

Introduction

The value and effectiveness of speech intervention is emphasized in previous research [3]. In this work, we use automatic speech recognition (ASR), video feedback and programmable microcontrollers to develop training games for children to supplement sessions with a speech language pathologist (SLP).

Training Game

We combine two key elements in our training games:

- A novel physical interface
- Customized video feedback

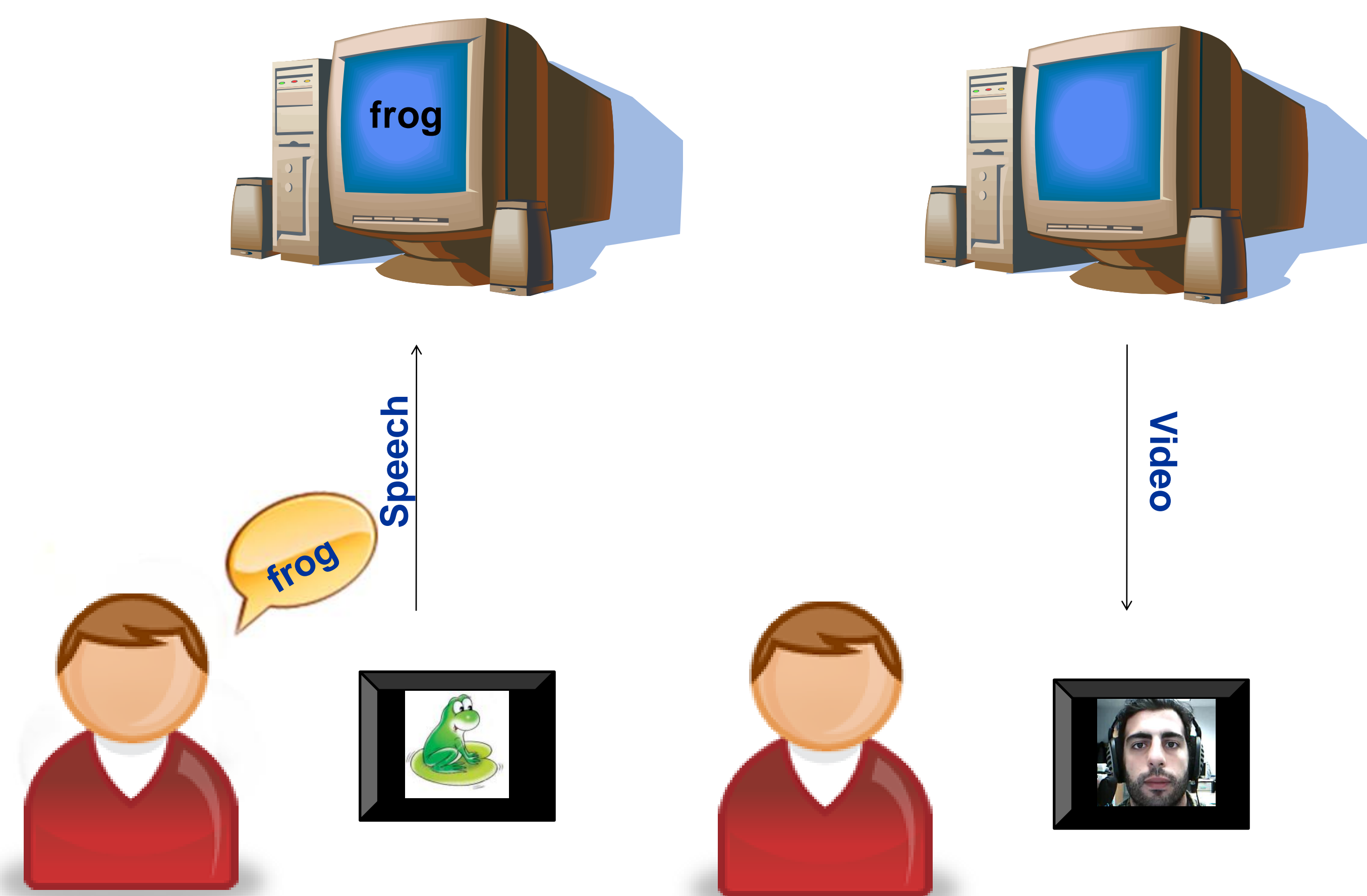


Figure 1. Interaction through wireless network

The child plays the game by talking into and moving interactive objects. The speech is captured by an embedded microphone and sent over a wireless network to a computer server that uses a speech recognition engine to process it and sends back appropriate video feedback based on the result. The system keeps track of the interactions of the child and provides the SLP with a report at the end of the exercise period that is used to assess which words and sounds are problematic.

