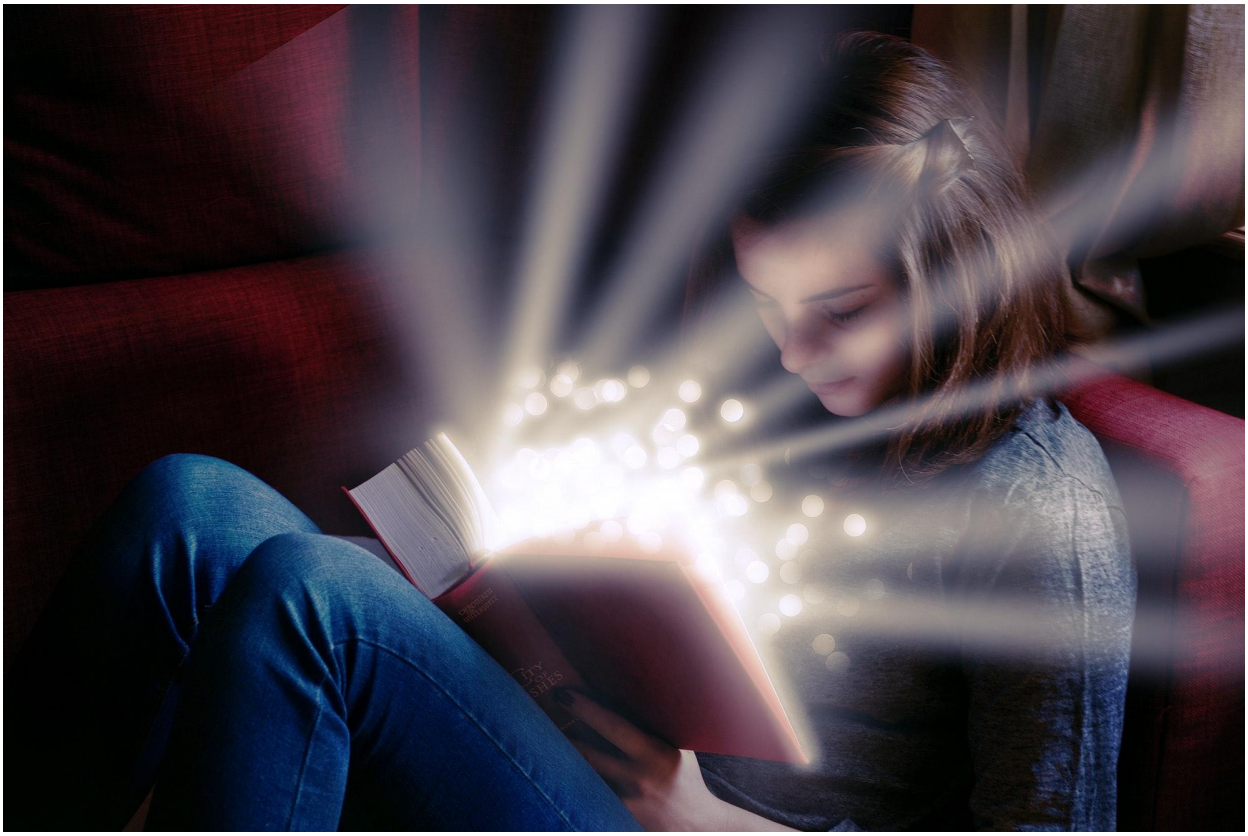

Story Pixies

A Video Self-Modeling Story Creation Framework

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Overview

Autism Spectrum Disorder (ASD) is a developmental disorder with a broad range of symptoms and severities. However, a common theme is difficulty with socialization and communication. (CDC, 2018) Neurotypical infants are naturally social learners, attending closely to the eyes and faces of their caregivers. This forms a solid foundation for learning as they grow. Autistic infants, on the other hand, appear to treat people as any other object. (Ingersoll, 2008) This leads to issues developing this foundation. While early therapy intervention is critical for improving these basic skills, autistic individuals often spend their lives attempting to catch up to their typically developing peers. Parental involvement in this endeavor is a key element to their success. (Mandelberg, Cunningham, Ellingsen, Bates, & Frankel, 2014)

In addition to therapy, parents need to support their autistic children with supplemental learning activities. Autistic children are generally stronger visual and auditory learners, (National Institute of Mental Health, 2018) and often prefer to interact with computers and tablets. There are a vast number of apps purported to help the development of autistic children. However, many of these games have no science behind them. A recent article in Science Magazine noted, "A directory compiled by the advocacy organization Autism Speaks lists more than 700 apps, games and other digital resources intended for people with autism or their families, but only around 5 percent of those have scientific data backing their effectiveness." (DeWeerdt, 2018)

Granted, it is difficult to find good evidence-based science to use as the basis of an app or program. A 2018 Annual Research Review paper on the state of Autism intervention science stated that "intervention science in such an important developmental disorder continues to be so fragmented and methodologically fragile." (Green & Garg, 2018) However, there are some accepted evidence-based interventions for Autism. While therapeutic interventions are not necessarily designed as educational tools, the methodologies used can very easily be adapted to a learning environment to teach skills that are difficult to obtain in a traditional setting, such as life or social skills.

