



# Light of life

Professor **Prabhat Ranjan** demonstrates the uses of brain-computer interface to help quadriplegic patients in India

Suresh Karat, who had a brilliant career after receiving an MBA from IIM-Ahmedabad, suffered a brainstem stroke at the very young age of 32, in 1999. This left him severely disabled; he became a quadriplegic (no limb movements) with no speech. He could read and hear but could not communicate. He could communicate with his wife Jaya only through eye blinks.

Suresh loved to read and go through information available on the Internet but always needed a person to be with him. He wanted to share his thoughts and started writing a blog (<http://kesuresh.blogspot.in/>). However, this wasn't easy. He had to tell Jaya what to write using eye blinks. For Jaya, who now had to shoulder all responsibilities (including looking after their son), this was never easy. It helped that Suresh's batch-mates had formed a trust to financially support him and his family. Many of them were also looking for solutions around the world to help improve his quality of life.

I had a chance meeting with journalist Rashmi Bansal at an event where we were co-speakers. I discussed my work on assistive devices to help patients with cerebral palsy. She wanted to write about it to raise awareness. Though it never happened, she contacted me a year later to tell me about her classmate Suresh whom she had just met in Coimbatore. She described his situation and asked me to get in touch with Jaya for more details. After speaking with Jaya and going through Suresh's blog, I realised a brain-computer interface—using which I had developed a brainwave-operated Environment Control System—may prove useful.

In the second week of March 2012, my engineers Ajay and Hiren visited Suresh in Coimbatore and tried using a system based on brainwave monitoring. This was a historic moment; after a gap of 13 years, for the first time, Suresh typed himself. It took nearly two minutes to type four letters 'JAYA', but a beginning had been made.

The way we did this was to provide Suresh with a neuro-headset, mainly developed for playing computer games. Using this, we could recognise his facial expressions through brainwaves and his eye and head movements. By recognising even slight head movements, we could map the com-

puter cursor movement. We mapped his eye blinks to get the correct mouse clicks. In other words, the cursor could be moved on a virtual keyboard on the screen and letters could be typed by blinking. Now, Suresh can also browse the Internet and use a computer. While his first use was slow as he couldn't keep his head stable while trying to position the mouse, he has improved over a month. He can now focus better, especially when he is alone.

Subsequently, we demonstrated to him how he could control other systems around him (TV, light, fan, etc) by simply controlling a light bulb by blinking. We are now customising this system to suit his needs so that he can be much more self-reliant. Suresh is getting better at typing. He wrote a mail to Rashmi that brought tears to her eyes.

*Dear Rashmi,  
Thanks a million for enabling me to type. I never thought I would start crowing about typing an email but stranger things under heaven and earth.... When my typing speed improves, I will write a post about this and send the link to our batch.*

*Kesu [Suresh]*

This news spread through media, social networking and mailing groups. I have been flooded by calls from Suresh's friends expressing their happiness and emotional outburst. It's a spark of hope for thousands of others who have been suffering in silence. As the word spreads, more and more people in a similar situation have been approaching me for help. Two days back, I got a call from a person whose 59 year-old sister-in-law has motor neuron disease and has lost her limb movements and voice. Her children are abroad and she has no means to communicate with them. He requested me to provide her with a similar system.

As we age, our physical abilities tend to weaken and I hope we will be able to provide such assistive devices to improve quality of life of many of them. I would also like to mention that we are in the process of developing many more assistive devices through the latest developments in information and communication technology. Please do get in touch with us if you or your loved ones need any help in this regard.

*The author is a professor at the Dhirubhai Ambani Institute of Information and Communication Technology, Gandhinagar. Currently, he is working to apply embedded systems and sensor networks to planetary exploration (moon mission), wildlife tracking, nuclear fusion, healthcare and agriculture. Earlier, he was a full-time scientist working on nuclear fusion in India and the US*