

# Spontaneous Interactions with a Virtually Embodied Intelligent Assistant in Minecraft

## BACKGROUND

In recent years, artificial intelligence (AI) researchers have made great progress in developing autonomous agents that can learn semi-independently to operate in virtual environments such as game worlds [1,2].

However, designing for user interactions with such agents remains challenging, in part because agents' affordances are often poorly matched with users' intuitive expectations and preferences for instructing agents [3,4,5].

This has contributed to the slow uptake of machine learning techniques for AI in game development [6,7].

## AIMS

In this study, we sought to anticipate how users will try to interact with the kind of virtually embodied learning agents that are currently being developed, which learn to play digital games and operate in virtual environments such as Minecraft [1].

We chose a set of plausible abilities for a near-future learning agent, based on recent AI research. These abilities included: navigation in 3D space, object recognition, natural language understanding, user action prediction and learning from demonstration and feedback.

We designed an observational study to test the ways in which users would spontaneously seek to interact with such an agent when given minimal instruction.

## REFERENCES

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## METHOD

We recruited 18 participants (11 female) aged 11-15 from two high schools in the United Kingdom.

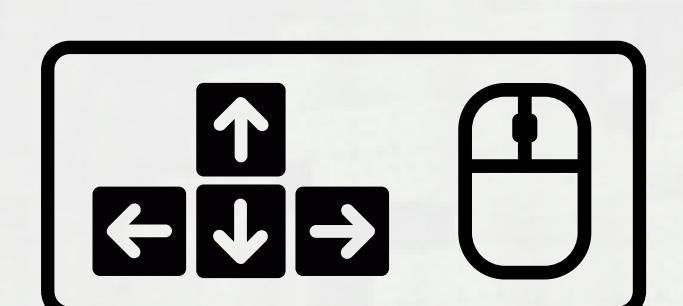
### WIZARD OF OZ DESIGN



Participants were asked to undertake building tasks in Minecraft with the assistance of a "prototype AI" named help\_bot. Help\_bot was an avatar controlled by a hidden researcher (the wizard) according to a behaviour script, which was adapted during the tasks to "learn" from user actions and feedback.

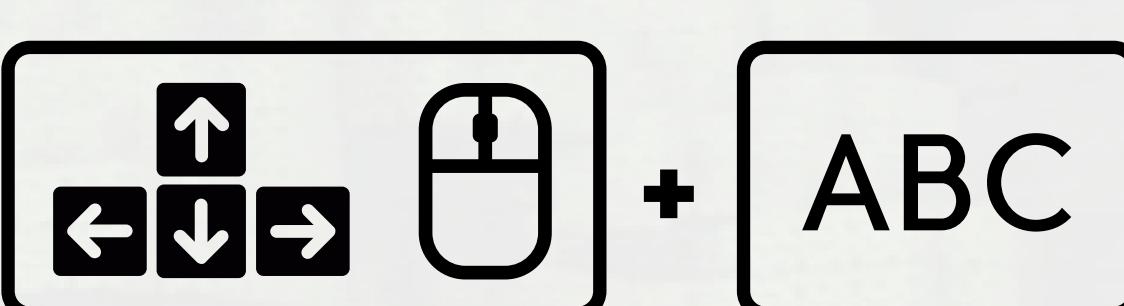
The facilitator interviewed each participant before and after each task.

### TASK CONDITIONS



#### CONTROLS ONLY

In Condition 1, users were given keyboard and mouse game controls.

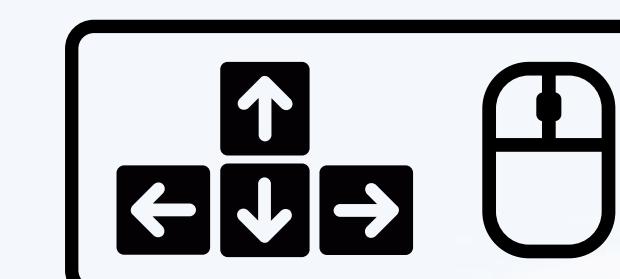


#### CONTROLS & TEXT

In Condition 2, users were given keyboard and mouse game controls, plus a command line for natural language inputs.

## INTERACTION TYPES

When interacting with help\_bot, users commonly attempted the following types of interactions:



#### CONTROLS

- Demonstrate actions for the agent to copy.
- Prompt the agent with an item to suggest behaviours related to that item.
- Correct the agent's actions, to signal for it to do something different.
- Point at a location to draw the agent's attention by standing on or staring at it.



#### TEXT INPUT

- Instruct the agent with direct commands.
- Label an object or sequence of actions for future reference.
- Question the agent about its inventory, status or abilities.
- Encourage the agent with thanks and praise.
- Cancel the agent's current action.

## TEACHING STRATEGIES

- Consistent with past studies [3,4], users were much more likely to teach the agent by demonstration and implicit feedback than explicit feedback; a challenge for feedback-based interactive machine learning.
- Users' teaching strategies for help\_bot were typical of teaching behaviours in human social groups [8,9]. In future research, we will study how differently users teach human and AI agent learners.