with the other parties (for instance, the public)

via Goubert (2017) and Center for Innovation in Research and Teaching (2019)

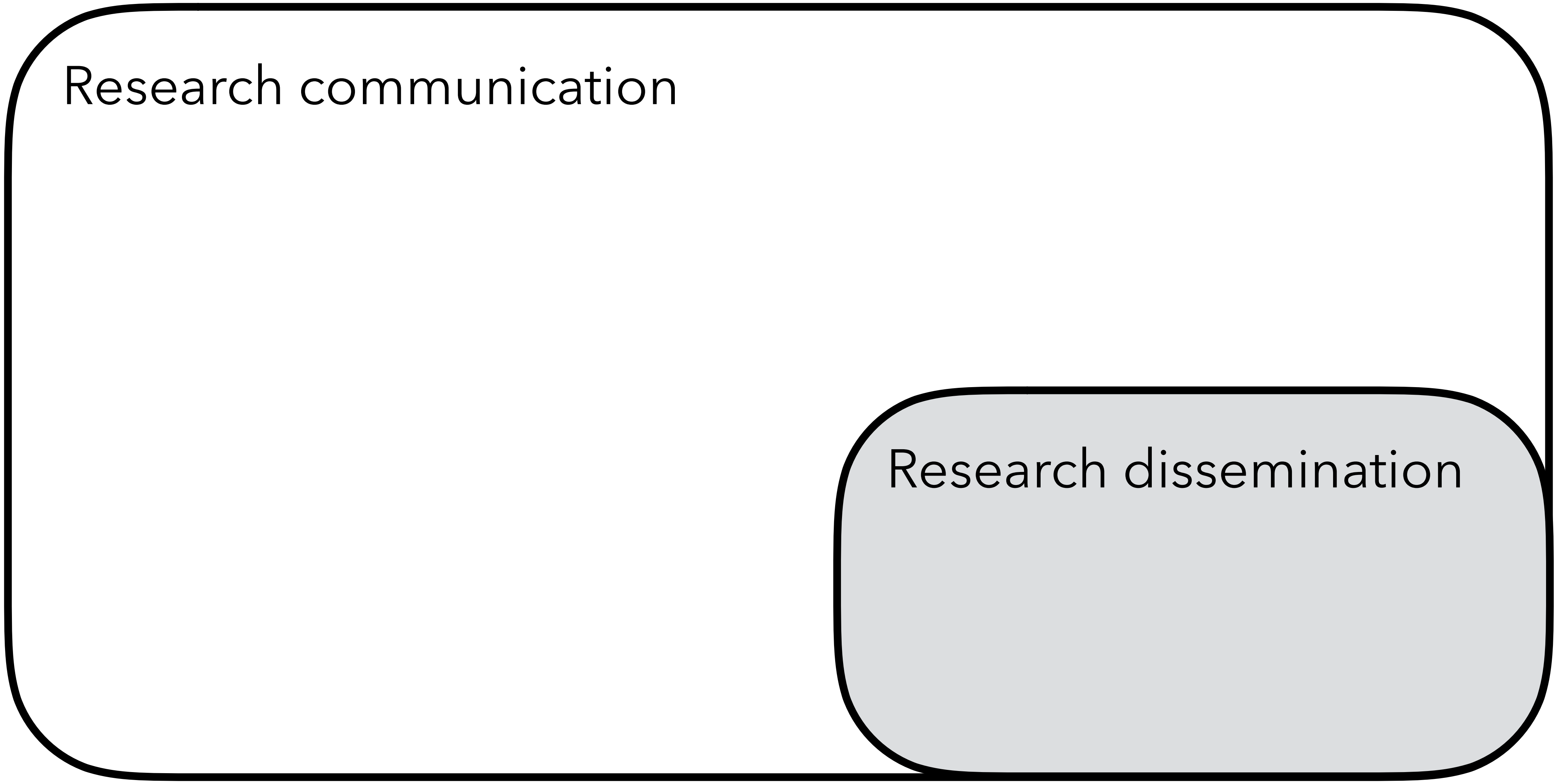
R. communication ≠ R. dissemination

- research dissemination is usually referred to as the process of presenting the research results in various formats towards the end of the latest research efforts (e.g. within a scientific report, conference talk, etc.)

- research dissemination may also involve the release of collected data, source code, applications, etc.

via Center for Innovation in Research and Teaching (2019)

R. communication ⊇ R. dissemination



Research dissemination can be seen as a sub-group of the broader activity of research communication.

Challenges of research communication

- “know your audience”: use non-scientific jargon when appropriate, and know what details / part of the work is interesting to your audience

- not every good researcher is also a good storyteller…

- time and resources for preparation and execution

via Goubert (2017) and Center for Innovation in Research and Teaching (2019)

Challenges of immersive technologies

- immersive technologies such as virtual reality (VR; among others) are usually “very visual”
  - consequently, simply describing them orally or in written text is rather challenging
    - even providing stating images often provide a rather limited impression of a VR application

- immersive technologies often require special hardware to experience

- immersive applications are often rather user-centric

Research communication methods (for immersive technologies)

1. attend public events
   - good for networking and direct contact with users
2. produce software demonstration videos
   - highlighting your VR application and its features
3. 360° interactive web view
   - enable the viewer to interactively explore your VR application from a specific viewpoint
4. publish / distribute your application open source
   - users can run / test / (modify) your application themselves

