cMotion: Helping Autistics Develop Mentally and Socially

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Introduction

Autism is a lifelong disorder mainly characterized by a strong inability to recognize or comprehend emotions, and an incapability to connect with other human beings. Autistic individuals are, however, extremely obsessive over their limited interests, and very task-oriented, precise, and logical – even though this is extremely hard for them to express. Because of these qualities, it's my personal hypothesis that autistic children could become superb computer programmers. The difficulty with this, however, is making the children accept the complex syntax of computer languages which looks remarkably incorrect to someone who's accustomed to doing something a certain way.

This summer, I've worked on designing a prototype for a game that I will be creating in the fall. This game, cMotion, will ultimately familiarize the intended users, autistic children, with C++ syntax, as well as give a strong review of different facial expressions and emotional responses. The game is not intended to teach emotion recognition or the actual act of programming to these children; rather, it will hopefully make the participants more comfortable with C++ syntax so that when they actually are taught later on, they will more readily accept what they don't immediately understand.

Background

O. Grynszpan, et. al. "Using facial expressions depicting emotions in a human-computer interface intended for people with autism"

- Studied how high-functioning autistics interact with computers in regards to spatial cognition and social interaction
- Found that autistic individuals can improve their ability to interact with others and communicate coherently by playing games that focus in these areas.
- This seems to only work for social interactions and did not work for spatial cognition.

A.O. Mohamed, et al. "Attention analysis in interactive software for children with autism"

- Studied how autistics respond to different levels of stimuli
- Concluded that too much stimuli saturates an autistic individual, and they'll stay more focused if there's only necessary stimuli – excess aspects of the game that are unneeded will go unnoticed and may cause frustration or lack of attention.

The room that prompts the user to feel happy.

Research

- I read articles (two of which are listed above) through ACM portal and IEEE xplore.
- I took notes of the conclusions of each, using them to help design how I wanted the game to play
- I went on National Autism Society and a few other lesser known autism sites to find out how they thought video games and computers affected autistic children.
- I made a user story for cMotion
- I took a few online tutorials to learn how to program C# and how to use

Impact

- While this program is just a prototype and hasn't yet been tested by participants, it will hopefully provide the following to its intended users (high-functioning autistics):
  - An understanding of how computer code can make different things happen depending on what's entered in
  - An understanding of how computer syntax looks and operates together
  - A reinforcement of how emotions can be read by facial expressions
- Hopefully, this program will also provide scientific researchers with:
  - An increased understanding of how autistic children interact with computers
  - An understanding of how autistic individuals can actually operate a computer themselves.

Conclusions

Autistic children respond best to:
- As little stimulation as possible while still being comprehensive
- A set, clear goal that they are working for
- Auditory and visual speech/text together provide the optimal way of making an autistic child comprehend a point

Future Work

This fall I plan to create the actual version of cMotion with the Source engine developed for Half-Life 2. This game will not only contain 3D paths, but a virtual human with clear, readable, diverse facial expressions. I'll be using Face Poser to manipulate her various emotions, and I expect there will be a much clearer understanding of emotions when using a virtual human as opposed to a sprite. I also plan the make more interactions with AI characters to evoke emotions, instead of just images in a room.

Ultimately, I would like to allow autistic children to play through this game. Ideally, there would be two groups. A control group that has never seen the game before and an experimental group that has played through the game a few times and has achieved mastery. Both groups would be then taught how to make simple computer programs. If the group that has played cMotion before accepts the programming syntax more readily than the group that hasn't and there is a significant difference, a positive correlation between this game and the ability to teach programming concepts to autistic children could be deduced.

The user explores the world trying to locate emotions.