

# TOOLS FOR MIXED REALITY IN SMART ENVIRONMENTS

**LAB 3: Virtual-Physical dimensions**

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# AGENDA

- Mixed reality tools
- Collab task.



# BEFORE START...

- Any question about topics of the previous lecture/lab?
- Suggestion/petition?

Go to [www.menti.com](http://www.menti.com) and use the code 76 18 36 9



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# MIXED REALITY TOOLS FOR BUILDING SMART OBJECTS/ENVIRONMENTS

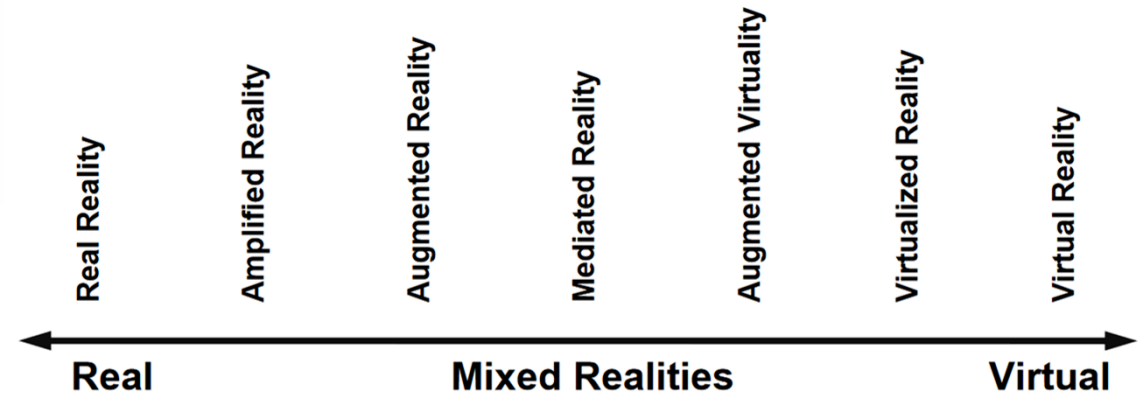


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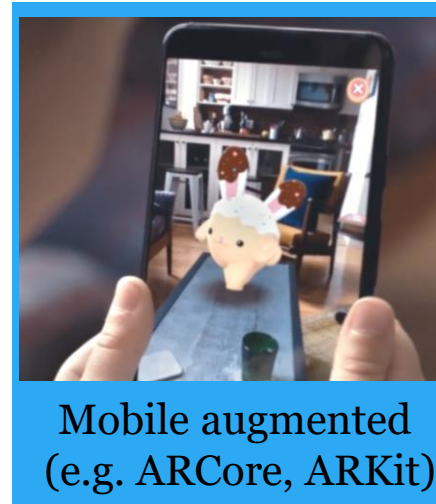
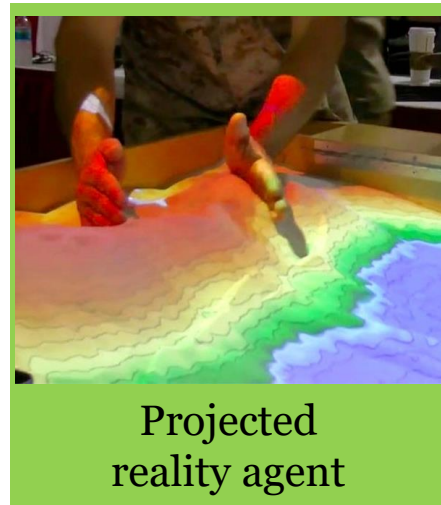
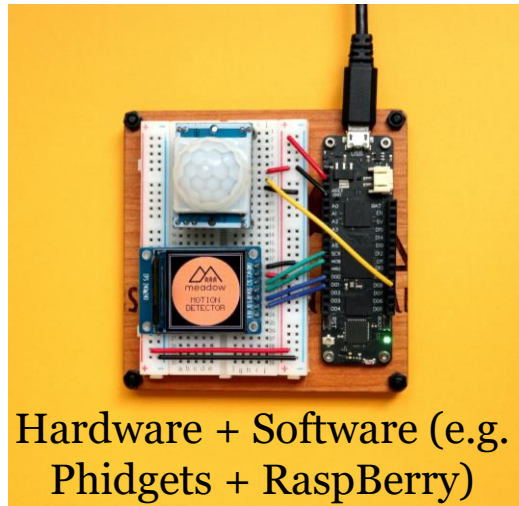
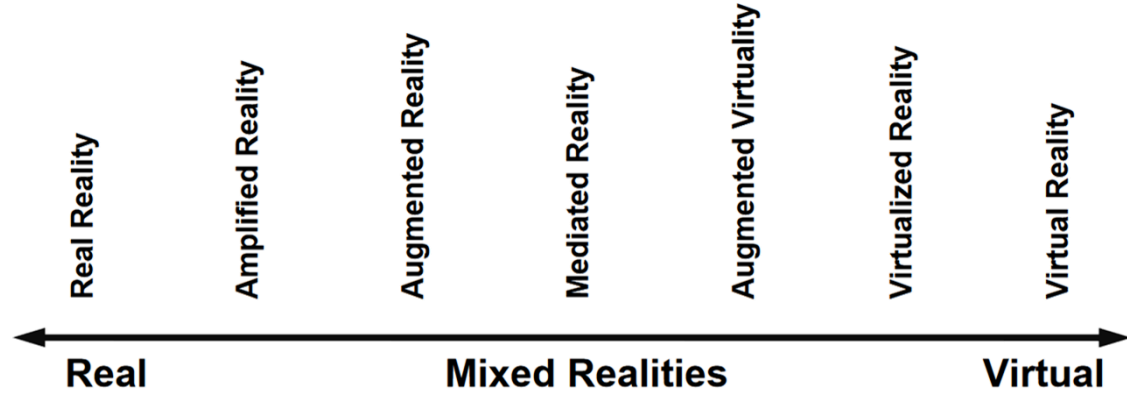
# MIXED REALITY



Milgram, P., & Kishino, F. (1994). A taxonomy of mixed reality visual displays. *IEICE TRANSACTIONS on Information and Systems*, 77(12), 1321-1329.