Public events

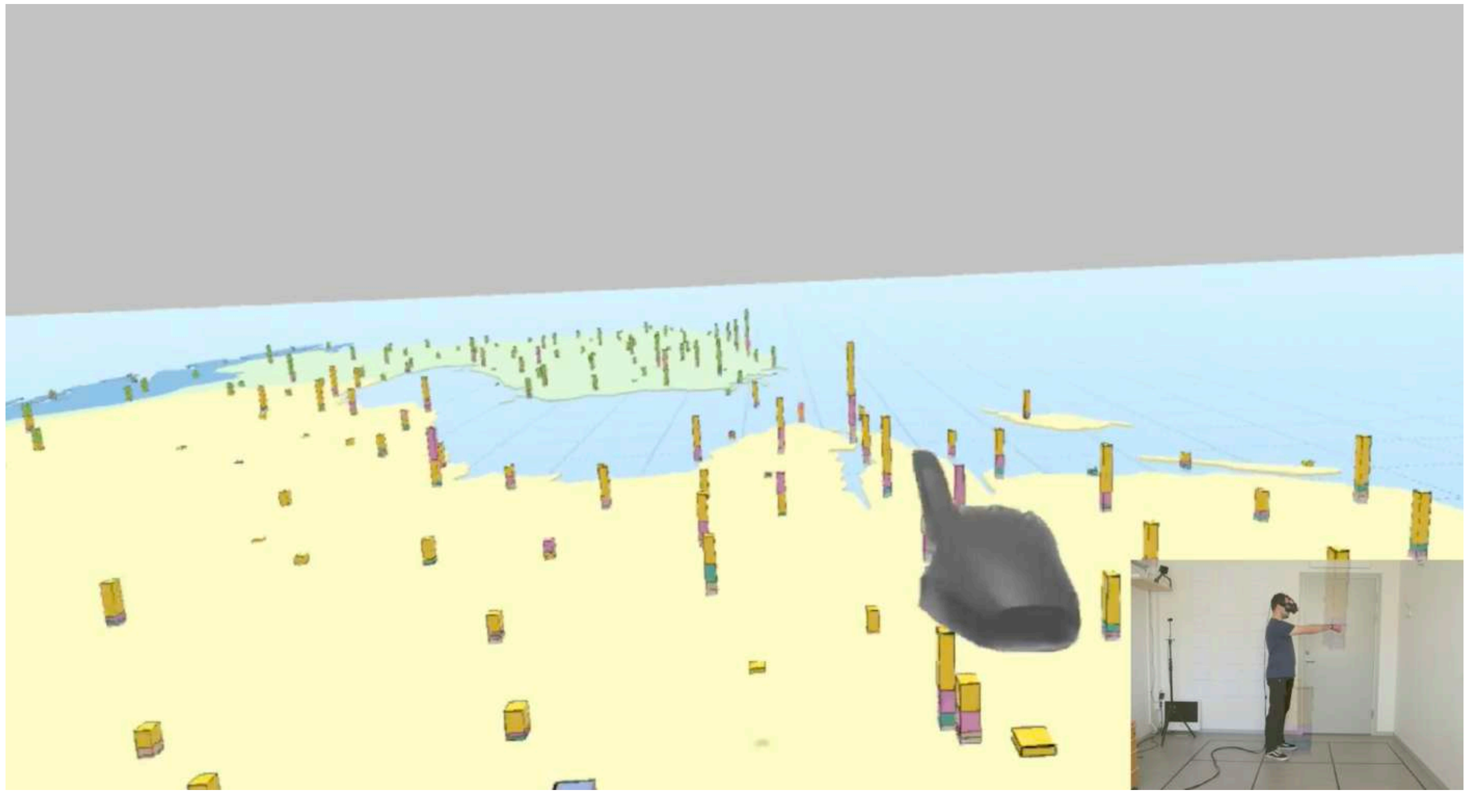
- “science outreach” initiatives

- relevant local / regional community meet-ups

- consider to provide a hands-on software demonstration
    - preparation: think about logistics (equipment) and investigate location (and its requirements)
    - conduction: public / target audience gets an impression of your work, while you have some “quick and dirty” real life test sessions (constructive feedback, fresh impulses)

Demonstration videos

- additional to screenshots or general image material, software demonstration videos usually provide the viewer with a better understanding of your application “in action”



VRxAR Labs - video demo [vimeo.com/vrxar/hcia-wip2018]

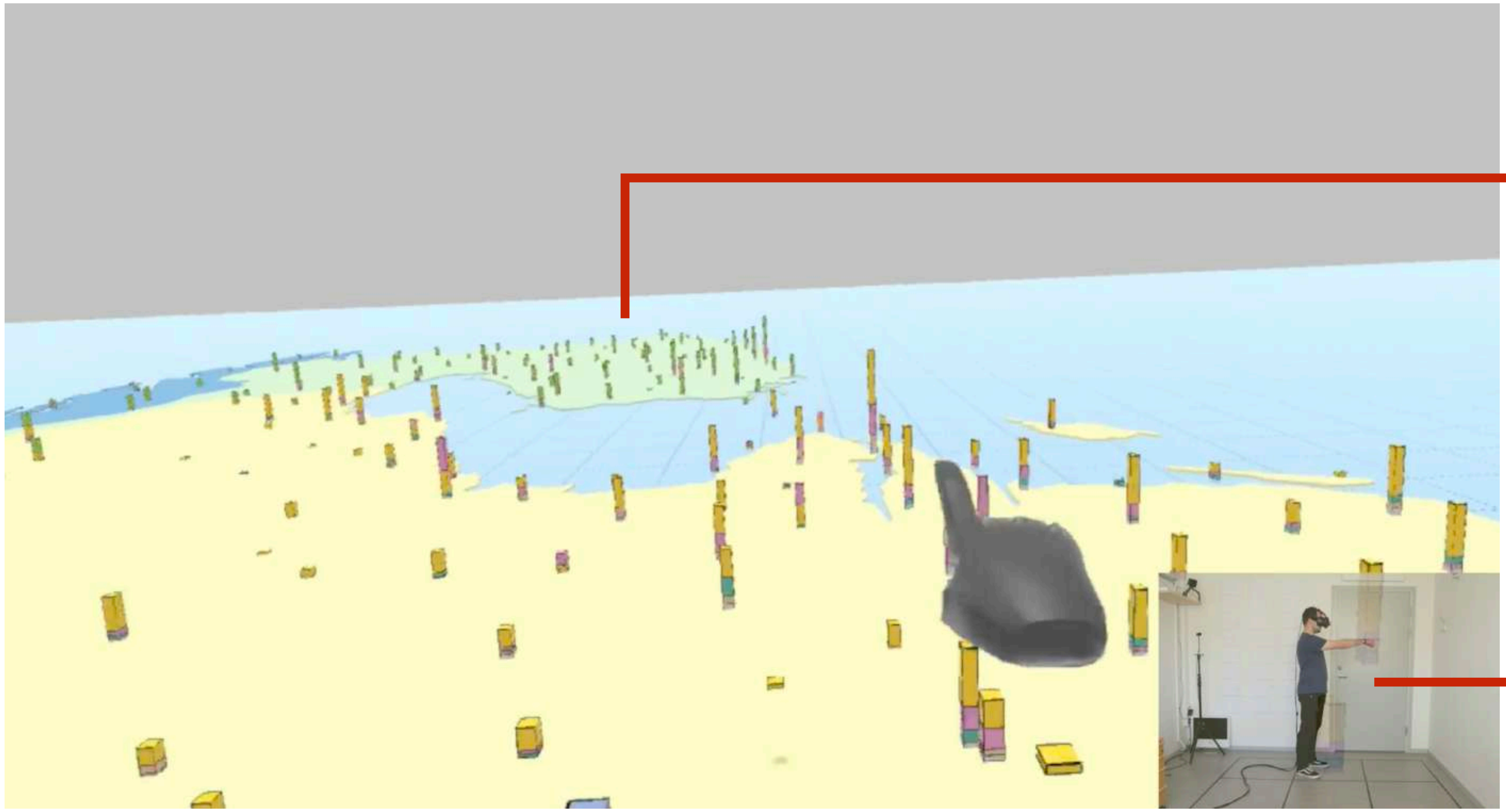
Considerations for producing a demo video 1/7

