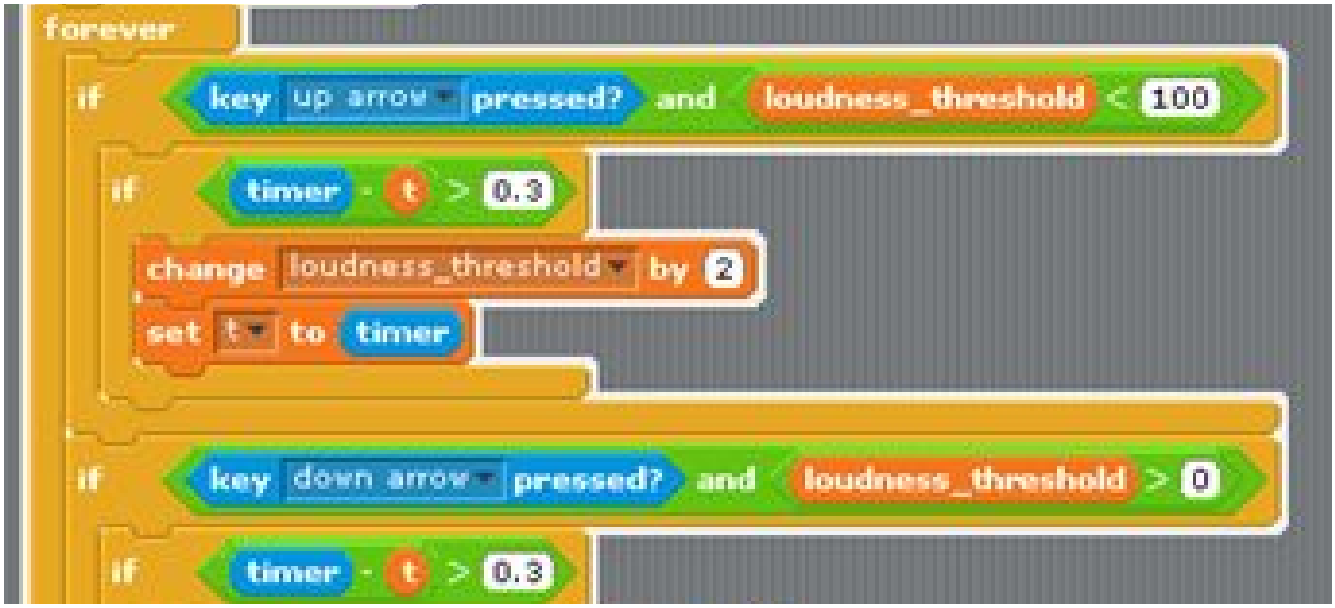
The Power of Speech

M. Ehsan Hoque



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Ehsan, Siam and Shahed-playing computer games.

January 17, 2010 I politely enter the room of Dr. Rownak Hafiz, Chairperson of Bangladesh Autism Welfare Foundation, and say, “I am looking for a high functioning autistic kid with speech difficulties.”

Dr Hafiz assures me with a smile, “We have exactly what you are looking for.”

Moments later, a severely autistic nine year old, Siam, walks into the computer lab accompanied by his teacher. Shahed, who has been Siam's class teacher for the last three years, tells us that Siam has very limited vocabulary and he is not capable of forming independent sentences on his own. Siam likes to repeat what he hears and he is difficult to work with due to his short attention span. He also does not understand the concept of turn taking a critical factor fundamental to human communication. We try to engage him in our intervention, but minutes later, the intervention had to

be terminated due to his lack of cooperation. I impatiently look at the teachers, Siam, and the volunteers with a look which reads, “How are we supposed to work with him?”

Two weeks later

Siam looks forward to 9:00 am everyday when we arrive at the Autism Welfare Foundation and nudges his teacher to bring him to the computer lab. While at the lab, he demonstrates his ability to learn new words, retain them, and describes them with proper loudness and control of his voice. He pays undivided attention while we engage him in our intervention. He shows his ability to take turns to perform tasks in the computer, which is a concept a lot of individuals with autism struggle with and could take months or even years to grasp.

So what did we do to him in two weeks?

Flashback

December 17, 2009. I keep punching the keyboard of my computer towards drafting an email to Nicholas Negroponte, the founder of One Laptop per Child (OLPC) effort. My purpose is to request him to donate a few 100-dollar laptops for my project in Bangladesh, so the project could scale up. I certainly did not have the funds to buy the expensive desktops or laptops for my project. Therefore, getting a generous donation of laptops from the OLPC foundation would be the best way to go. After two of days of effort of writing a convincing email, I finally give up and send him an email with whatever content I had. Within a minute, in response to my flowery convincing email, I get a reply with sixs words in it. “How many laptops do you need?”

