Project Overview

Photo by Wafa Johal

Team NA-Boxjelly

Project ChatGPT and Nao Robot

Background

The CoWriter Letter Learning program is an educational tool specifically designed to run on Nao robots, with the aim of helping children improve their handwriting skills through an interactive and collaborative learning experience. The existing software, available at CoWriter Letter Learning, is written in Python 2.7 and uses an older version of the Robot Operating System (ROS) framework, the Indigo version.

It is important to note that the CoWriter program has been out of use for some time and has not been maintained, which has led to its incompatibility with modern systems and reduced effectiveness as an educational tool. However, the recent release of ChatGPT, a state-of-the-art conversational AI, has unlocked the potential for more fluid and natural human-robot interactions. This development has renewed interest in the CoWriter program, as integrating ChatGPT could greatly enhance the program's capabilities and effectiveness in providing a highly engaging and personalized learning experience for children.

Client Goals

What follows is a list of client goals, which the client would like this project to realise.

1. Maintain compatibility with modern systems: Ensure that the CoWriter program remains compatible with contemporary hardware and software platforms by updating the Python version and ROS framework. This compatibility is essential to provide a seamless and effective user experience across different systems.
2. Enhance the user experience: Improve the user experience by incorporating ChatGPT, allowing for more dynamic, natural, and personalized conversations between the Nao robot and children. This will make the learning process more enjoyable and engaging, ultimately leading to better learning outcomes.
3. Personalize the learning experience: Create a more personalized learning environment by leveraging ChatGPT's capabilities to generate word suggestions based on children's interests. This tailored approach will keep children motivated and invested in the learning process, ensuring more effective handwriting improvement.
4. Improve program capabilities and performance: Upgrade the software stack to include the latest version of ROS and Python, resulting in better performance, access to new features, and improved security. This update will also enable better compatibility with newer hardware and ROS packages, enhancing the program's overall capabilities.

5. Facilitate easy software maintenance and updates: Modernize the CoWriter program to ensure easy maintenance and updates in the future. By using current versions of Python and ROS, the program will benefit from ongoing support, making it easier to incorporate new features and address potential issues.

Project Overview

In order to maintain compatibility with current systems and take full advantage of the recent advancements in conversational AI, the CoWriter Letter Learning program requires updates and enhancements. By updating the software stack, incorporating the latest version of ROS, and integrating ChatGPT, the CoWriter program will be better equipped to provide an engaging and personalized learning experience for children. These updates will also ensure that the program remains relevant and effective as an educational tool for handwriting improvement in the modern technological landscape.

Key Project Tasks:

1. Python version update: Upgrading the Python version from 2.7 to 3.8.10 will bring several benefits to the CoWriter program. The update will provide access to the latest language features, optimizations, and security updates, ensuring that the software remains compatible with modern systems and runs efficiently.
2. ROS framework update: Transitioning from the ROS Indigo framework to the Noetic version is a crucial step in modernizing the CoWriter program. This update will provide better compatibility with newer hardware, improved performance, and access to the latest ROS packages and tools, ultimately enhancing the program's capabilities and user experience.
3. ChatGPT Integration: The integration of ChatGPT into the CoWriter program's dialogue manager is a key component of this project. By incorporating this state-of-the-art conversational AI, the CoWriter program will be able to facilitate more dynamic, natural, and personalized conversations with children. This enhancement will lead to a more engaging and effective learning experience for users, promoting handwriting improvement through fluid and natural human-robot interactions.
4. Personalized word suggestions: One of the most significant benefits of integrating ChatGPT is the ability to generate word suggestions based on children's interests. By tailoring the content to each child's preferences, the CoWriter program will create a motivating and customized learning environment. This personalized approach will not only make the learning process more enjoyable but also contribute to improved learning outcomes.

By addressing the compatibility issues with the existing ROS Indigo version, this project aims to ensure that the CoWriter program remains compatible with contemporary hardware and software platforms. The Indigo version is no longer maintained, which means it is unable to access the latest features, improvements, and bug fixes. Moreover, the Noetic version, the latest ROS version, is not compatible with Python 2, which further necessitates the need to update both ROS and Python. Transitioning to the ROS Noetic version, which supports Python 3, will provide better support for newer hardware, access to the latest ROS packages and tools, and ongoing updates to security and performance. These improvements will not only rectify the compatibility issues but also enhance the overall capabilities and user experience of the CoWriter program, thereby motivating the need for these updates.

There are five members of team NA-Boxjelly, who are working on the key project tasks outlined above. The members of the project team are:

- Joel Towell
- Jun Li Chen
- Tianyang Wang
- Yanting Mu
- Chang Shen

Please see the Team Roles and Responsibilities page for a detailed description of team roles.

Additionally, there are a number of other stakeholders in this project. The key stakeholders in this project are:

- Wafa Johal, the client
- Max Plumley, the project supervisor
- The members of the project team

Scope

In-Scope Features

The old CoWriter project makes use of code in several GitHub repositories: CoWriter, CoWriter Letter Learning, NaoWriting, Choose Adaptive Words, and Shape Learning. The code in these repositories is using Python 2.7 and ROS Indigo.

The current project involves delivery of the following:

- Update all *.py files in the linked repositories so that they use Python 3.8.10
- Update relevant files (CMakeLists.txt, package.xml, launch files, etc.) to use ROS Noetic
- Document code, clean up bad practices used in old code (e.g. global variables)
- Integrate ChatGPT as the dialogue manager for the Nao robot
- Parse audio into text (to be input to ChatGPT)
- Design a prompted, child-friendly, persona for the robot

Out-of-Scope Features

The following features are out-of-scope and will not be included as part of this project:

- New web app/UI for capturing Wacom and iOS pen data.
- Web app for analysing data from child-robot interactions.

Timeline

Sprint 2 planning and associated documentation to be delivered by 24 Mar 2023

Porting over legacy code to use Python 3.8.10 and ROS Noetic to be delivered by 28 Apr 2023

Showcase of port to client to take place on 01 May 2023

Important Links

The GitHub repository for this project can be found here.
[https://github.com/COMP90082-2023-SM1/NA-Boxjelly/tree/main]

The Trello board for this project can be accessed through this invitation link.
[https://trello.com/invite/b/kFaAe4oC/ATTI54b0bda9502936ac2167f430d4a7c5c4B9B01388/boxjelly]

The work which this project is updating and extending can be accessed through the following links:

CoWriter repository
[https://github.com/CHRI-Lab/cowriter]

CoWriter Letter Learning repository
[https://github.com/CHRI-Lab/cowriter_letter_learning]

NaoWriting repository
[https://github.com/chili-epfl/nao_writing/tree/master_wacom/nao_trajectory_following].

Choose Adaptive Words repository
[https://github.com/CHRI-Lab/choose_adaptive_words].

Shape Learning repository
[https://github.com/chili-epfl/shape_learning].

Link to our Sprint 2 demo video:

[https://www.youtube.com/watch?v=zVhCEDpGPME]

Link to our Sprint 3 demo video:

[https://youtu.be/QeSPYzzCbWA]

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