- consider recording a long take (one take, “one shot”) scene
  - uninterrupted demonstration (no cuts) of the application provides the viewer with a coherent impression
  - script (what to show, and how) is very useful
  - likely: multiple attempts necessary to get it right

- in general: create a script in advance, outlining all the scenes, features, interactions you want to demonstrate / communicate with the video
  - think about the purpose of the video
    (e.g. overall demonstration, demo of a specific feature)

Considerations for producing a demo video 2/7

- display both the (virtual) application as well as the user in the real world, for instance via picture-in-picture (PiP)

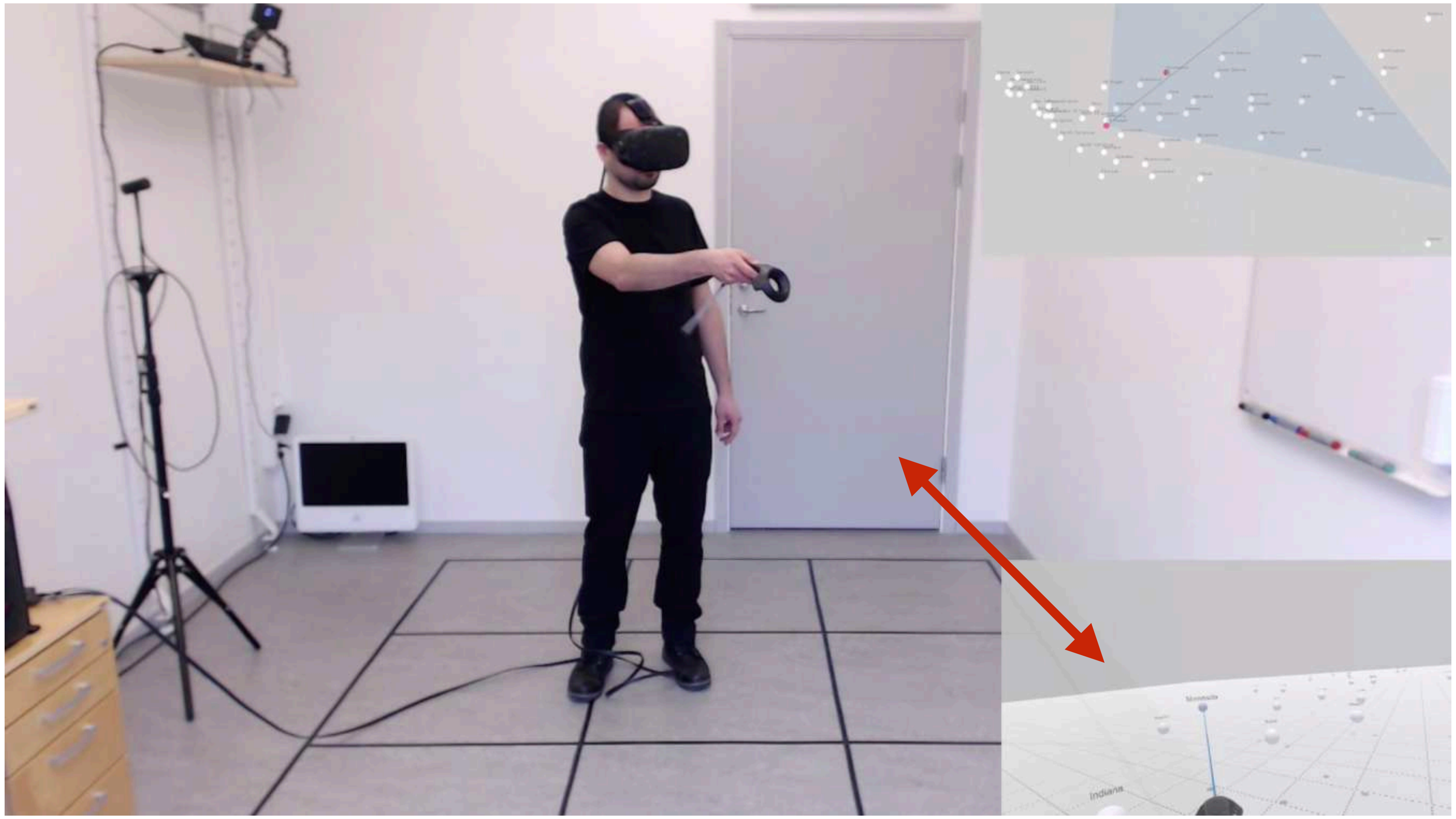


virtual, computer-generated environment

real world user as PiP; 80% opacity to not entirely occlude the virtual content “beneath”

