Whitepaper

Visual Computing and Games Technology (MSc)

Tell me mAI story

by

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1 Project Idea

1.1 Vision

Imagine children could present a drawing of animals to our AI to make it tell a children's story involving the animals as characters. At the heart of the interaction are the children's drawings, digitized as images. Easy to grasp features allow children to influence the story. They can provide clues to the AI regarding character importance, relations, activities. Thus, children interact with and learn about AI in simple creative ways while having fun.

1.2 Core Features

Interactive storytelling tool for elementary school children aged 6 to 8 as well as young secondary school children aged 8-12. Its unique capability lies in its ability to understand hand-drawn animal illustrations, which should be selected from a pre-defined animal catalog, and in response, generate captivating stories involving the recognized characters.

With the help of numbers, markers, and activity cards, the children can influence the story that will be created.

- Using numbers, the importance of the characters can be denoted, for example a 9 would be a main character.

- Markers are used to indicate which characters should meet with and talk to which other characters during the story.

- Pre-defined activity cards can be placed onto the picture to indicate which characters should take part in which activities (e.g. eating, drinking, jumping, going for a walk) during the story. (The activity cards are considered a potential feature, still to be prioritized with respect to other features and details.)

Essentially, a processing pipeline transforms an annotated child's drawing into a generated story, which is then read aloud by the machine or device.

2 Related Works

2.1 Scientific Research

Children's drawings have been a research topic for many years with the intention to analyze these drawings. More and more these drawings are analyzed with the help of machine learning or deep learning algorithms [1, 2]. Separately, the detection of drawings are used in a more gamified way as well. In 2017 Google introduced its machine learning based game "Quick, Draw!", where you draw a sketch and the neural network tries to guess what it is. At the same time the game uses the sketches to learn and identify more sketches [3]. Meta went even further and uses an AI to animate children's drawings when they have arms and legs. These characters can be animated to do different poses like dancing or jumping as well as being set in different backgrounds [4]. Using artificial intelligence for creative storytelling in general [5] and children's stories specifically is not a new approach, but has gained a lot of attention in the last few years. Zhang et al. [6] developed a child - AI collaborative drawing system for story telling called "StoryDrawer" . Another example is the human - AI collaborative chatbot "StoryBuddy" that enables children and parents to use an AI for storytelling [7]. Our research project aims to bring a new idea to this research area by using a mixed media approach with paper drawings influenced with tangibles that create an enjoyable children's story.

AI techniques have been increasingly expanding and bridging its application to diverse field such as Computer Vision, which unlock the understanding of visual artistic expression, e.g., in children's drawing. The domain of object detection has advanced from early algorithms like edge-based methods (Canny edge detection [9]) or template matching [8], to modern deep learning methods like CNN (Convolutional Neural Networks [10]). Additionally, the convergence of generative AI model and object detection has enabled the potential of collectively textual and visual information processing, to provide robust solutions for visual scene understanding.

3 Game Design

Pre-defined set of animals:

- fox

- owl

- spider

- cow

- elephant

Our targeted user group are children aged 6 to 12 years old. Therefore, we need the consent of their parents to be part of our evaluation audience for using our tool and answering a research questionnaire afterwards. Another additional condition regarding this user group is that the final story has to be in German. This can either be achieved by designing the tool to have a German output or by translating it to German afterwards. Additionally, the research group has to make sure that the AI generated content is child friendly and no offensive output is possible.

4 Hardware and Frameworks

4.1 Hardware

- Windows PC and powerful GPUs (e.g. Nvidia) (at least two or three)

- Game Studio access

- Camera or similar image input devices (webcam, phone camera)

4.2 Software

- Google Colaboratory and Hugging Face Platform accounts (free plan is expected to be sufficient)

- Python code editor (VS Code) or IDE (PyCharm)

- Meta AI account

5   Project member qualifications

Vanessa S.

- Project management
- Scientific writing and research
- Game interface development
- Game design
- Digital storytelling

Sven L.

- Images and text dataset curation and preprocessing
- Image classification
- Object recognition
- Convolutional Neural Networks
- Auto-encoders
- Python programming and packaging
- Vision keeping

Hoan V.

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- Object recognition
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- Auto-encoders
- Python programming and packaging
- Computer vision framework evaluation
- Digital storytelling

6   Experience gained or deepened during the project

- Deep Learning
- LLM Prompt Engineering, Instruction Tuning, Fine Tuning
- Text-to-Speech
- AI training and testing on platforms (e.g. Hugging Face, Google Colab)

7 Research Questions

It is possible during the progress of the research project that we will split the research questions into a primary research question and secondary aspects to it.

Potential research questions:

- Do kids like the stories, i.e. is it possible to generate stories meaningful to kids, compared to children's literature.

- Do kids accept the product, in particular do they like how they can influence the story via variations of their pictures, markers, activity cards, etc.?

- Do kids understand AI? That it can make mistakes? Do they have fun using it?

References

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