Funny Math: A User Expression Driven and Dynamic Difficulty Experience

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What is FunnyMath

FunnyMath is an example of using computer vision to innovate and improve on traditional education methods. Our approach is to use Ohh1, an open source game, along with the VisageSDK to create an educational experience which adapts to the student’s needs. VisageSDK is used to track facial expressions, and by monitoring the emotional state of the user, the difficulty of the game can be manipulated to better suit the user.

Motivations and Objectives

- Current educational methods are less effective than a personalized and interactive approach.
- Our objective is to make learning problem solving skills more effective through a personalized entertaining experience.
- Funny Math changes its difficulty depending on the user’s facial expressions and emotions to create an innovative platform.

Methodology

- We first investigated existing math games. Lacking any particularly interesting open examples, we instead sought out logic games.
- Eventually we found Ohh1, and proceeded to tie our existing script into it, leveraging the existing hint system.
- Simultaneously, we experimented with the Visage SDK, extending the provided Face Detector demo page to also show emotional state, according to our desired heuristic.
- We later adapted this script into our current frustration heuristic: a certain amount of frames deemed “angry,” diminished by those deemed “happy”

Research Challenges

- Little to no prior experience with Javascript
- Working within the limitations of the Visage SDK
  - Poor moustache detection
  - Highly variable or face-dependent emotion probabilities
  - Poor browser support
  - Fickle/day-to-day results

Future Work

- Funny Math can be improved by more testing with different uses to obtain better thresholds.
- The Anger Bar page could be used as a training session to determine thresholds for individual users and create personalized profiles.

Results

- "Anger Bar" demo page
  - Horizontal bar slowly fills with every frame of camera data where the subject is in the “angry state.”
  - Additional Happiness measure can revert the bar’s progress.
- 0hh1 with hints tied to our heuristics
  - The game tracks the state of an invisible “anger bar,” using the same heuristics as defined above. When the bar reaches a certain threshold, the game shows a hint.
- Discussion
  - Many parameters -- such as the threshold for what is considered “angry” or “happy,” can be reconfigured

Acknowledgement

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References

[2] https://github.com/Q42/0hh1
[4] mathy.website