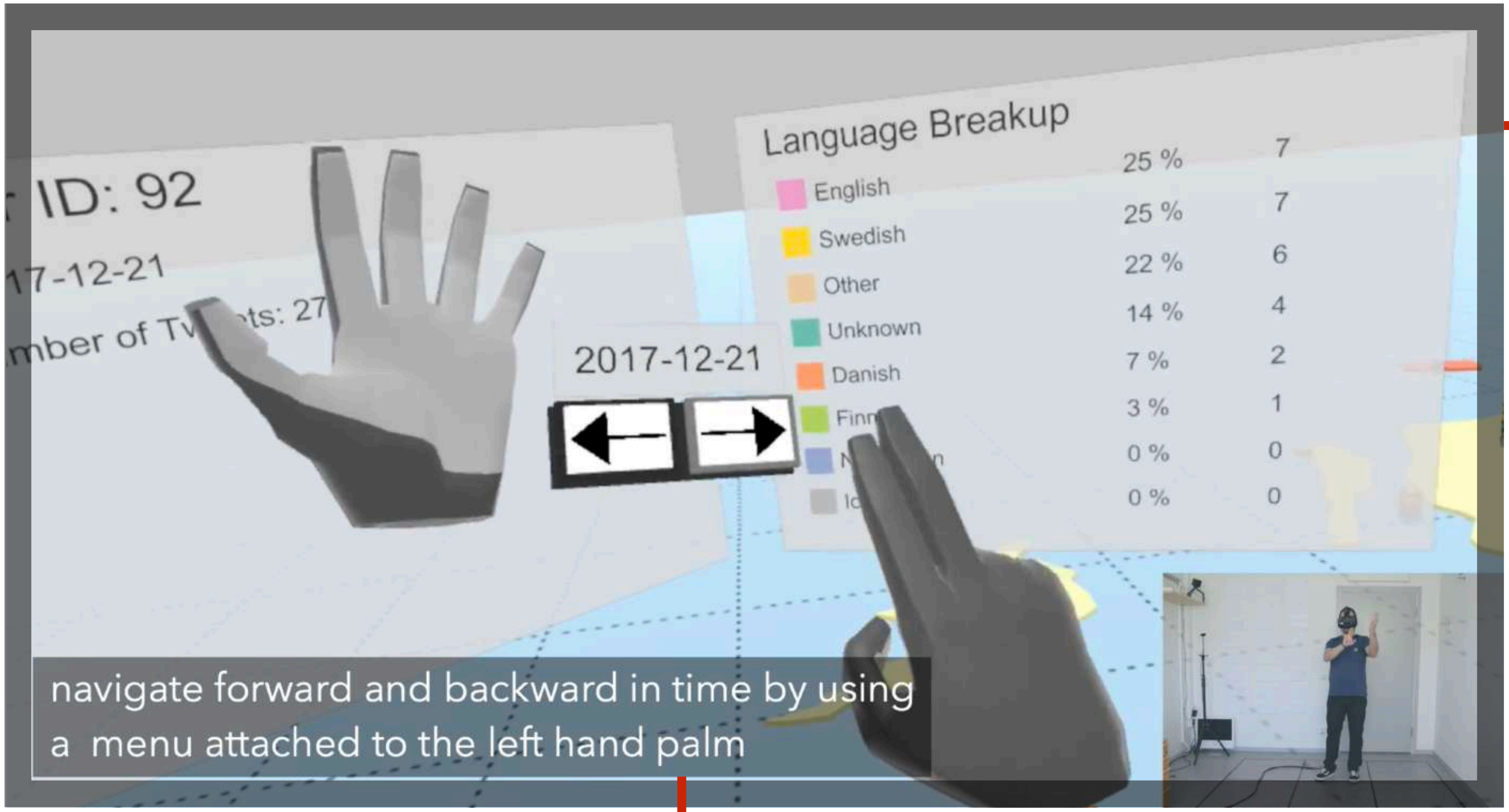
Considerations for producing a demo video 3/7

- switch display of (virtual) application and real world user, for instance to put an emphasis on a special interaction feature or input modality



Considerations for producing a demo video 4/7

- consider “holding” (pausing) the video via freeze frame and/or display descriptions of what is currently being demonstrated



English	25 %	7
Swedish	25 %	7
Other	22 %	6
Unknown	14 %	4
Danish	7 %	2
Finn	3 %	1
N n	0 %	0
Id	0 %	0

navigate forward and backward in time by using
a menu attached to the left hand palm

display “freeze frame” to provide a visual “pause” cue to the viewer

description of the currently demonstrated feature

(note: works also well when the video is displayed on loop in the background of an event)

Considerations for producing a demo video 5/7

- instead of explanatory subtitles (see previous slide), spoken narration / commentary may be an alternative to (literally) tell the viewer about your application
    - do not do both explanatory subtitles AND spoken narration: too many things going on for the viewer!
        - conventional subtitles are ok (potentially even in different languages to reach a broader audience)
    - narration is also great if you want to keep the viewer's attention, for instance within the context of an instruction video (for a user interaction study; having a video ensures every participant receives the same introduction)

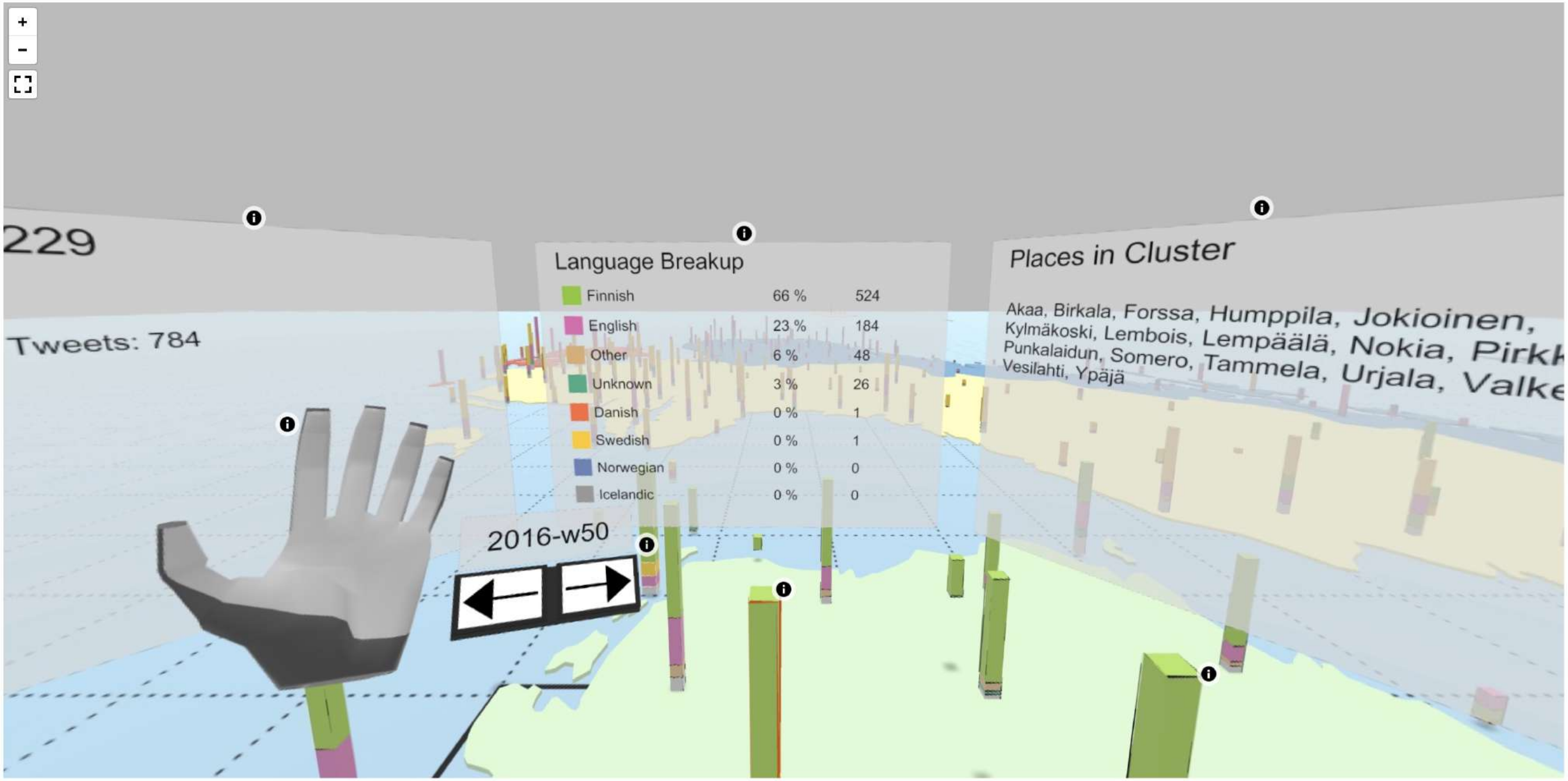
Considerations for producing a demo video 6/7