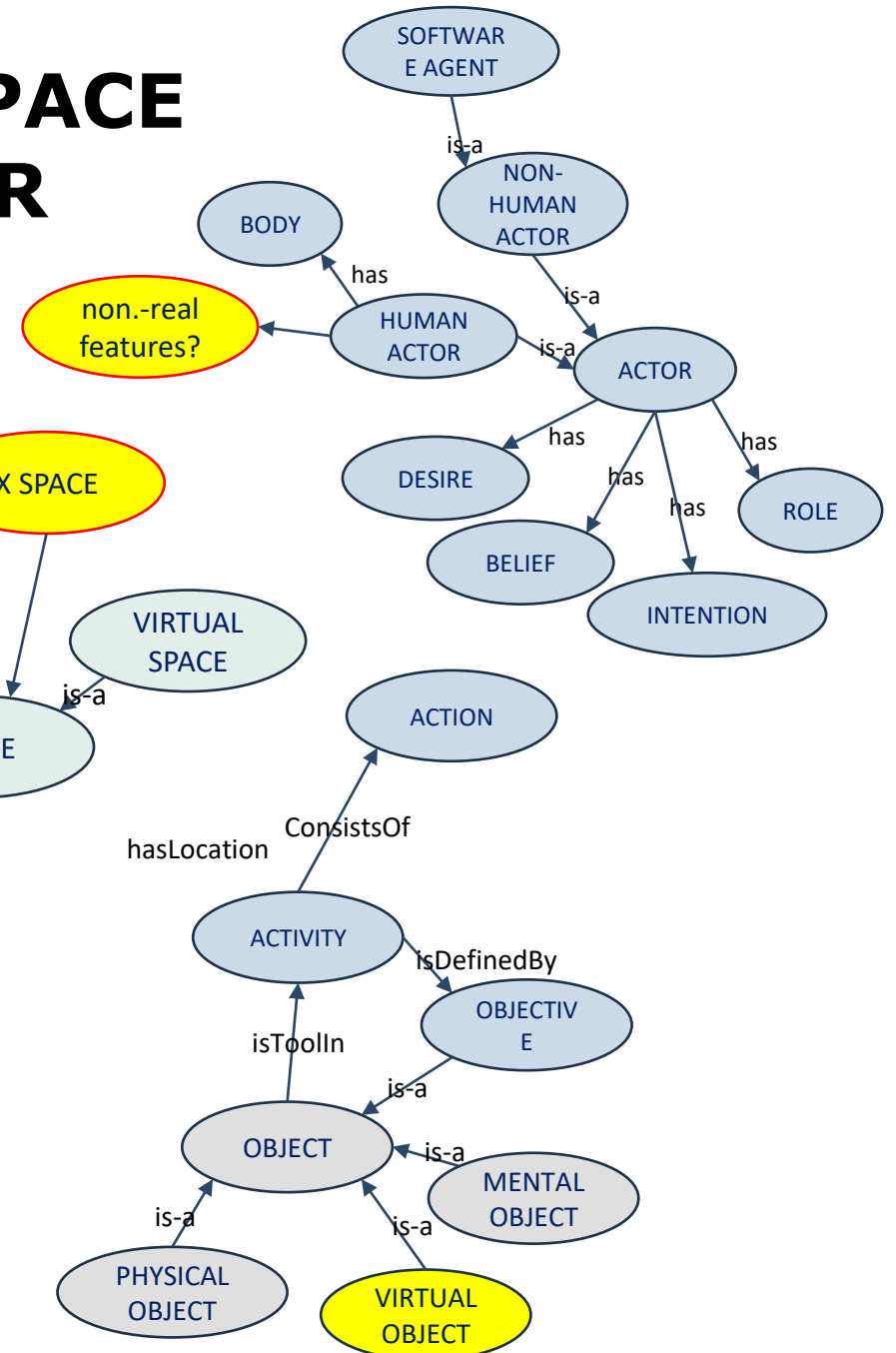


# SMART OBJECTS IN X-REALITY

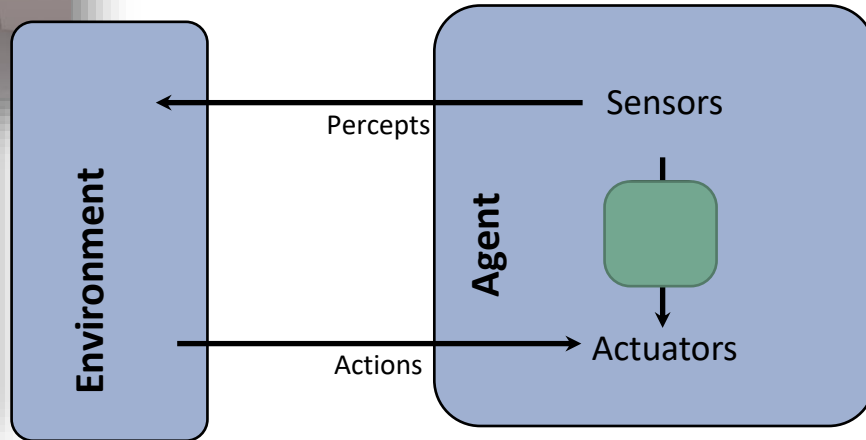


# EXTENDING THE SPACE AND THE ACTOR

What information should be added to extend the user model in a x-reality?