Existing Works

Applied behavior analysis (ABA) is the most widely accepted intervention for autistic children. (ABA Therapy, 2018) It is a set of principles based on the science of learning and behavior. However, it heavily relies on professional evaluations and individual goal creation. *Autism Language and Cognitive Therapy with MITA* (MITA) (ImagiRation, 2018) is one such educational game backed by research, and makes use of ABA principles. However, it does not directly teach social or living skills.

FaceSay (FaceSay, 2018) and *Let's Face It!* (Games | Let's Face It, 2018) are two research backed educational games that target social skills. However, they target the underlying foundational skills of gaze, joint attention and emotion recognition. These are critical skills to learn, but once those skills are developed, learners need to focus on more advanced skills.

Video modeling (VM) and video self-modeling (VSM) are also widely accepted evidence-based methodologies. (Bellini & Akullian, 2007) It has been shown to be effective and generalizable across a wide range of diagnoses and ages (above preschool level). (Buggey & Ogle, 2011) One such platform which revolves around VM is *Gemiini*. (Gemiini, 2018) It targets life and social skills in discrete video segments, each of which is less than a minute long.

Bandura's work with social learning indicates that an individual learns best from a similar model. (Bandura, 1994) Since there is nobody more similar to a person than oneself, VSM should be very effective. In this line, while *Gemiini* is fairly effective in teaching life and social skills, VSM would make learning even more engaging and relevant to the child.

Proposal

Video Self Modeling, Feedforward

One of the techniques of VSM is feedforward. This involves multiple sessions of capturing video of the individual performing a task. The video is then edited into a single clip capturing only the positive aspects of the task, essentially showing the subject performing the task completely from start to finish without mistake. Such a technique is useful when a child is working on a new skill which they have difficulty performing. For example, if the target goal is independently getting dressed, they would splice together video of the child laying out clothes on the bed and pulling on each piece of clothing. The editor would remove any prompts to produce a final video of the child performing all of the steps in sequence with no prompting or mistakes.

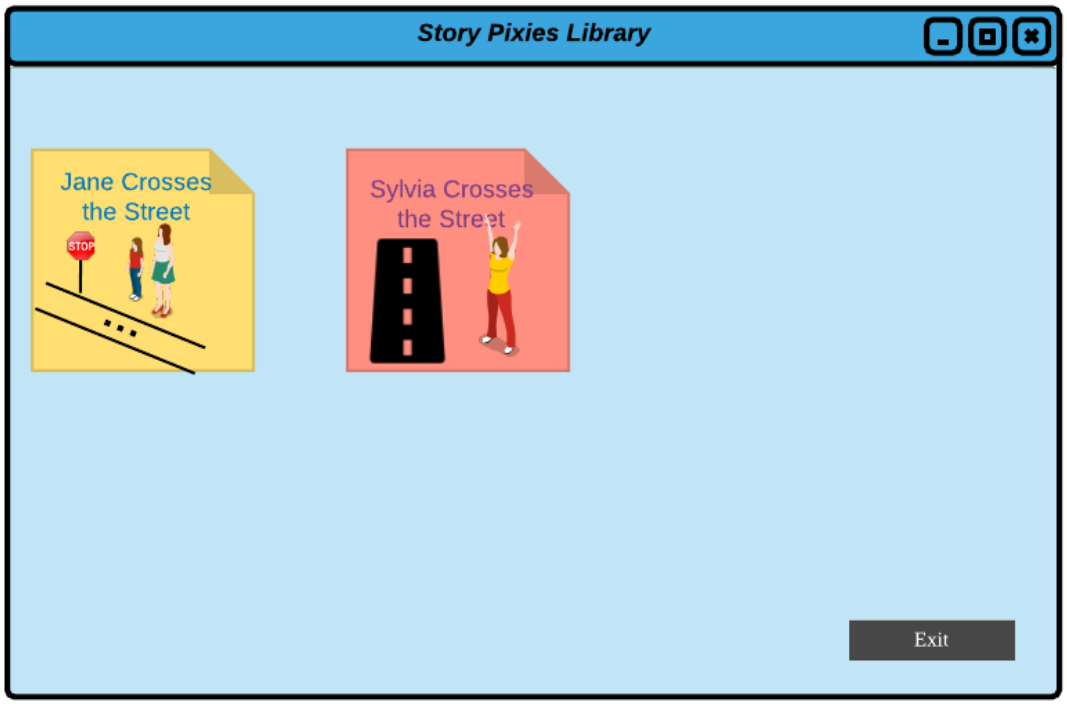
One of its biggest drawbacks, however, is the difficulty in assembling each video. There is overwhelming support for the effectiveness of VSM, however few schools implement it due to the difficulty in editing and producing the videos. (Bellini & McConnell, Strength-Based Educational Programming for Students with Autism Spectrum Disorders: A Case for Video Self-Modeling, 2010) One such issue with editing is the necessity to maintain a continuity in the video. If the video clips were broken into smaller discrete pieces separated by naturally occurring transitions and supported by a framework to assemble them, it should be easier to implement this methodology.