Poshla playing computer game.

Approximately one third to one half of children and adults with Autism Spectrum Disorder (ASD) have significant difficulty using speech and language as an effective means of communication. Their inability to express themselves just the way we do often gets misinterpreted as their disinterest to engage in social interaction. These communication challenges affect interaction partners as well, making it hard for family members and others to understand what a person with ASD is trying to say and/or what feelings they are trying to convey. Given the implications of speech-language abilities on social communication, there is a longstanding interest in assessing

and intervening on speech production and processing abilities in ASD. Conventional speech-language therapy includes sentence modeling (where the therapist models a sentence and the person is asked to repeat it), pacing (where the therapist uses a finger to pace the person's speech), and use of flash cards (where the person is asked to describe what is on a flashcard). While helpful, these therapies can be tedious and unrewarding for many students, and improvements often do not generalize to natural speech. Recent developments in speech technology have made it possible to develop precise and objective measures of speech and language ability that can assist with assessment and intervention efforts.

Motivated by this development, as a graduate research scientist at the Media Lab of Massachusetts of Institute of Technology, we have developed a set of games where we engage our participants to improve their speech difficulties relating to loudness, speech rate, and turn taking. For instance, a car race game we have created, a participant will have to speak loud and clear to the microphone for his/her car to move, while the other car moves on its own by the computer. The car which reaches the finish line first, wins.

The main ideas behind these games were that (1) they are easily customizable to suit the needs and interests of individuals on the autism spectrum; (2) free and open-source, making them accessible to all with an internet connection; and (3) allow for a community of individuals on the autism spectrum and their caregivers to share and extend the games.

Our hypothesis is that a computerised game controlled by speech that is fun and engaging, and provides real-time visualisations of speech properties, can positively influence verbal communication. Our objective is not to replace conventional speech therapy, rather we wish to supplement this approach with entertaining and customizable tools that speech-language therapist can use when working with individuals who have speech difficulties and problems with attention and motivation. The technology behind the games was so simple that a car race game could be converted into something else based on someone's interest and preference. An example of such phenomenon is where the same environment of car race games being applied to (a) ships, (c) planes, or even the (d) characters of from the Disney movie, Wall-E.

The games were developed using an open source platform called scratch (scratch.mit.edu) developed at the MIT Media Lab. These games were used in United States for one year among 8

individuals as part of an intervention and the games have proven to be fun, engaging and effective. So the next step for me was to seek out for external funding to expand this work among the kids in Bangladesh, and that's where the story begins.

So what is the intervention?

After I arrived in Dhaka, I needed two individuals to work as volunteers to help carry out this project. So I had written a note in Facebook hoping that I might be able to recruit the volunteers using my social network. In response to my note, I had received around 200 emails and my phone never stopped ringing for two days. Even though I was initially overwhelmed by the high number of responses, it was very satisfying to see the interest among students to help people with needs, in a voluntary basis.

Initially, when we were working with Siam, we gave him the games that were really popular among the kids in United States. For example, the game incorporating characters from the famous Disney movie Wall-E never failed to draw attention from the kids in the United States. However, Siam, or any other kid in Dhaka, did not find any interest in those games since Disney is not yet a well known in Bangladesh. Then we started revamping the games adding their cultural components including personalised voice messages (e.g., “Shabbash, tumi jite gecho, ki moja moja” English translation, “Wow, you just won!! How cool is that?”) to indicate the successful completion of the game. Adding those components to the games was trivial; even the teachers having no training on computer education could do them when showed how to.

We are now in the process of working with kids in an individual basis to learn more about their preferences and then apply those lessons towards customizing the games. We feel that each person with ASD is unique, and we need to work with each of them by painting the world around them according to their preferences. The strength of our approach is that we enable a non-computer specialist to 'paint the world' for an autistic child by being a game developer with 5 minutes of training. We would like to clarify the point that our entire effort is voluntary and charitable, and all of our games are open source.

Our work continues to go on with the aid of wonderful set of volunteers. We are working with a few university students who are contributing to the game developments, data collection and

analysis, and mass awareness towards autism. Part of our effort also includes large scale quantitative analysis which we plan to publish in the research community, welcoming others to replicate similar intervention in other parts of the world.

For further information about our approach and to get involved, please consider visiting our website at http://web.media.mit.edu/~mehoque/speech/

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M. Ehsan Hoque is a PhD student at the Massachusetts Institute of Technology (MIT), USA

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