<https://hubs.mozilla.com/>



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# COLLAB. TOOLS FOR MIXED REALITY



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# COLLAB. TOOLS FOR MIXED REALITY

- PaaS (Platform as a Service)
  - Heroku
  - Glitch
  - Google cloud
  - Azure cloud
  - ....
- IDEs
  - Unity (free 3 seats)
  - Visual Studio Code (Live Share Extension Pack)
  - NetBeans and Eclipse through Git
  - ...

COVID situation requires collaborative tools!



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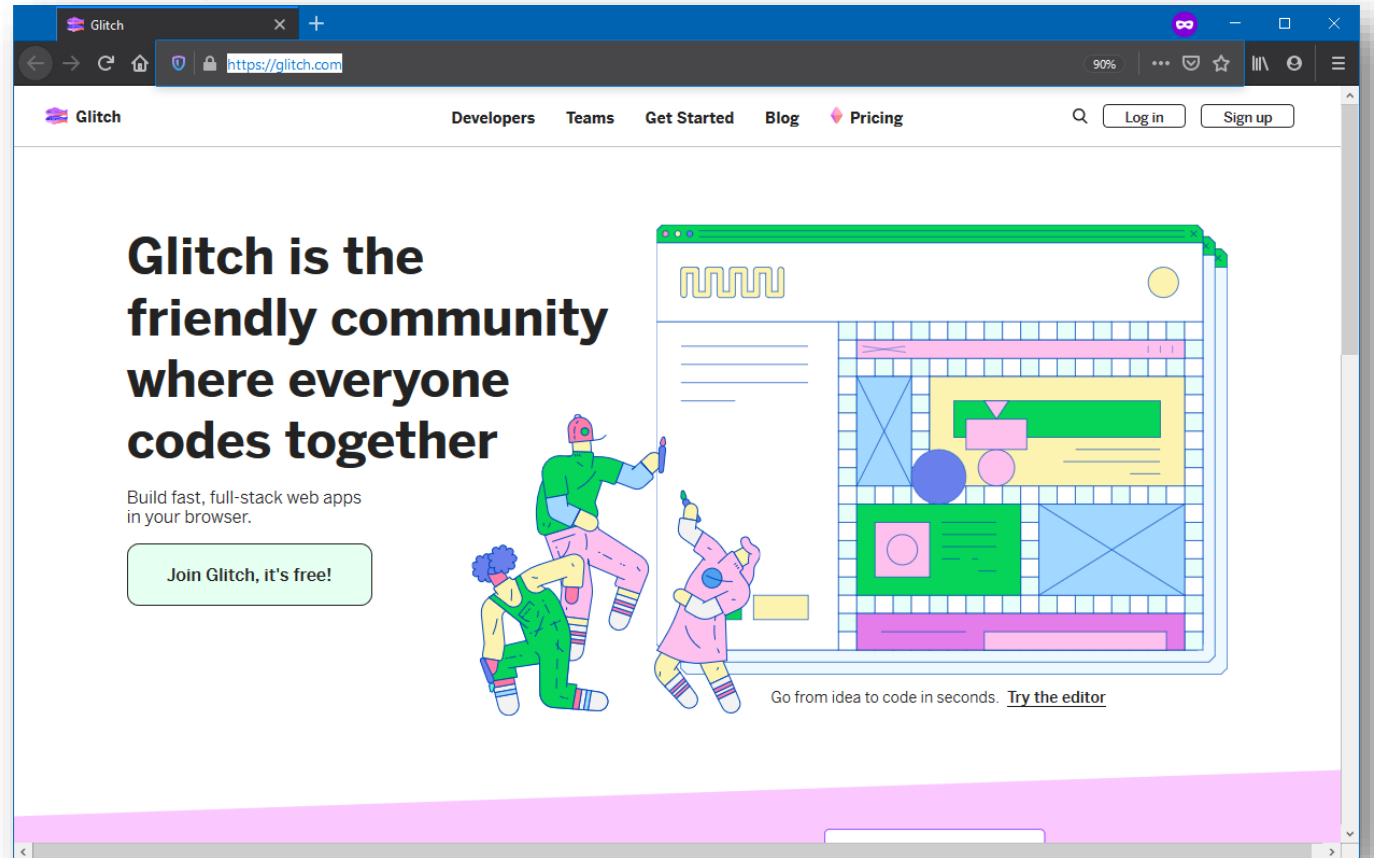
# BASICS ON GLITCH

## Collab IDE

Pro: easy, temporal free no-signup accounts,  
collab sharing, ...

Cons: ...

