Early Design of a Conversational AI Development Platform for Middle Schoolers

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Abstract—More young people are interacting with smart conversational agents such as Alexa and Google Assistant. These platforms are extensible, providing, in principle, a compelling opportunity for young users to create and tinker with their own conversational agents. However, to date the interfaces for conversational app development are adult-focused. This paper presents the early design process for AMBY (AI Made by You), which we are building to empower young learners to create their own conversational agents. We first conducted a contextual inquiry with 14 middle school students (aged 11-13) in an AI summer camp, followed by two other usability studies. The system design has been refined after each study. Key features of AMBY include a visual dialogue management panel, testing panel with a diverse avatar, and a voice input modality. AMBY is designed to serve as a pedagogically-robust resource for K-12 AI education and as an engaging and creative way for middle schoolers to explore AI.

Index Terms—K-12, AI education, conversational AI, conversational agent, AI literacy, interface design, middle school

I. INTRODUCTION

Artificial Intelligence (AI) powered tools are gaining importance in the lives of children. With rapidly increasing access to smartphones, computers, tablets, and the internet, more children than ever are playing AI-infused games, using smart learning tools, and interacting with AI-based conversational agents like Alexa and Siri in their everyday lives [1], [2]. However, many children do not understand how these smart tools work "under the hood" [3]. Understanding the AI concepts behind these tools can help young learners to both navigate and use such tools efficiently [4]. Conversational agents are becoming a popular medium for researchers to teach K-12 students about AI literacy. For example, Zhorai [5], a conversational platform and curriculum for children, showed promising results for increasing engagement and AI learning. Similarly, Zhu et al. [6] created a conversational agent for programming that can develop Python-based programs through natural language conversation. In another study, Brummelen et al. [7] enhanced a K-12 AI curriculum where 6-12th grade students used MIT App Inventor [8] (a block-based programming tool) to make conversational agents.

This paper introduces a prototype of a novel conversational app development tool, AMBY (AI Made By You), for middle

school students to create their own conversational agents. AMBY is built on Dialogflow [9], a conversational app development environment by Google. We followed an iterative design approach in which we implemented three studies to design, develop and improve the tool. We first conducted contextual inquiry in a two-week middle school summer camp and received initial ideas and feedback from the learners. Based on their input, we developed the initial prototype for AMBY and carried out two more iterations (alpha and beta usability testing) to further improve the application. This poster presents the outcomes of the iterative design process and describes the components of AMBY.

II. AMBY: DESIGN AND DEVELOPMENT

A. Iterative Design Process

We developed AMBY through three iterative design and development cycles. In the first iteration, we received feedback from 14 middle school students (aged 11-13) who attended an AI summer camp in the southeastern United States in August 2021. These students first learned about important AI concepts and Dialogflow development skills. Next, they worked in pairs to create their own conversational agents using Dialogflow. We observed that the students, especially those who are developing typing skills or have low computer literacy, had various challenges with Dialogflow such as difficulty with typing while working on the projects. They also had difficulty understanding AI concepts and faced usability issues such as inefficient navigation and slow app response from Dialogflow. As a next step in the design process, we utilized the above insights to create wireframes and mockups, followed by an interactive, web-based prototype, of a system that allows students to create conversational agents while addressing the limitations and challenges they faced with Dialogflow.

