



## User Study – Industrial Collaboration in Augmented Reality

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*Gereon Elvers*

## Welcome! - General Information

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- Thanks for taking the time to participate in my user study!
- The goal of the study is to research collaborative behaviour when using Augmented Reality in a shared-space assembly task
  - Collaborative behaviour: You will be paired with a partner.
  - Augmented reality: You will be wearing a Hololens 2 headset.
  - Shared space: You will be working in the same room.
  - Assembly task: You will be asked to assemble a virtual object.
- The study will take around 90 minutes.
- Parts of the study will be recorded. This recording, together with the information you provide, forms the basis of our analysis.
- Your participation is entirely voluntary, and you can withdraw at any time.
- For more information, please review the Participant Information Sheet and Consent Form.

**Please sign the Consent Form now.**

# Structure of the Study

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1. Pre-questionnaire & Introduction to Hololens 2 device
2. Task Variant 1
  - a. Post-Questionnaire
3. Task Variant 2
  - a. Post-Questionnaire
4. Task Variant 3
  - a. Post Questionnaire
5. Task Variant 4
  - a. Post Questionnaire
6. Final questionnaire, short interviews & discussion

**Proceed with the Pre-Questionnaire now.**

## Task description

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With your partner, build a “bridge structure” connecting the two blocks.

- This means a line of blocks with continuous contact.
- Approach this as an engineering challenge.
  - Minimize the amount of material used.
  - Maximize the stability of the structure.
  - Pretend you are a civil engineer getting paid to work out a suitable design.

## Task description: Some notes

- There are multiple block variants with different prices (relevant for some variants of the task). You can spawn them through the virtual tables. Select the object you want, then confirm. There will be a 3-second countdown after each spawn (to prevent accidental double-spawning).



## Task description: Some notes

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- Blocks can be picked up directly or grabbed through the “laser pointer”.
- When placing a block, it will “snap” to the closest 90-degree rotation and align on an invisible “grid”.
- Blocks that are not currently picked up by a player are “soft locked” in place (can be moved, but are really heavy).

## Task description: Some notes

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- Your play space is 3 meters by 3 meters (you will encounter walls if you try to move objects beyond that).
- Blocks touching the red areas will disappear after 5 seconds.
- Known issue: It's likely you may start seeing virtual controllers in your hands. You can just ignore them.

## Preparation Guidelines

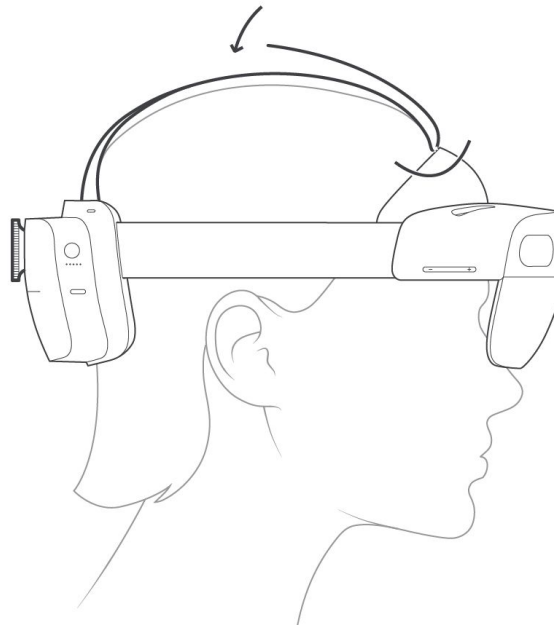
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Place the HoloLens 2 on your head. The brow pad should sit comfortably on your forehead and the back band should sit in the middle-back of your head.

If necessary, extend the headband by turning the adjustment wheel, and then loosen the overhead strap.

Disclaimer:

- Please don't run or jump when wearing the HoloLens.
- Remove jewelry, scarves, or any accessories that might interfere with movement or usage of the HoloLens. Wearing glasses is okay.
- Between sessions, please place the HoloLens on a table.





# Calibration Instructions

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- The Hololens devices have been calibrated for use in the place space. It is possible this may need to be redone.
- If instructed, walk around and briefly look at the three placed markers until the countdown is replaced with a green checkmark.

**Put on the Hololens now.**

## Task Variant: Open-ended

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- There is no strict time, object or any other limit.
- Just build the best bridge you can, considering the three dimensions: cost, stability, time to build
- When you are done, place the Hololenses back on the desk

## Task Variant: Silence

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- There is no strict time or object limit.
- You may not talk to your partner during the task!
- Once you are done, please place the Hololens back on the desk.

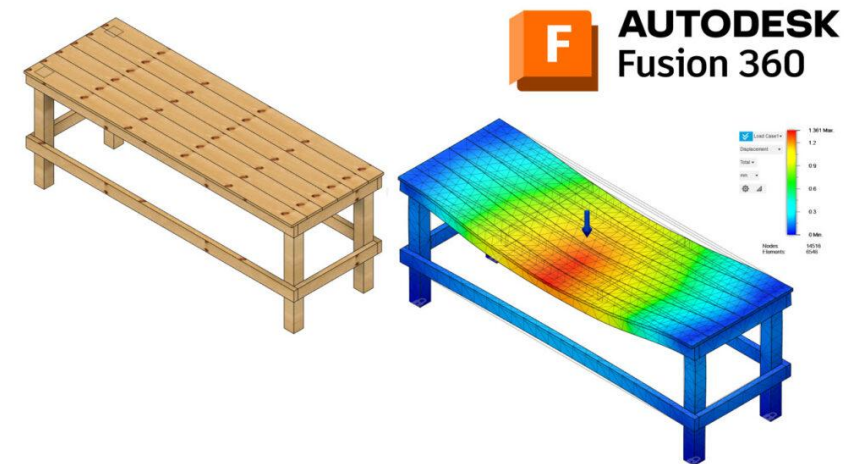
## Task Variant: Time limit

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- There is no strict object limit.
- You will have **three minutes** to complete the task from the moment you spawn the first block.

## Task Variant: Role-play

- There is no strict time or object limit.
- I will assign each of you a role
  - Project Manager: Keep cost as low as possible (while still getting a functional bridge).  
Metric: Cost
  - Structural Engineer: Make the bridge as stable as possible.  
Metric: Static Stress Analysis in Autodesk Fusion (even load from the top)
- You will be notified who won after completion of the study (if you want).



## Post-Questionnaire

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- Thanks for participating!
- Player 1, please fill out the Post-Task Survey, Big Five Personality Test and General Information Survey **outside**.
- Player 2, please remain here for a quick interview
- We will swap once the interview has concluded.