

The Computational Apprentice: Exploring a New Approach for AI Assistance



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Abstract

Future intelligent systems often envision AI agents that aid users through mixed-initiative interaction. To make such agents effective, an understanding of the ways agents can learn from users' actions and explanations is necessary. To help develop this understanding, this work describes and explores the interactions between an AI apprentice and a human mentor through a series of studies

Purpose

We want to make an apprentice AI that can discuss ideas with the user and learn more about their field through communication and interaction. Some programmers communicate with rubber ducks, inanimate objects or other humans to help them solve issues or bugs they have in their code. This program would be a middle ground between the two. It is a nonhuman interactive tool that can help a programmer to find bugs or possible ways to improve the code.

Objective

We want to understand how people interact with a voice agent while engaged in a creative task. Specifically, are people willing to engage or talk about code while writing it to a perceived non-human agent. We also want to know what is the best way for a non-human agent can interact with a human and be helpful.

Methods

Formative Study:

- We set up a creative programming task and recorded potential users to engage in this task with a human apprentice. This was to understand how comfortable users would be discussing and describing their code.

Design Probe:

- We modified an existing web-based IDE (editor.p5js.org) to enable a remote human to “speak” with the programmer participants in a robotic voice to sound like a voice agent.
- We used this simulation of an apprentice AI to understand whether, in the AI agent apprentice context, programmers are willing to document and explain code by voice when prompted.

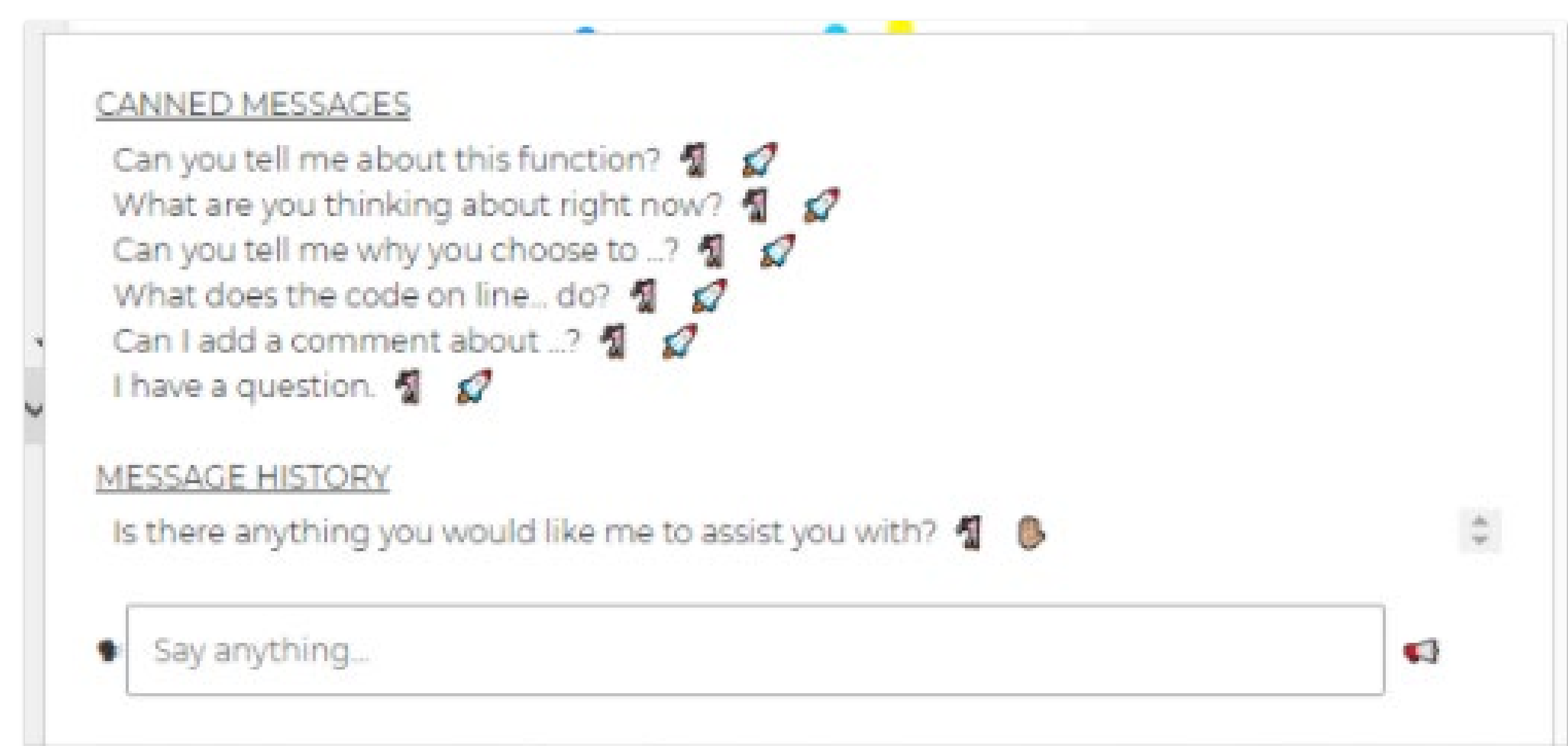


Results

- Participants were willing to answer, via voice, even an AI agent.
- Participants expected the agent to have a basic understanding of the environment and answer questions about it.
- Participants did not find the actual goal of the agent particularly helpful to the creative task.
- Participants wanted more control over when comments were placed where, and did not find the prompting useful, even though they did not find it particularly intrusive either.

```
1 function setup() {
2   createCanvas(400, 400);
3 }
4
5 const frameDelay = 2 * 30;
6
7 let circles = new Set();
8
9 function draw() {
10  background(255);
11
12  if (frameCount % frameDelay == 0) {
13    let count = fibonacci(frameCount/frameDelay);
14    for (let i = 0; i < count; i++) {
15      let theta = random(0, TWO_PI);
16      let v = random(Log(count));
17      circles.add({
18        x: width/2, y: height/2,
19        vx: v*sin(theta), vy: v*cos(theta),
20        hue: random(360)
21      });
22    }
23  }
24 }
```

← Participant view.
Participants were asked to code a visual of a fibonacci sequence



↑ “Wizard” view Textbox.
An extra text entry box where wizards can type questions voice robotically the participant.

References

- [1] Beyer, H. and Holtzblatt, K. “Principles of Contextual Inquiry” in *Contextual design: defining customer-centered systems*. Elsevier. p 41-66.
- [2] G. P. Laput et al., “PixelTone: a multimodal interface for image editing,” p. 10.
- [3] E. Horvitz, “Principles of mixed-initiative user interfaces,” in *Proceedings of the SIGCHI conference on Human factors in computing systems the CHI is the limit - CHI '99*, Pittsburgh, Pennsylvania, United States, 1999, pp. 159–166, doi: 10.1145/302979.303030.
- [4] E. Horvitz, J. Breese, D. Heckerman, D. Hovel, and K. Rommelset, “The Lumiere Project: Bayesian User Modeling for Inferring the Goals and Needs of Software Users,” p. 10.

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