- when recording your demonstration video, be aware …
    - to do slow head and interaction movements
        - remember, the display medium is different (normal computer monitor vs. VR headset): "looking around" naturally in VR is possible much faster than following fast camera adjustments in conventional motion-picture
    - to not turn your-(real world)-self away from the camera
        - looking at the real world user's back is usually not that interesting for the viewer (plus you are likely occluding your interactions)

Considerations for producing a demo video 7/7

- consider introducing all / the main features of your application right from the start (within the first 1 or 2 minutes), and present some “pure” footage (no annotations, narration, subtitles, etc.) at the end of the video
    - if the viewer wants to get further (uninterrupted) impressions of your application, the viewer can simply “keep watching”, while not having to fear to miss any new feature introductions
    - be considerate with the viewer’s time

360° interactive web view - an example



Language Breakup

🟩 Finnish	66 %	524
🟪 English	23 %	184
🟧 Other	6 %	48
🟩 Unknown	3 %	26
🟥 Danish	0 %	1
🟨 Swedish	0 %	1
🟦 Norwegian	0 %	0
⬛ Icelandic	0 %	0

Places in Cluster

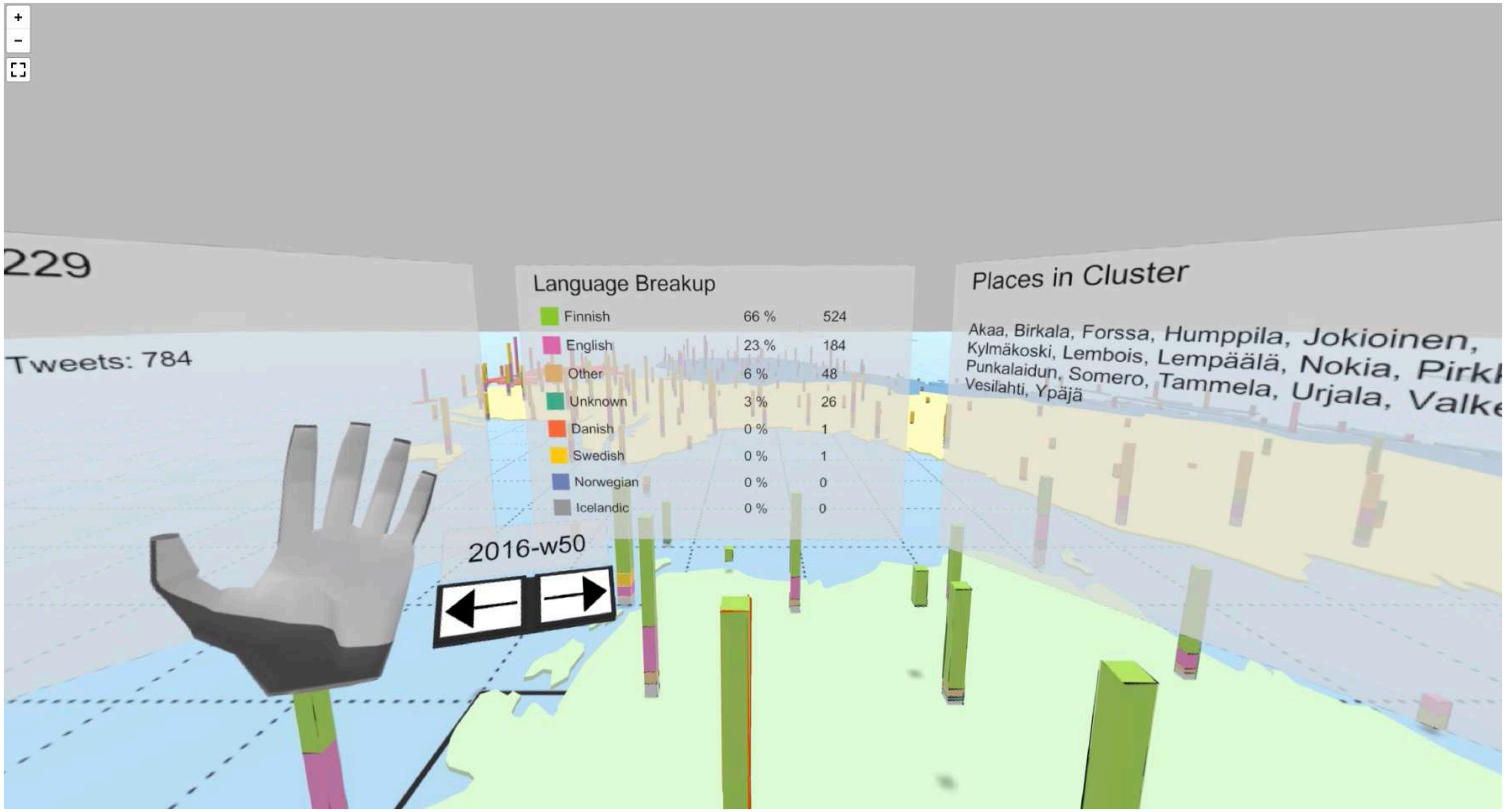
Akaa, Birkala, Forssa, Humppila, Jokioinen,
Kylmäkoski, Lembois, Lempäälä, Nokia, Pirkk
Punkalaidun, Somero, Tammela, Urjala, Valke
Vesilahti, Ypäjä

VRxAR Labs - 360° demo [vrxar.lnu.se/apps/odxvrxnts-360/]

360° interactive web views

- 360° photo / screenshot displayed using a normal web browser (desktop or mobile)
- view is pan- and zoom-able to interactively “look around”
- provides the user with an opportunity to explore the immersive virtual scene
    1. at own accord
    2. using non-immersive technologies (no special hardware, e.g. VR headset, required)

Good: Display unaltered version of the captured virtual scene.