Interactive Objects: A new Paradigm

By using interactive objects as the interface of the game, we transcend the traditional computer screen, mouse and keyboard paradigm. Using this mechanism emphasizes the element of play and in turn increases the motivation of the child which is essential for the success of the application. Furthermore, the interface can be customized to match the needs of children with other disabilities thus making the application more accessible.

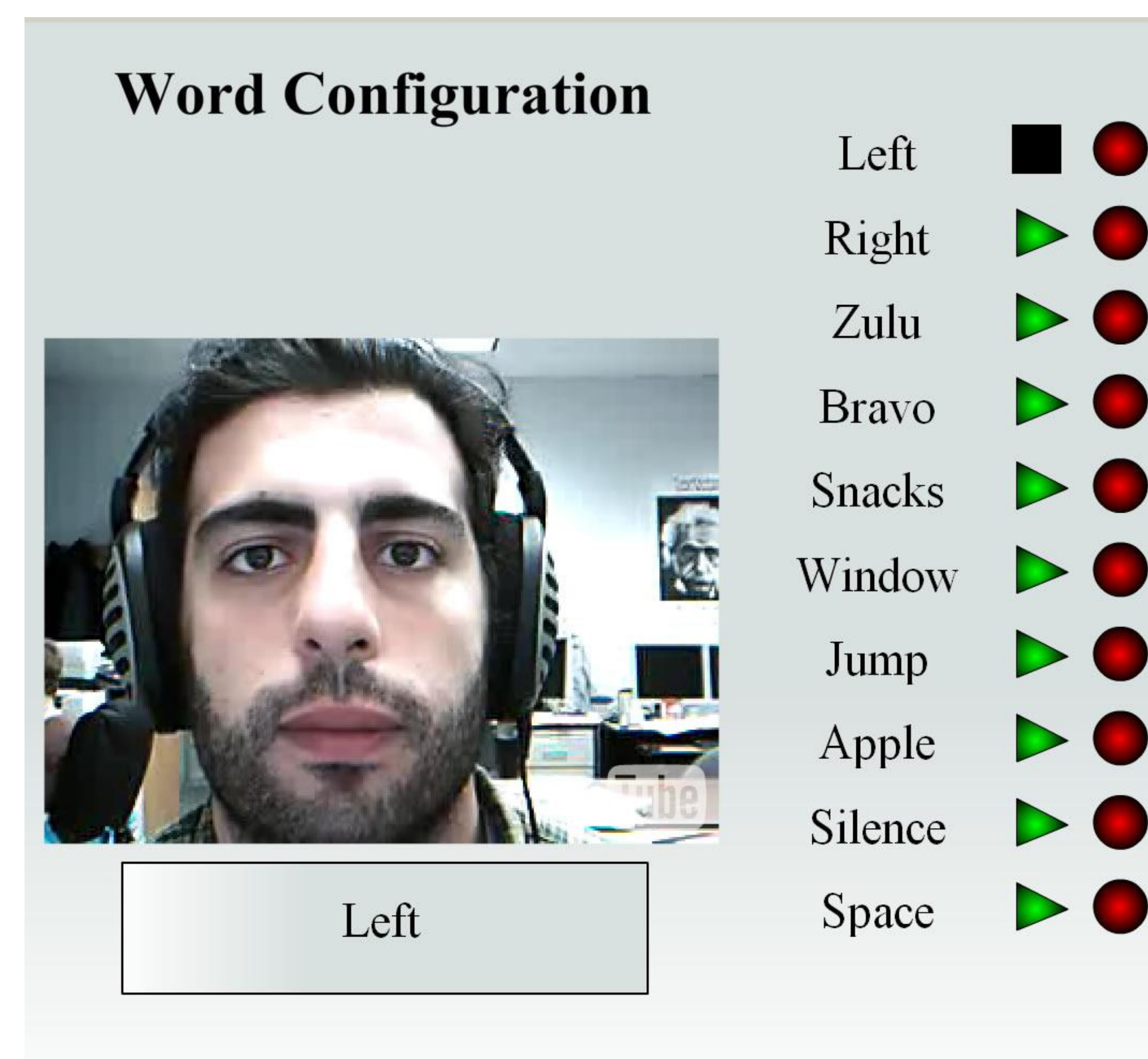
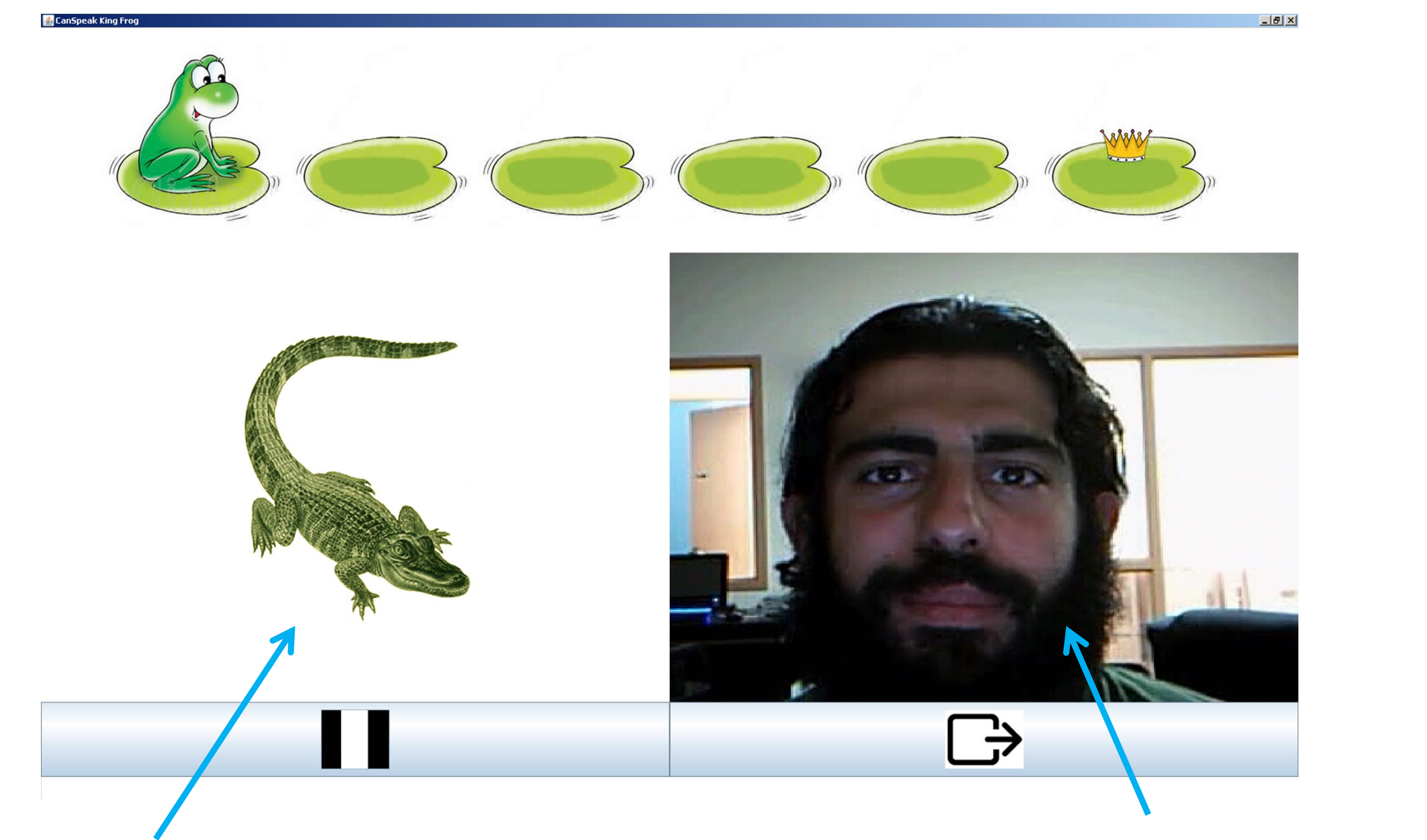


Figure 3. Video feedback recorded and reviewed for each word

Video Feedback

An essential part of the project involves a simple and efficient interface that lets the SLP record video feedback for each word or phrase. This video is shown to the child whenever they have difficulty pronouncing a word. The customized video feedback is more effective than other forms of feedback, such as wave-form visualizations, tongue and vocal tract animations or recorded voices, provided by other speech intervention applications [1][2]. Additionally, the SLP can configure the difficulty of the exercises by specifying how closely the child's pronunciations should match correct pronunciations stored in the system.



Visual Cues

Video Feedback

Figure 2. The "Frog King" interface

"Frog King" Desktop Prototype

In the first phase of the project, we have developed "Frog King", a desktop version of the game. The child helps the frog get to the crown by saying a number of words. Each time a word is said correctly the frog moves forward. Video feedback is provided in case of repeated errors.

In the physical version, each interactive object represents a lotus flower and the child helps the frog "jump" from leaf to leaf by saying corresponding words into each object.

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References

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