<https://glitch.com/>



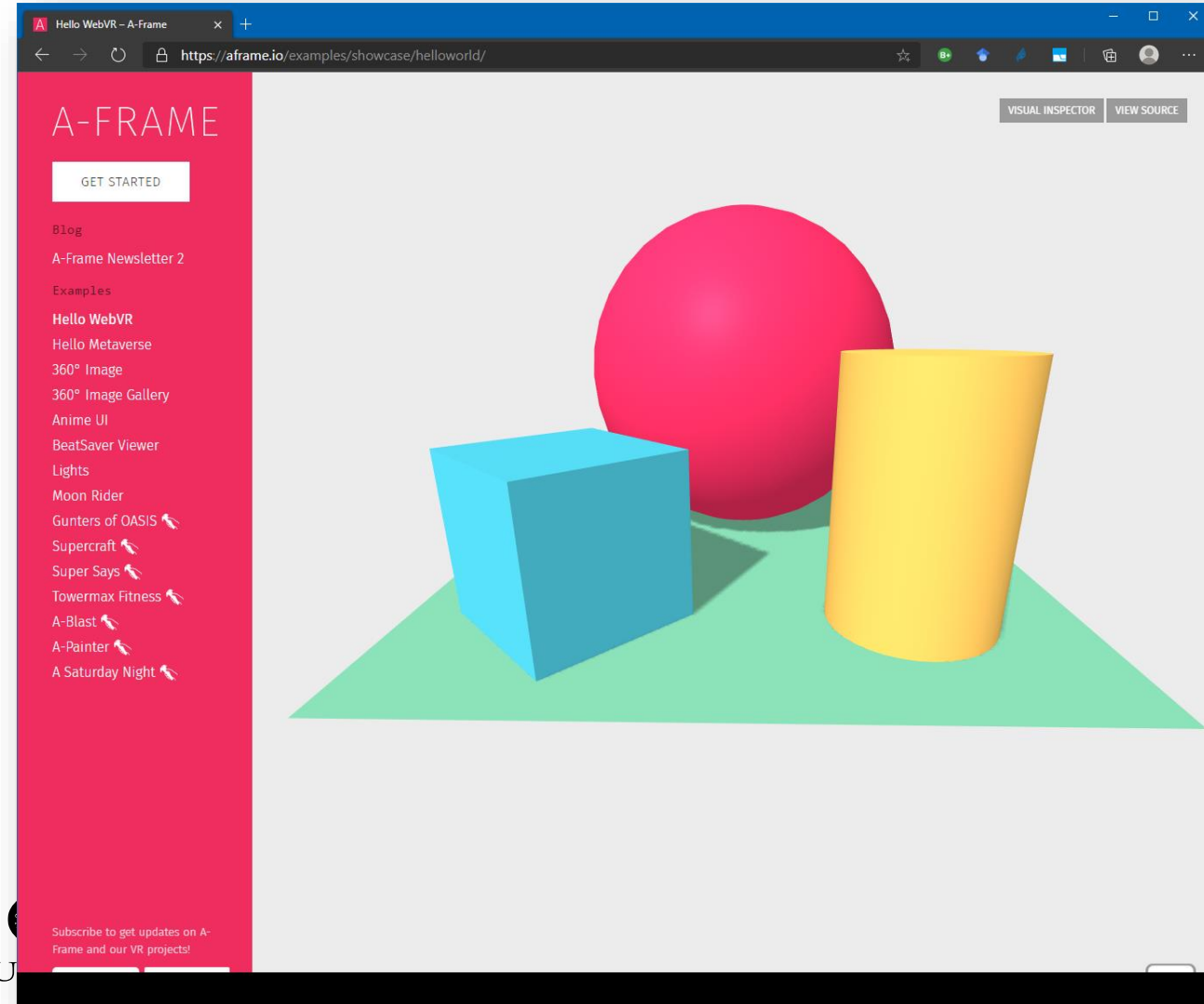
# BASICS ON A-FRAME

## VR on Web

Pro: easy to start, free, plenty of collab. tools, ...

Cons: not easy to integrate with Python, Java, ...