229

Tweets: 784

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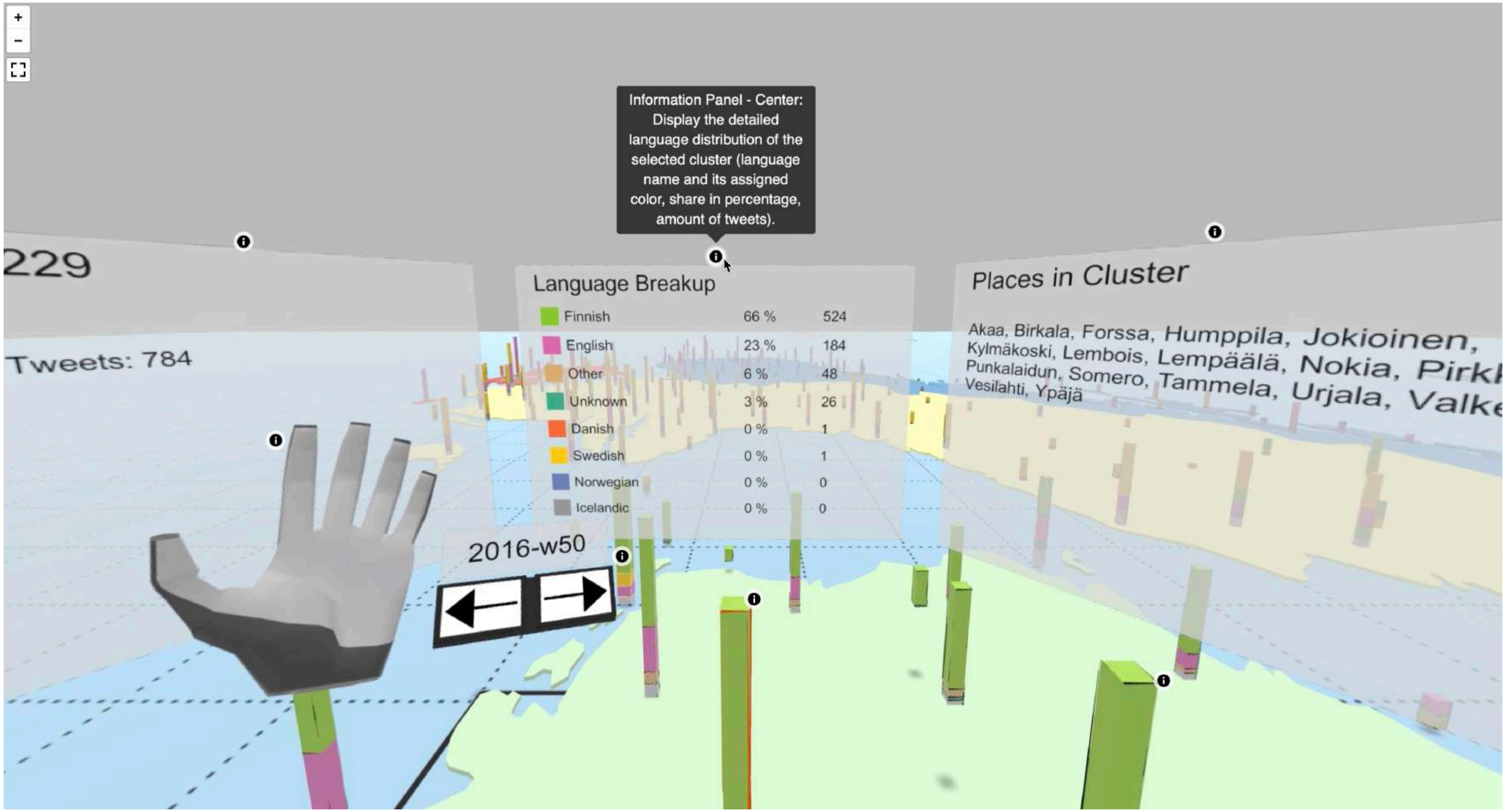
VRxAR Labs - 360° demo [vrxar.lnu.se/apps/odxvrxnts-360/?annot=false]

360° interactive web view

Better: Display annotations, describing different elements and features within your virtual reality scene in order to further facilitate the user’s understanding.



Information Panel - Center: Display the detailed language distribution of the selected cluster (language name and its assigned color, share in percentage, amount of tweets).

Language Breakup

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🟥 Danish	0 %	1
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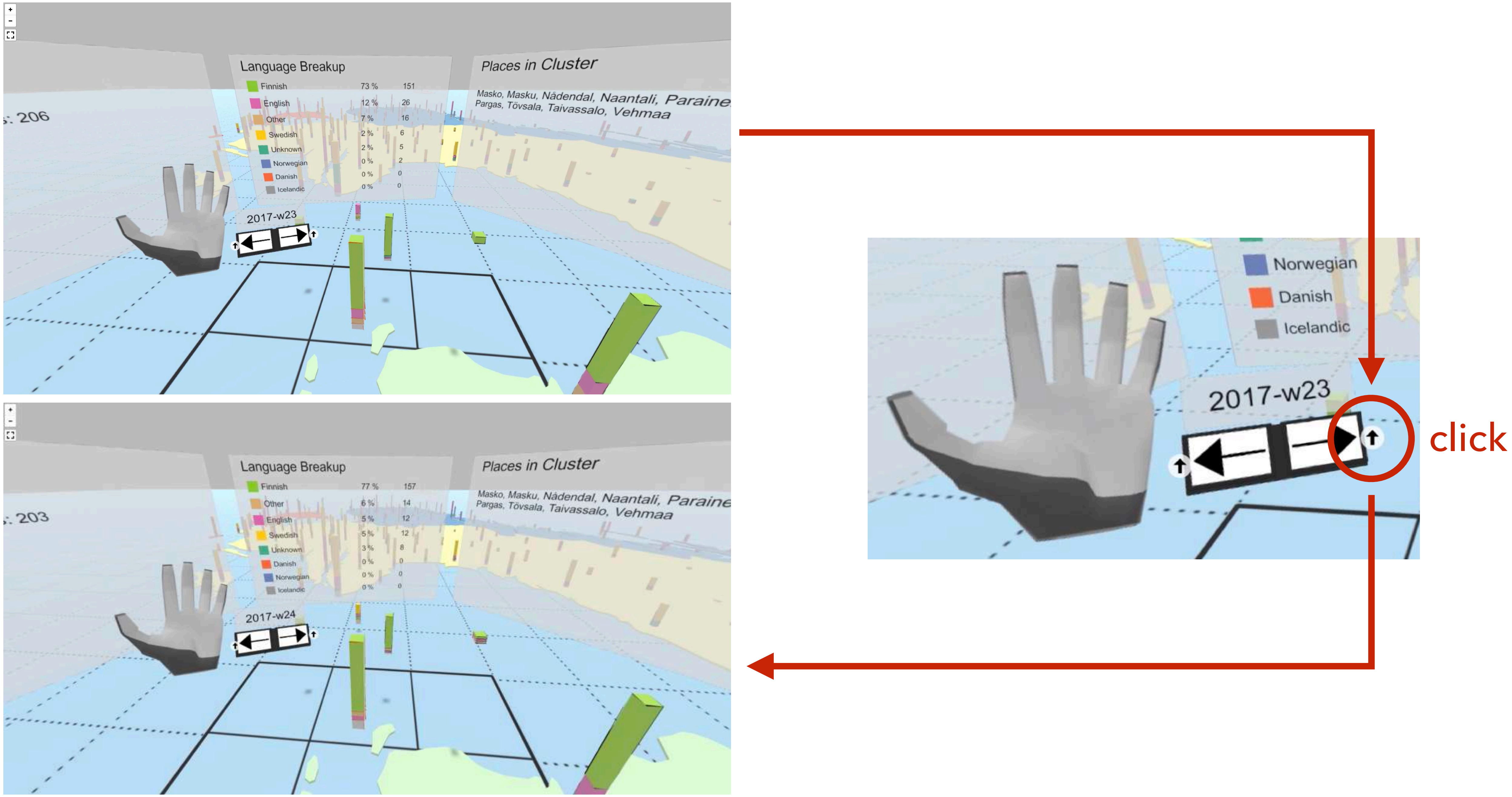
VRxAR Labs - 360° demo [vrxar.lnu.se/apps/odxvrxnts-360/?annot=true]

