Stroke Rehabilitation Using Artificial Intelligence K.A.K.I (Kinesthetic Augmented Kinematic Inference)

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Stroke was among the top causes of adult disability globally. Stroke patients required early rehabilitation for better recovery. However, they faced various problems to follow through institutional rehabilitation programs. This situation was worsened by the pandemic. Our project allowed home-based rehabilitation through interactive exercises. The project's fundamental used vision sensing to feed the images into a deep learning network to evaluate the stroke patient's rehabilitation performance. Camera images of the hand gestures were augmented against 570 images of a normal trained person through machine learning network and differentiate various hand coordination gestures in real-time. The strength of the hands was evaluated by exertion onto the muscle strength evaluator. Speech therapy identified proper pronunciation of the patient using the web application. We conducted real-world testing over different gender, age groups and medical conditions. Experimental results confirmed the proper hand gesturing through the probability of correctness with the highest at 0.98. It recognized the accuracy of various gestures which correlated with medical observation. Muscle strength evaluator revealed a variation of strength with sensitivity to identify differences in muscular strength. Speech therapy identified proper pronunciation through the accuracy of the patients’ speech. 1500 sound waves with high separation of the trained dataset were used with a high probability of pronunciation correctness up to 0.93. Our project successfully solved stroke patients' problems. It is a low-cost non-invasive technology with high customizability for various home-based rehabilitation therapies. Patients' progress could be monitored remotely with a web application.

Awards Won:
Third Award of $1,000
Oracle Academy: Award of $5,000 for outstanding project in the systems software category.