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Researchers develop computer vision technique to analyse stroke rehabilitation process

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Methods from optogenetics and machine learning should improve treatment options for stroke patients. Researchers from Heidelberg University have developed a computer vision technique to analyse the changes in motor skills that result from targeted stimulation of healthy areas of the brain. Movements recorded with a video camera are automatically analysed to monitor the rehabilitation process and evaluate and adjust the optogenetic stimulation. Researchers from the Interdisciplinary Center for Scientific Computing (IWR) in Heidelberg worked with neurobiologists from Switzerland to develop the method.

Along with speech and vision problems, motor paralyses are the most common symptoms post-stroke. According to lead author Dr. Dr. Anna-Sophia Wahl, a neuroscientist at the Swiss Federal Institute of Technology (ETH) in Zurich, neurorehabilitation is the only treatment option for the majority of stroke victims. "Many approaches in basic science and in the clinic aim to trigger regeneration processes post-stroke by stimulating healthy brain regions of indeterminate size. However, we use optogenetics to systematically stimulate certain unaffected areas of the brain so that they sprout connections into the damaged hemisphere in order to assume its functions." So-called corticospinal circuits from the cerebral cortex to the spinal cord are specifically activated.

In optogenetics, light is used to control genetically modified cells. The

cooperation partners in Switzerland – researchers from the ETH and the University of Zurich – used optogenetic stimulation in combination with intensive rehabilitation training to restore the paralysed paw function in rats. "Using our automatic evaluation of the movement processes, we were able to demonstrate a full recovery," explains Prof. Dr. Björn Ommer, IWR researcher and head of the Heidelberg team. The new computer vision technique is able to quantify even the slightest changes in motor functions. "By recording and analysing the movements, we can objectively assess whether there was true restoration of the original function or merely compensation."

Prof. Ommer is a member of the Interdisciplinary Center for Scientific Computing of Heidelberg University. His Computer Vision research group is located at the Heidelberg Collaboratory for Image Processing. The latest results of the collaborative study with the researchers in Zurich were published in the journal *Nature Communications*.

More information: A. S. Wahl et al. Optogenetically stimulating intact rat corticospinal tract post-stroke restores motor control through regionalized functional circuit formation, *Nature Communications* (2017). DOI: 10.1038/s41467-017-01090-6

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