Story Pixies, a VSM Framework

Story Pixies is meant to be a framework application which enables parents or teachers to easily assemble a VSM story featuring the child in order to teach generalizable life and social skills. A caregiver can use the framework as a basis for personalizing a VSM story library which the child can use to view the video stories which feature them. The natural progression of a story requires turning pages to show the next scene. This can serve as a natural break to eliminate a feeling of discontinuity that might otherwise occur when splitting two scenes together.

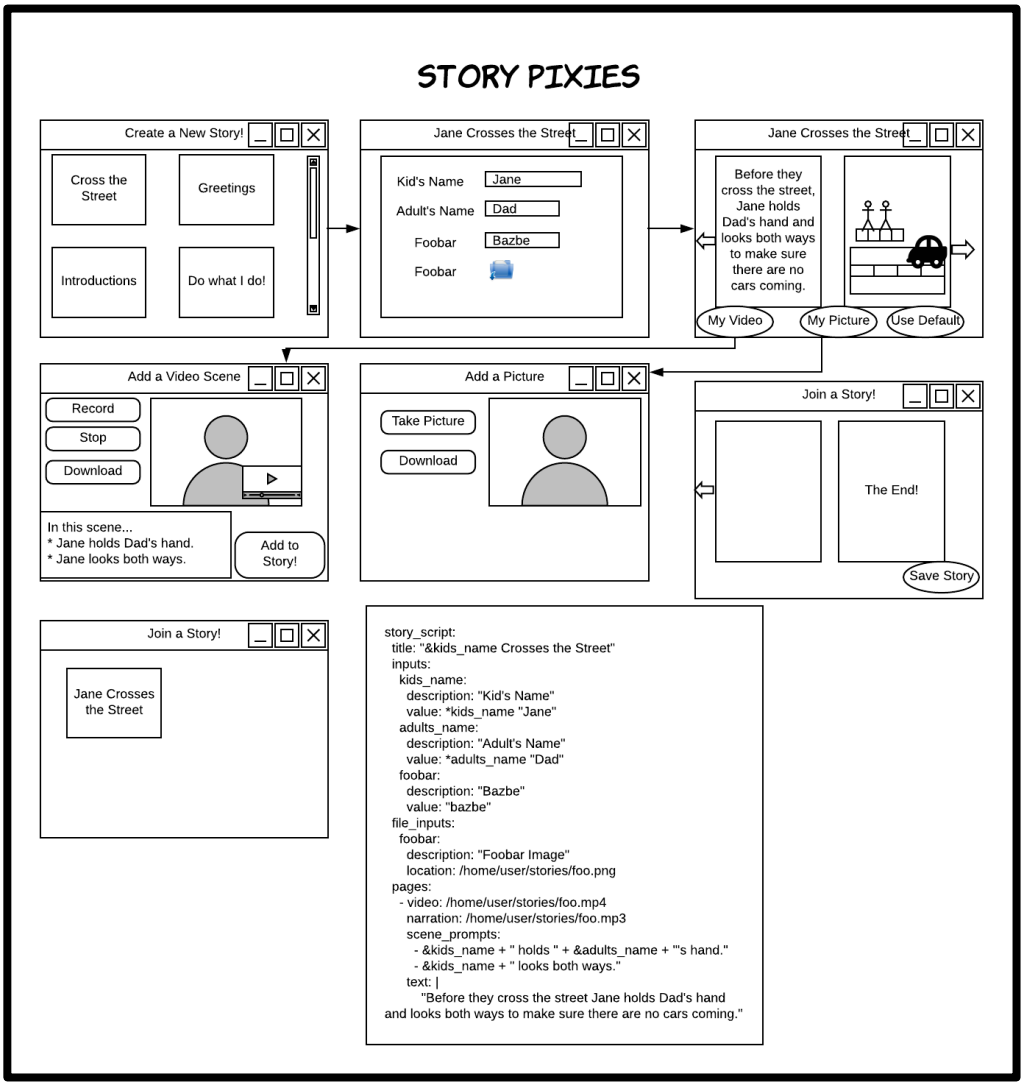
Child's Story Library

A generic library can be presented to the child at first to evaluate which stories interest the child. That story can then be taken and personalized for the child, adding it as a separate book to the library. This step will increase engagement and motivation by identifying a subject of intrinsic interest to the child.



Story Creation Workflow

1. **Review stories -** The caregiver reviews the available story templates in the app, and selects one in which the child has taken interest. A few templates will be available at first, but later versions should include the ability to create them from scratch.
2. **Personalize the story text -** Once selected, the caregiver will fill personalize the story for the child by entering information which can be inserted into the story, such as the child's name and a featured companion's name for use in the narrative.
3. **Personalize the story visuals -** Moving on, the caregiver will review each page and choose whether to use the default picture, their own picture or a video clip.
4. **Add the story -** Finally, the story can be added to the child's library for them to view and enjoy.



Alternate Collaborative Workflow

For more advanced children, the caregiver can work with the child to create a story. While in the creation screen, video can be captured instead of just uploaded. This will allow the child to take part in the creation of their story by acting out scenes instead of the caregiver assembling scenes from externally obtained video.

1. **Review stories -** The caregiver and child sit down together to review the available story templates. The child selects one of interest.
2. **Personalize the story text -** Once selected, the caregiver will help the child personalize the story by entering information which can be inserted into the story, such as the child's name and a featured companion's name for use in the narrative.
3. **Personalize the story visuals -** As the child moves through the story template, the caregiver will assist the child in capturing video as the child and caregiver act out the scene together.
4. **Add the story -** Finally, the story can be added to the child's library for them to view and enjoy.

Evaluation

Final evaluation of the project will ensure the following functionality is met. Note that adjustments may be made during the course of the project to account for unknown unknowns.