Interaction: Consider “simulating” interaction in your 360° view, for instance operating the user interface in order to communicate interactive aspects your VR application.



Language Breakup

🟩 Finnish	73 %	151
🟪 English	12 %	26
🟧 Other	7 %	16
🟨 Swedish	2 %	6
🟩 Unknown	2 %	5
🟦 Norwegian	0 %	2
🟥 Danish	0 %	0
⬜ Icelandic	0 %	0

Places in Cluster

Masko, Masku, Nådendal, Naantali, Paraine
Pargas, Tövsala, Taivassalo, Vehmaa

Language Breakup

🟩 Finnish	77 %	157
🟧 Other	6 %	14
🟪 English	5 %	12
🟨 Swedish	5 %	12
🟩 Unknown	3 %	8
🟥 Danish	0 %	0
🟦 Norwegian	0 %	0
⬜ Icelandic	0 %	0

Places in Cluster

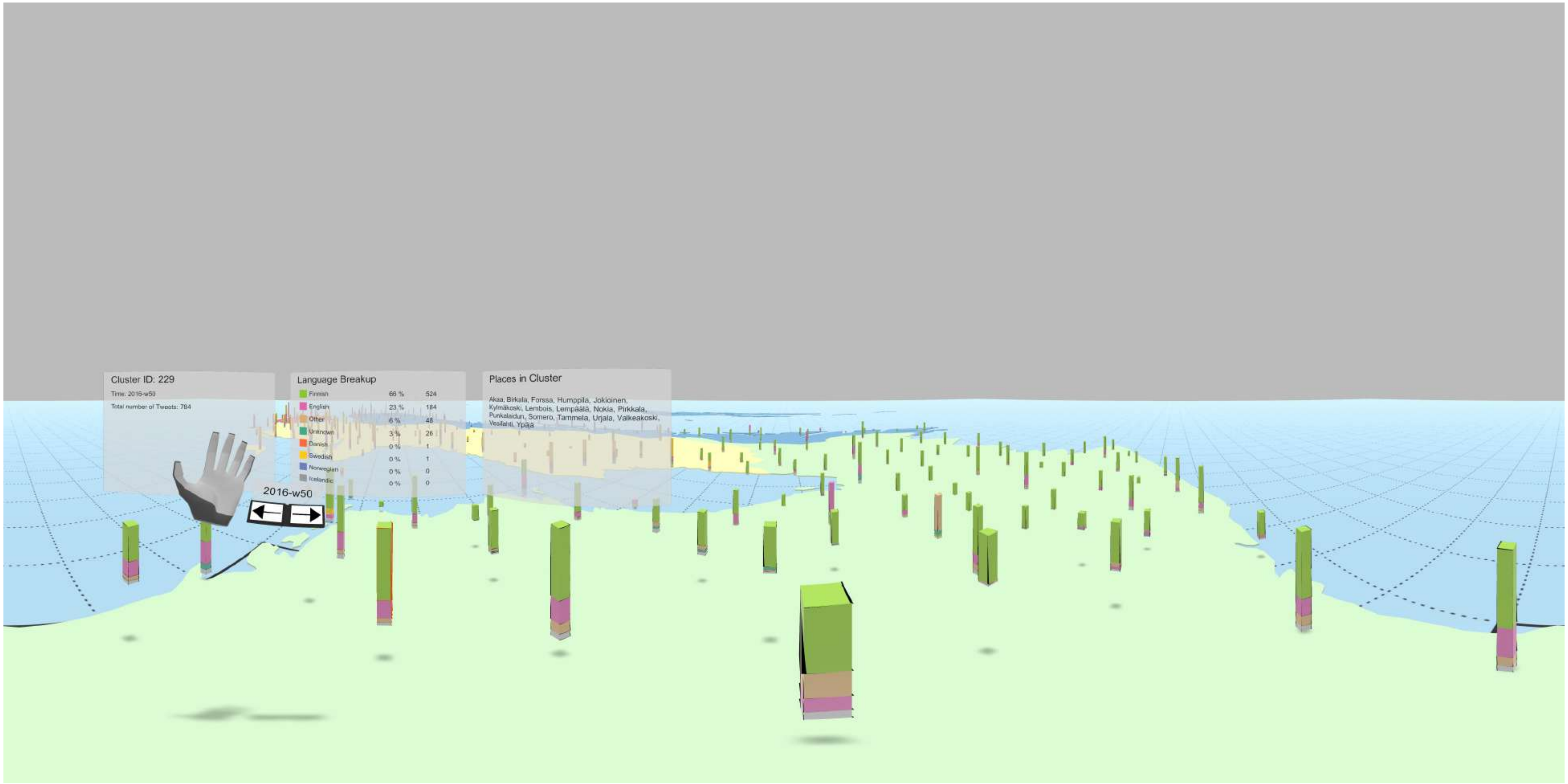
Masko, Masku, Nådendal, Naantali, Paraine
Pargas, Tövsala, Taivassalo, Vehmaa

VRxAR Labs - 360° demo [vrxar.lnu.se/apps/odxvrxnts-360/time.html]

360° web view - workflow in a nutshell

1. render a specific viewpoint (virtual camera position) of the virtual reality scene into an equirectangular projection
   - try to take an as high-resolution rendering as possible (decreasing the size later is easier than increasing)
2. map equirectangular projection onto a sphere / spherical model

equirectangular projection - an example



Cluster ID: 229

Time: 2016-w50

Total number of Tweets: 784

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How to create an equirectangular projection?