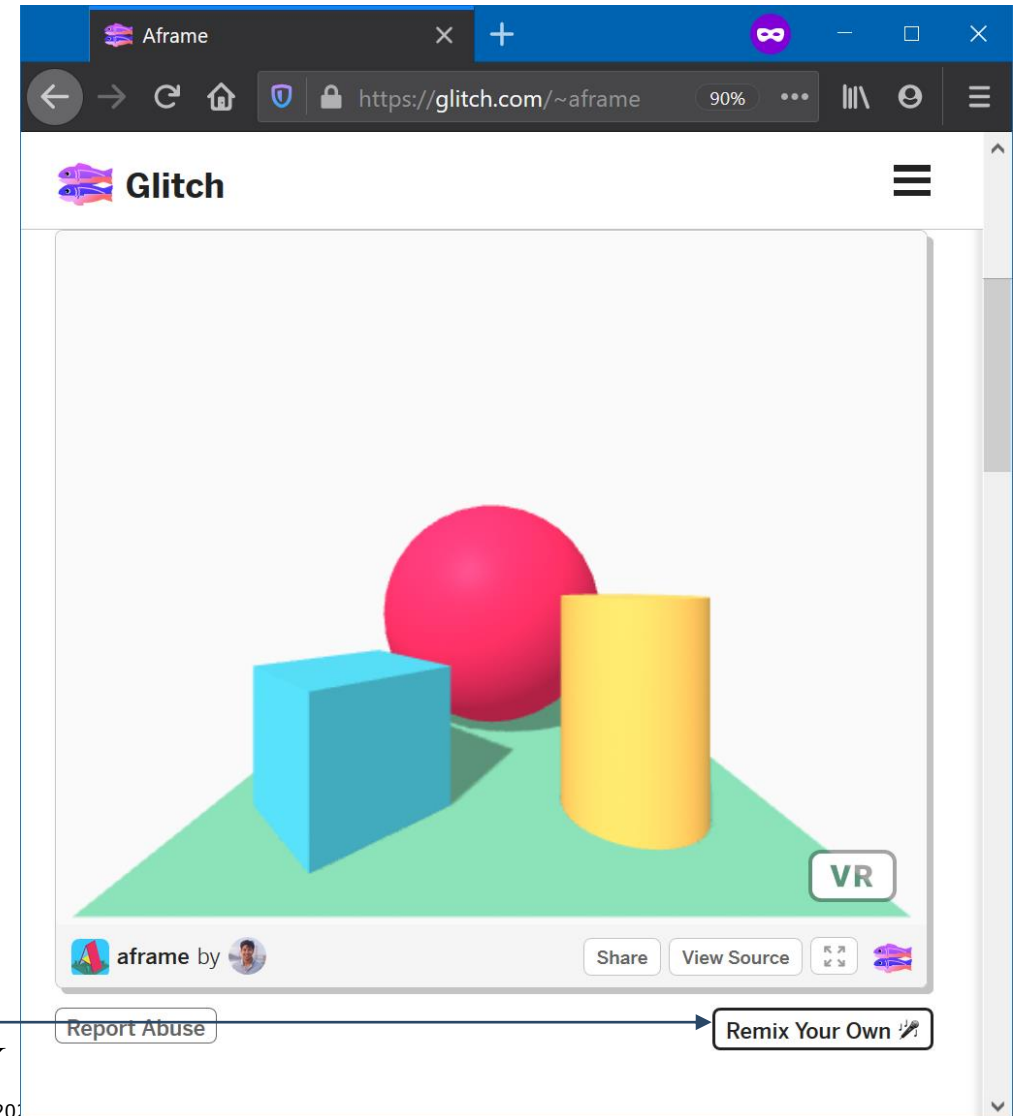
<https://aframe.io/>



# GLITCH A-FRAME

## Demo

1. Go to: <https://glitch.com/~aframe>
2. “Remix your own”
3. Select main page, click in “index.html”
4. Show the VR (Next to The Code)



# AR QUICK DEMO

- Image tracking
  - Open in your computer browser, open Web camera:
    - <https://ar-js-org.github.io/AR.js/aframe/examples/image-tracking/nft/>
  - Open in your mobile phone, and show to the camera
    - <https://raw.githubusercontent.com/AR-js-org/AR.js/master/data/images/hiro.png>
- Location-based
  - Open in your mobile phone browser (in Firefox may not work)
    - <https://codepen.io/nicolocarpignoli/pen/MWwzyVP>
- Marker-based
  - Similar to Image tracking

## Tools:

- AR.js (<https://ar-js-org.github.io/AR.js-Docs/>)
- Unity Vuforia
- Many others

**TASK**  
**MIXED REALITY IN AN ELDERLY**  
**SMART HOUSE ENVIRONMENT**

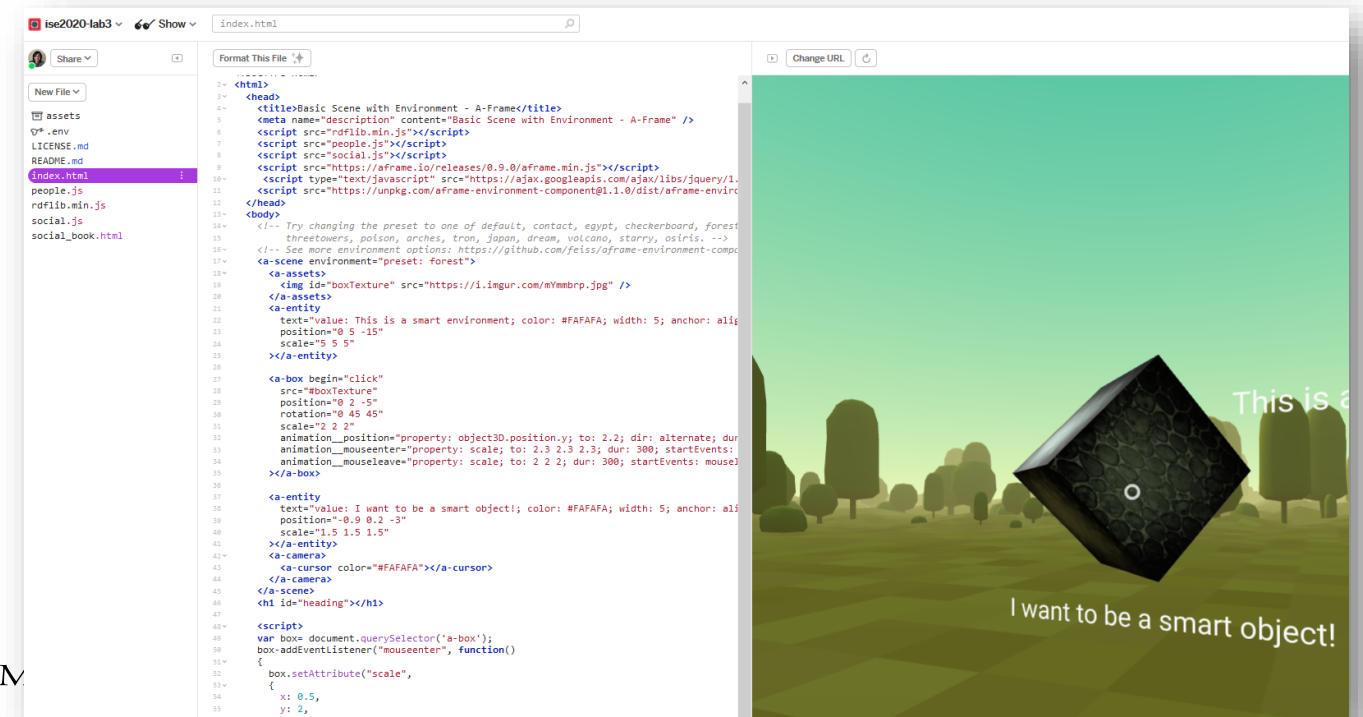


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# EXTENDING THE SPACE AND THE ACTOR

## Minimal demos of interactions: case VR

- Goal: create the skeleton of a virtual smart object
- Tools: A-Frame + Javascript + HTML + rdflib.js + ise-core-ontology.owl + Glitch
- <https://glitch.com/~ise2020-lab3>



The screenshot shows a Glitch editor interface. On the left, a file explorer lists files: assets, env, LICENSE.md, README.md, index.html (selected), rdflib.min.js, social.js, and social\_book.html. The main editor displays HTML and JavaScript code for an A-Frame scene. The code includes a title, meta description, and various scripts. The scene is set in a forest environment with a box object that has a click event listener. The box object is a cube with a texture and a white circle on its top face. The scene also includes a camera and a heading element.