In the second iteration (alpha testing), our goal was to identify potential technical bugs of the first prototype of AMBY. We implemented alpha testing with 11 adult participants who are knowledgeable in conversational AI and UI/UX. These tests helped us identify several usability issues such as screen resolution problems, button positions, and color representation of intents. After alpha testing, we fixed the issues we identified and prepared the tool for the next iteration.
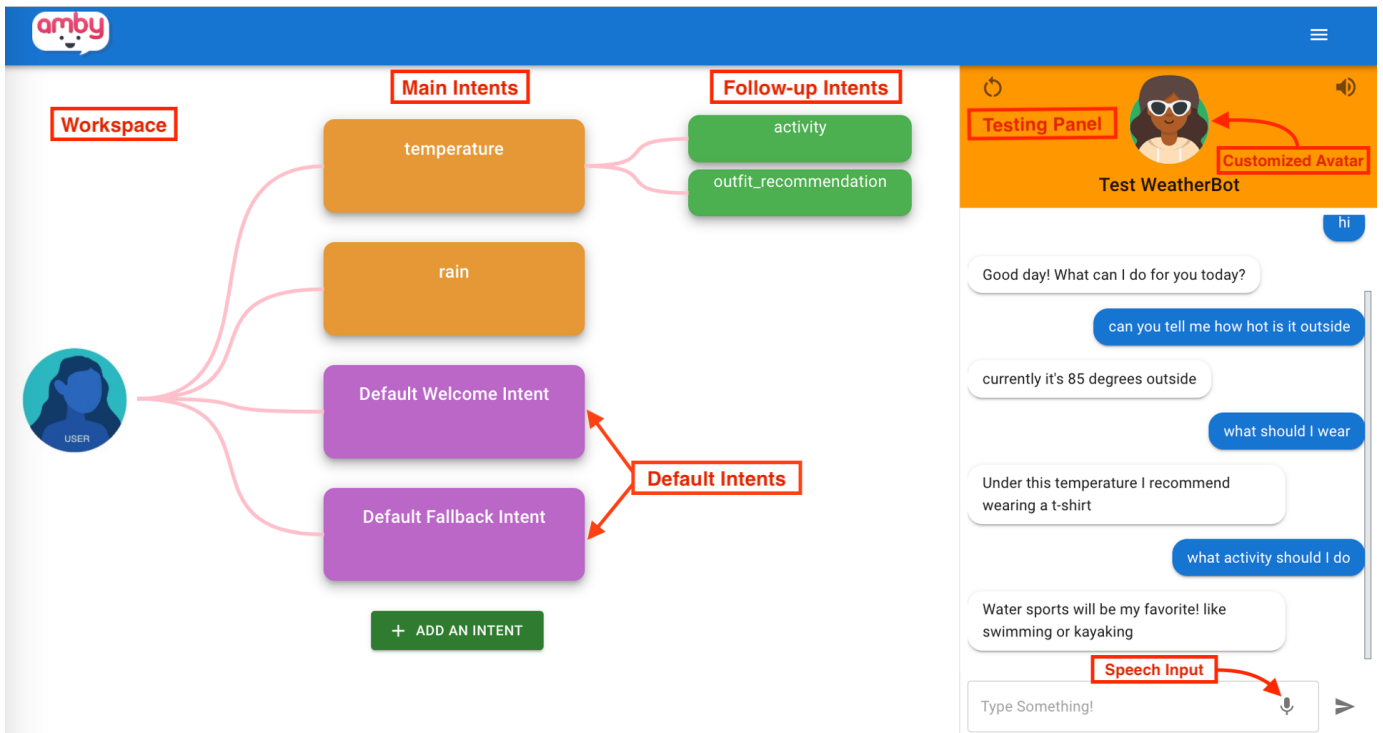
Fig. 1. AMBY interface: Students use different cards to manage user intents (left panel), and they can test their agents anytime (right panel).

In the third iteration (beta testing), we tested AMBY with nine of the children who had previously attended the summer camp (from the first iteration) in a two-hour in-person workshop. We first provided a short review of conversational AI topics and then conducted think-aloud sessions with students in AMBY. We asked them questions about AMBY's color scheme, accessibility features such as the speech input, and the selection of avatars to represent the AI.

B. AMBY Main Components

AMBY is built over Google's Dialogflow, and allows users to manage intents and test, or chat with an existing agent. AMBY provides the following features:

1) Avatar Representing Conversational Agents: AMBY provides a set of avatars for students to choose for their agents. The user-selected avatar allows for agent embodiment and is a part of various other interface components.

2) Visual Dialogue Management Panel: This panel allow students to manage dialogue turns in the conversational agent using *intents*. An intent is an end-user's intention in a dialogue turn. In AMBY, the user-generated intents are colored as yellow (main intents) and green (follow-up intents). The two default intents, which are automatically generated by Dialogflow, are colored differently (in purple) to emphasize their unique properties and use. All of the intents are directly or indirectly connected to a "user avatar" to help students visualize a flow from the end-user's actual intention to the various intents.

3) Testing Panel for Quick Evaluation: The right panel provides users with the ability to test their agents. It supports both textual and voice input modalities. Users can also mute and unmute the agent's voice and reset the existing test window using this panel.

4) Voice Input Modality: Unlike Dialogflow, which only allows making changes through typing, AMBY supports speech-to-text as an input modality for training phrases, responses and agent testing (see the microphone button marked in figure 1). The goal is to increase student engagement and allow them to focus on the key concepts of AI rather than typing.

III. CONCLUSION

This poster presents AMBY (AI Made by You), a web-based, interactive tool for middle school students to create their own conversational agents. The features of the interface are informed by an iterative design process, and these features aim to address the limitations of other interfaces, while also providing visual cues to foster AI literacy in students as they make their conversational agents. This tool is still under development and will be studied with larger user bases in the near future. These types of investigations can lead to improved support for children to explore and learn about AI.

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