- Unity3D
  - Unity 360° Screenshot Capture (via GitHub)
  - ManualUIRenderer (needed in order to render UI elements when capturing screenshots with I360Render.cs) (via forum.unity.com)
    - Attention: There is a memory allocation bug in this script, which does not deallocate memory, thus causing the RAM to reach its limit after some time.

- Unreal Engine 4
  - Tutorial (via cubebrush.co and YouTube)
    - UE's Scene Capture or Nvidia's Ansel Unreal Plugin

How to view an equirectangular projection?

- several solutions available, either as dedicated apps or (online) using the web browser

- recommendation: Pannellum (via panellum.org)
  - light-weight JavaScript-based solution
  - easy to customize
  - provides a fair amount of useful features, incl.
    - annotations ("hot spots")
    - transitions to other scenes
    - control over pitch, yaw, horizontal field of view…
    - on mobile: use sensors to "look around"

Pannellum - minimal template (JavaScript)

```
<!DOCTYPE HTML>
<html lang="en">
<head>
   <link rel="stylesheet" href="lib/pannellum.css"/>
   <script type="text/javascript" src="lib/pannellum.js" charset=“utf-8"></script>
   <style type="text/css">
        #panorama {
            width:  100%;
            height: 800px;
        }
   </style>
</head>
<body>
    <div id="panorama"></div>
    <script>
       // create collection of hotspot data
       var hotspotData = [
            {
                "pitch": -23.0,
                "yaw": -42.0,
                "type": "info",
                "text": "some useful information"
            }
        ];
        // create 360 viewer and load image
        pannellum.viewer('panorama', {
            "type": "equirectangular",
            "panorama": "images/myEquirectangularImage.jpg",
            "autoLoad": true,
            "orientationOnByDefault": true,
            "yaw" : 0,
            "pitch": 0,
            "hfov": 100,
            "hotSpots": hotspotData
        });
    </script>
</body>
</html>
```

Open Source definition

- 10 criteria for categorization as “open source”:
    1. Free Redistribution
    2. Source Code
    3. Derived Works
    4. Integrity of The Author's Source Code
    5. No Discrimination Against Persons or Groups
    6. No Discrimination Against Fields of Endeavor
    7. Distribution of License
    8. License Must Not Be Specific to a Product
    9. License Must Not Restrict Other Software
    10. License Must Be Technology-Neutral

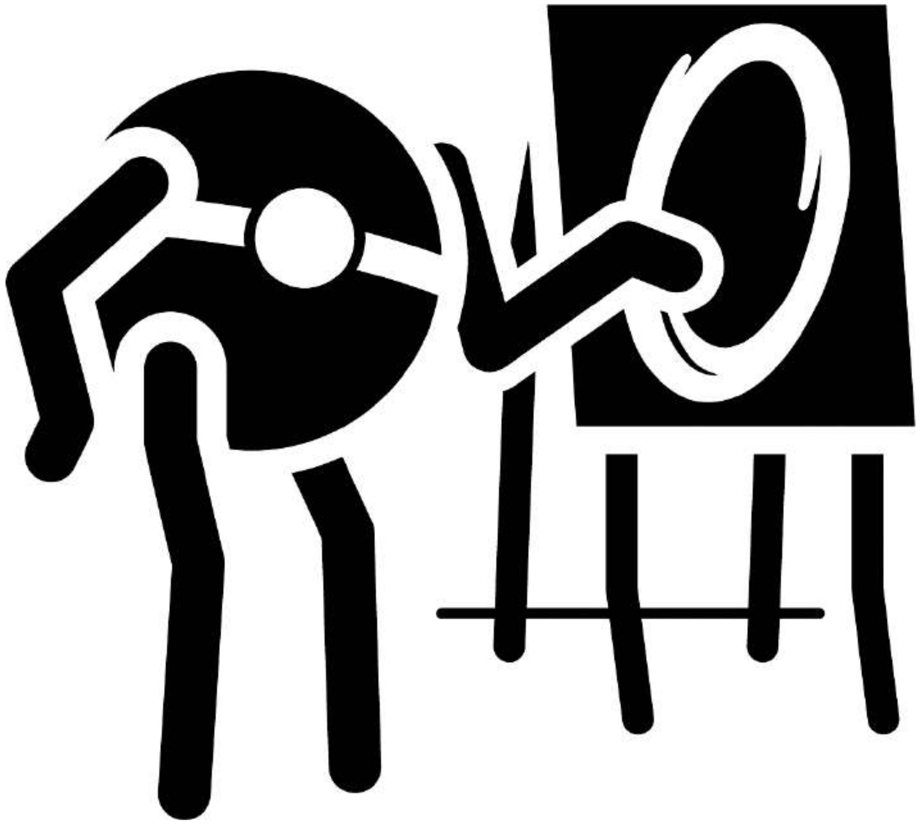
via Opensource.org (2019a)

Open Source licences

- licenses that comply with the Open Source Definition (see previous slide)
- allow software to be freely used, modified, and shared
- differences regarding permissions, conditions, and limitations
- see references below for licence comparison as well as the licences themselves (to be used in your project)
  - popular: GNU GPLv3 and MIT Licence

via GitHub, Inc. (2019) and Opensource.org (2019b)

Questions & Answers



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Contact

Nico Reski

reski.nicoversity.com

@nicoversity

github.com/nicoversity

nico.reski@lnu.se

(PGP Key ID: B061D75B,
PGP Fingerprint: E826 C9FF 1701 0BAC
CA98 308C 6772 4499 B061 D75B)

Office: HUS D 2269 A
VRxAR Labs
Department of Computer Science
and Media Technology (CM)
Faculty of Technology
Linnaeus University, Växjö

Additional references

Portal icons in the presentation available via
bit.ly/portaliconpack