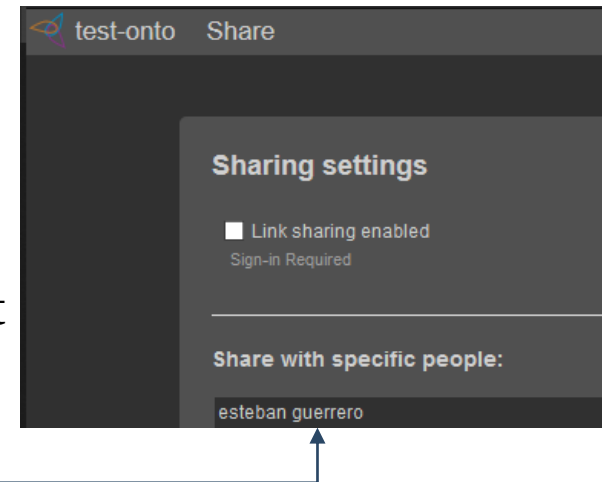
```
<html>
<head>
  <title>Basic Scene with Environment - A-Frame</title>
  <meta name="description" content="Basic Scene with Environment - A-Frame" />
  <script src="rdflib.min.js"></script>
  <script src="people.js"></script>
  <script src="social.js"></script>
  <script src="https://aframe.io/releases/0.9.0/aframe.min.js"></script>
  <script type="text/javascript" src="https://ajax.googleapis.com/ajax/libs/jquery/1.12.4/jquery.min.js"></script>
  <script src="https://unpkg.com/aframe-environment-component@1.1.0/dist/aframe-enviro
</head>
<body>
  <!-- Try changing the preset to one of default, contact, egypt, checkerboard, forest
  threetowers, poison, arches, tron, japan, dream, volcano, starry, osiris. -->
  <!-- See more environment options: https://github.com/feiss/aframe-environment-comp
  <a-scene environment="preset: forest">
    <a-assets>
      
    </a-assets>
    <a-entity
      text="value: This is a smart environment; color: #FAFAFA; width: 5; anchor: all;
      position="0 5 -15"
      scale="5 5 5"
    ></a-entity>
    <a-box begin="click"
      src="#boxTexture"
      position="0 2 -5"
      rotation="0 45 45"
      scale="2 2 2"
      animation_position="property: object3D.position.y; to: 2.2; dir: alternate; dur
      animation_mouseenter="property: scale; to: 2.3 2.3 2.3; dur: 300; startEvent:
      animation_mouseleave="property: scale; to: 2 2 2; dur: 300; startEvent: mouse
    ></a-box>
    <a-entity
      text="value: I want to be a smart object!; color: #FAFAFA; width: 5; anchor: all;
      position="-0.9 0.2 -3"
      scale="1.5 1.5 1.5"
    ></a-entity>
    <a-camera>
      <a-cursor color="#FAFAFA"></a-cursor>
    </a-camera>
  </a-scene>
  <h1 id="heading"></h1>
  <script>
  var box= document.querySelector('a-box');
  box.addEventListener("mouseenter", function()
  {
    box.setAttribute("scale",
    {
      x: 0.5,
      y: 2,

```

# COLLABORATIVE TASK

## Procedure: Time 20 minutes

1. Split the group in Zoom rooms to form teams –**randomly**–
2. Take example of an older adult living at home with some specific needs (smart home environment)
3. Consider one option of mixed reality (projected, augmented, virtual, etc.)
4. Upload ontology **ise-core-ontology.owl** (in Canvas) into Web Protege
5. Update/create the knowledge graph collaboratively with mixed reality smart objects
  1. Define functionalities of a smart object/environment
6. Share with user: esteban guerrero
7. Glitch!
  1. <https://glitch.com/~ise2020-lab3>
  2. Remix!
8. Answer questions (next slide), take notes about those answers. Then present those answers.





# QUESTIONS

- What additional knowledge about the space and actor did you add to the knowledge graph considering a VR solution?
- What advantages may have VR in a real scenario? For example older adult smart environment?
- What disadvantages may have VR?



