

# Improving Speech Therapy by Motivational Home Exercises

Peter DEMČÁK, Ondrej GALBAVÝ, Miroslav ŠIMEK, Veronika ŠTRBÁKOVÁ\*

*Slovak University of Technology in Bratislava  
Faculty of Informatics and Information Technologies  
Ilkovičova, 842 16 Bratislava, Slovakia  
Icup2013@googlegroups.com*

The ability of speech has an important place in human lives. It is closely connected to other human skills like thinking and perception, learning, writing and reading. Nowadays, many people and especially children suffer from speech disorders. It is essential that children perfect their ability to speak correctly before they begin attending primary school, because after reaching the age of seven, the correction of habitually incorrect speech becomes lengthy and rather difficult.

Many parents with children with speech disorder attend speech therapy. Although speech therapy may show the wanted results, about 40% children in Slovak and Czech primary schools still suffer from some kind of speech disorder. In secondary schools, this persists in approximately 10-15% cases. These numbers are striking enough for us to start finding ways in which we could improve the techniques of speech therapy by using modern technologies. The resulting complex solution we are introducing is called Speekle.

The speech therapists need to prescribe children various types of exercises:

- In many children the speech disorder originates from having weak tongue muscles.
- There are many phonemes (speech sounds used in spoken language) that children find difficult to pronounce. Generally, teaching them to pronounce them correctly requires repeating the sounds many times, often continually and with use of over-pronunciation.
- Children who have difficulties with spotting difference between different phonemes usually need exercise on listening words with the help of their parent.

In reality, many children refuse to exercise and view the exercises as punishment because it is tiring and takes up a lot of their time. Parents also tend to underestimate the importance of exercising, or they may lack the needed time and energy to help their

---

\* Supervisor: Michal Barla, Institute of Informatics and Software Engineering

children exercise. Though the speech therapists can usually see whether the child has been exercising or not, they lack the means ensure exercise is not neglected and monitor its correctness.

Our solution, which we propose to solve this situation, aims to improve home exercises. It stands on two main cornerstones.

- We created specialized methods for controlling a computer that can be used to support speech therapy. We use the resulting technologies to emulate speech exercises in our application. We currently have at our disposal two types of special controls:
  - Tongue tracking – Developed using Kinect, this technology enables us to track the position of the tongue, so the patient can use it to control the computer. This way we provide means to exercise oral-motor skills of the patient.
  - Phoneme recognizer – This method makes use of analyzing sound in real time and extracting certain problematic phonemes which are characteristic for the local language. We concentrate on recognition of continually pronounced phonemes as they are pronounced during ordinary speech exercises.
- Each child who suffers from a speech disorder is its own case and has special needs. The human factor represented by a speech therapist cannot be replaced by a software system. This is why Speekle is more than just an application. It represents a whole platform which enables the speech therapist to review the information about the children's exercising and configure the exercises to help solving complex problems with speech.

Our solution is aimed at supporting speech therapy via reinvented practice of speech exercises. To build on our created means of control, we created the client game application TalkLand. From the view of the child, TalkLand is a game world where they participate in adventures by helping characters in this world. They help the character by playing their minigame, which is designed to emulate a specific speech exercise. Minigames in TalkLand utilize not only ordinary controls but also tongue tracking and phoneme recognizer. The special controls are naturally integrated into gameplay where they also support game immersion and provide instant feedback via gameplay to ensure the child exercises correctly.

The Speekle web application enables the speech therapists to monitor the progress of their own patients and customize their therapy according the patients abilities and needs. The app also provides the speech therapist with key moments, which are the most interesting recordings taken during the exercising session, accompanied by their own success rates.

We deployed the first iteration of Speekle in speech therapy center ASOBI in Bratislava where the children were amazed by playing with TalkLand and the speech therapist reviewed and approved of the session results.

*Extended version was published in Proc. of the 9th Student Research Conference in Informatics and Information Technologies (IIT.SRC 2013), STU Bratislava, 1-6.*

*Acknowledgement.* This work was partially supported by the Institute of Informatics and Software Engineering, Slovak University of Technology in Bratislava.