Targeted Goals

- Stories can be paged through backwards and forwards
- Story library opens when clicked into
- Starter stories appear in the story library
- Stories can be selected and opened
- Custom data is correctly substituted in story text/title
- Media displays correctly in the stories (video media plays, image media displays)
- Creation page opens when clicked into
- Create new story button brings user into creation screen with blank template
- Clicking on an existing template brings user into creation screen with populated template
- User can page backwards and forwards through creation screen content
- User can add and create new data and save it to the template
- User can add/change the details on title page and save
- User can upload new media to a page from computer or download from url
- User can add/remove the template in the library

Stretch Goals

- User can capture new media via video or camera directly
- Video can be set to start and stop playing at given time points in the video file
- Narrative can be recorded and is read after turning the page
- Text to speech capability can be turned on, and is read after turning the page
- Story can be exported as a single video

Technical Details

Sources and Materials

- Designed with Lucidchart (Lucidchart, 2018), a web-based diagramming tool
- Coded with Kivy (Kivy: Cross-platform Python Framework for NUI, 2018), an open source, cross-platform Python library
- Image content from appropriate public domain sources or created from scratch
- Story content from appropriate public domain sources or created from scratch
- Version controlled with git and stored at https://github.com/netpixies/storypixies
- Data will be stored as in yaml (?) or similar type structured files to make sharing easy

Platforms and Hardware

The library used to create Story Pixies is cross-platform. However, it will initially be developed on a PC with either OS X or Ubuntu Linux. Additional hardware required will be a generic video camera on a laptop or mobile phone, or one capable of digitally transferring videos.

License and Source Availability

Story Pixies will be open sourced at https://github.com/netpixies/storypixies. License TBD.

Deliverables

- October 15, 2018 - Weekly Status Check 1
- October 22, 2018 - Weekly Status Check 2
- October 29, 2018 - Weekly Status Check 3
  - Intermediate Milestone 1: Presentation or trailer
- November 5, 2018 - Weekly Status Check 4
- November 12, 2018 - Weekly Status Check 5
- November 19, 2018 - Weekly Status Check 6
  - Intermediate Milestone 2: Functional prototype
- November 26, 2018 - Weekly Status Check 7
- December 3, 2018 - Weekly Status Check 8
- December 10, 2018 - Final Presentation: Video introducing the project
  - Final Paper: Accompanying paper
  - Final Project: Code, README and starter stories

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