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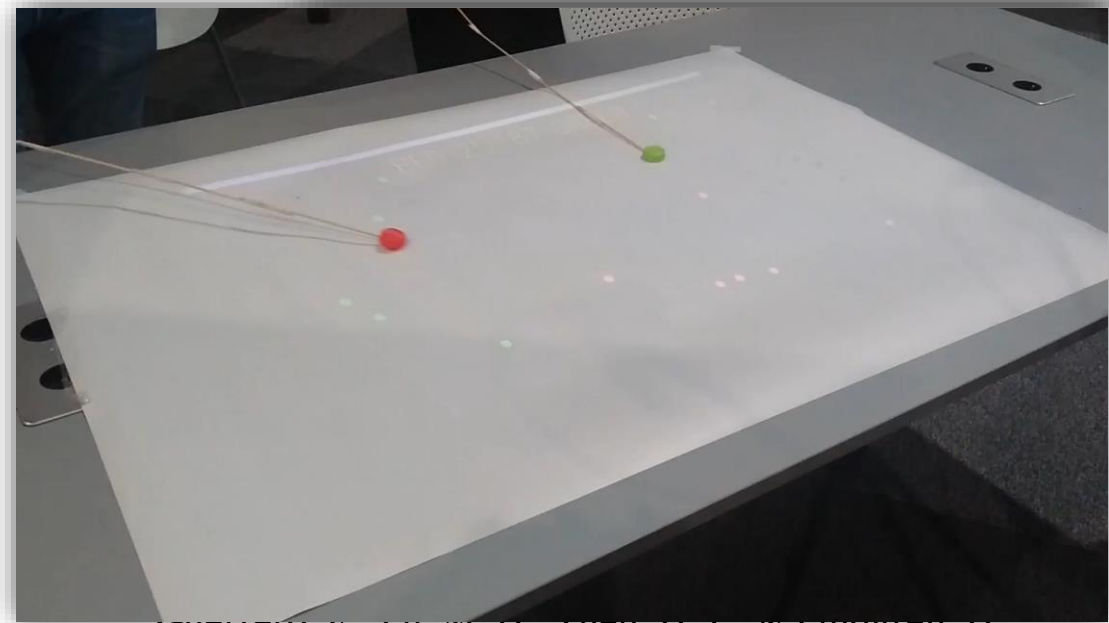
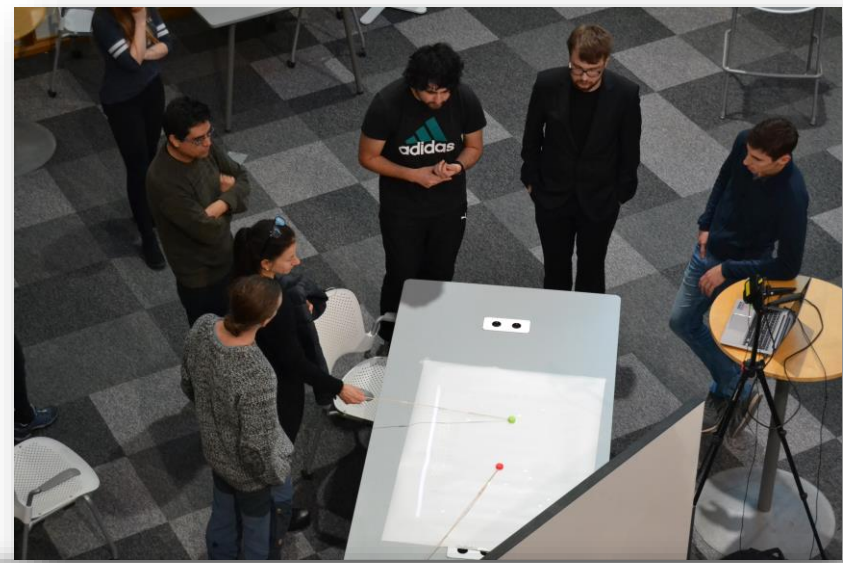
# EXAMPLES



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# PROJECTED XR

- Easier to develop and test, not expensive devices needed
- Not specific SDK available
- It can be used same environments for building native Windows/Linux/Ios applications (e.g. C++,Java, .NET, Python, etc.)

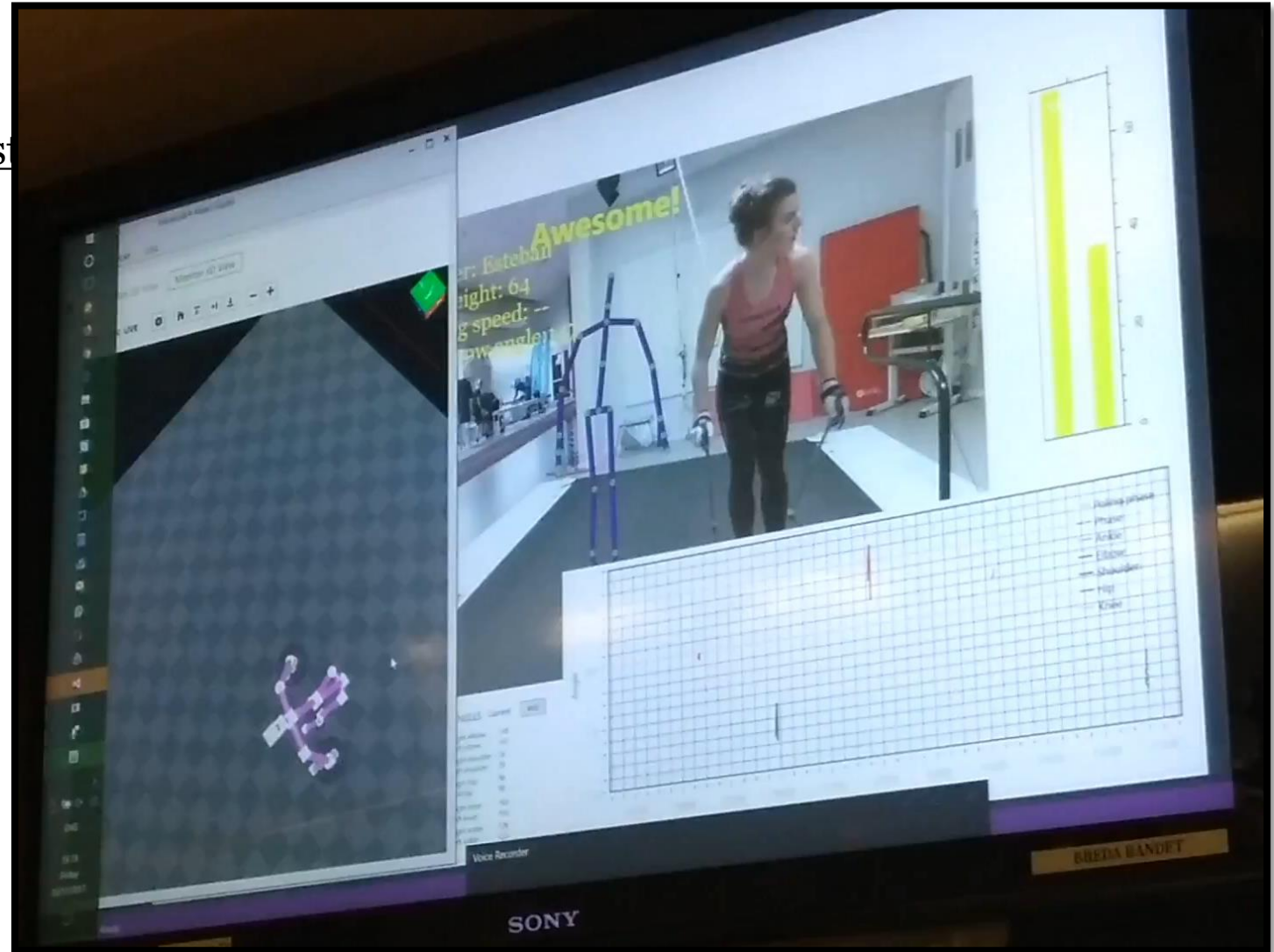


Guerrero, E., Lu, M. H., Fuen, H. F., & Lindgren, H. (2019). Designing and evaluating an intelligent augmented reality system for assisting older adults' medication management. *Cognitive Systems Research, 58*, 278-291.



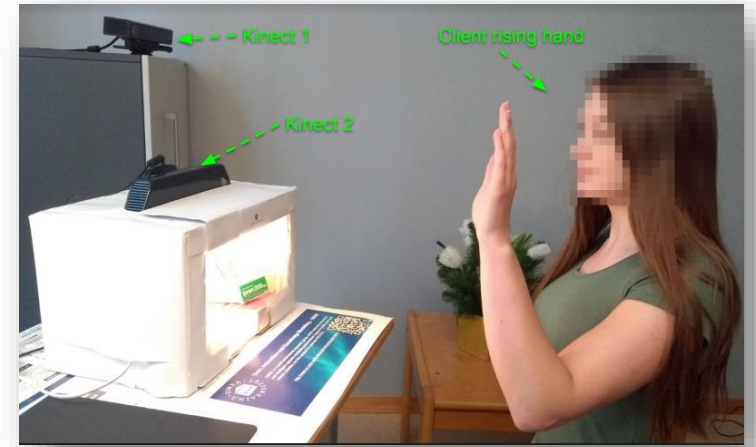
# X-COUNTRY SKIING

- 3D camera
- Machine learning tool: random forest
- Reasoning tool: DLV
- C# Python



# MEDAR PROJECTED

- 3D camera
- Mini projector
- Machine learning tool: random forest
- Reasoning tool: DLV
- C#



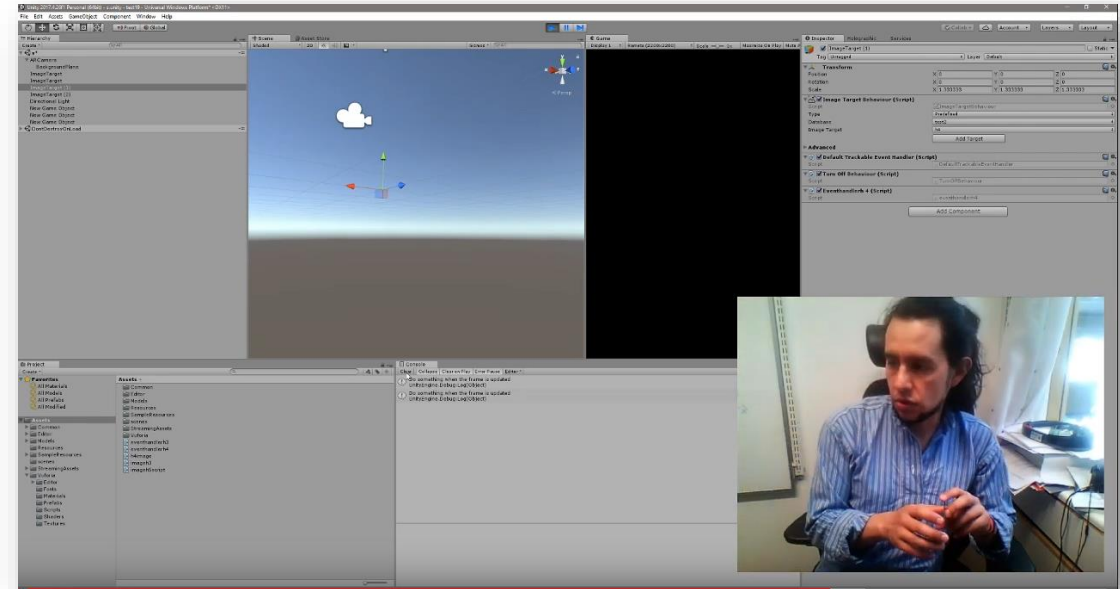
# OTHER RESOURCES



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# UNITY VUFORIA

- Unity Vuforia, Image tracking
- <https://youtu.be/RKSSMT8eLro>



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**THANK YOU**