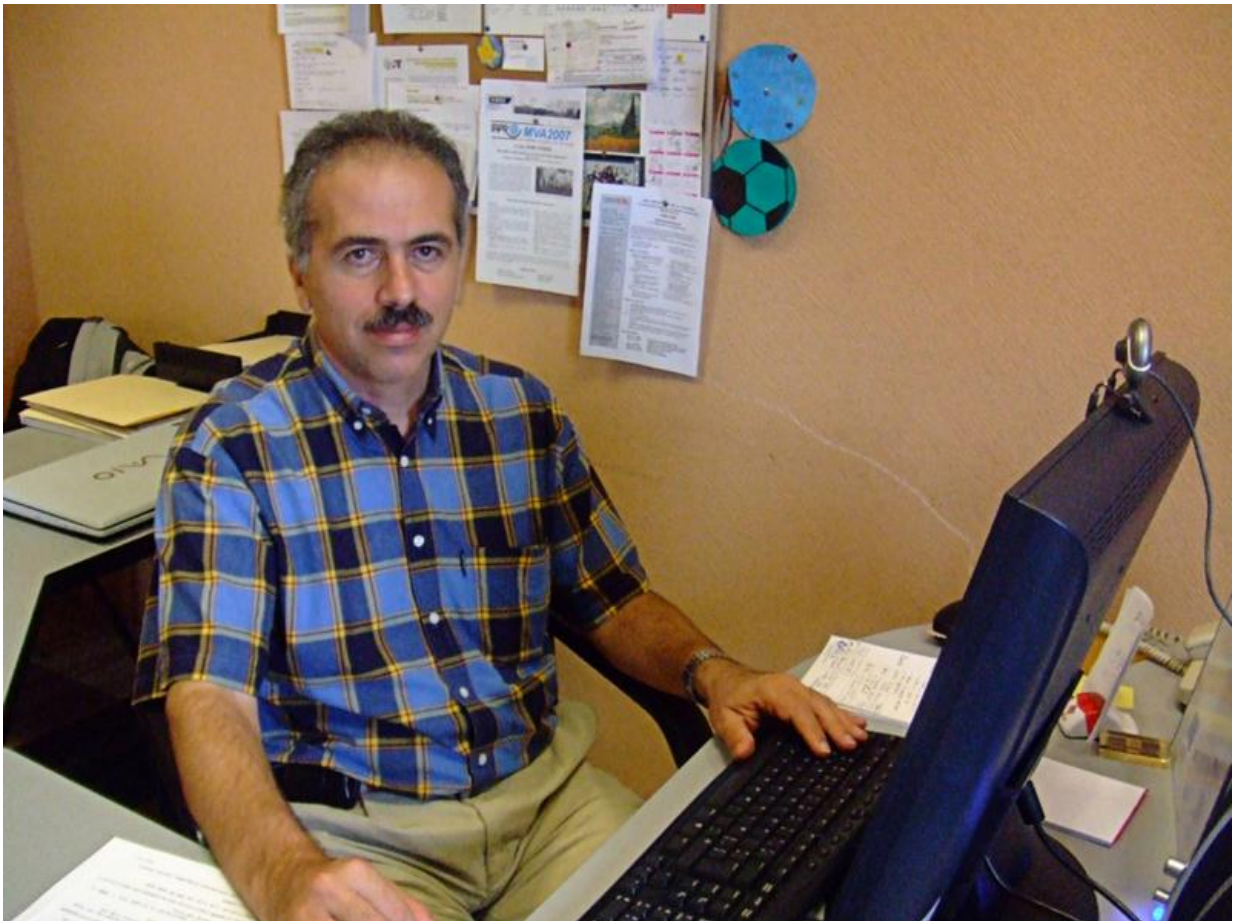


Artificial intelligence system provides therapy for cerebral stroke sufferers

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Luis Enrique Sucar Succar

Artificial intelligence, virtual worlds and interaction with video games

comprise the elements of a new therapy designed by several Mexican institutions to help stroke patients and children with cerebral palsy to recover mobility of their upper extremities quickly.

The purpose of developing this computational system of "gesture therapy" is to offer a lower-cost and more effective alternative to traditional methods, said Luis Enrique Sucar Succar, researcher at the National Institute of Astrophysics, Optics and Electronics (INAOE) in Mexico.

The technology has been proven clinically successful at the National Institute of Neurology and Neurosurgery (INNN) and Pediatrics (INP). It encompasses a computer with a webcam and a special handle with a color sphere and force sensors, which detects the exercises performed by the patient.

The idea is that a virtual agent instructs the patient to perform tasks through different games designed to exercise important parts of the arm for rehabilitation, such as the shoulder, elbow, wrist, fingers, and using different types of movement, including flexion, extension and pressing. This allows the patient to perform rehabilitation at home, without the need for a therapist's presence.

The system's virtual environments simulate daily activities to present a normal lifestyle, for example, cleaning a window, painting a room, cooking an egg, and grocery shopping.



INAOE

The system is based on artificial intelligence, which is responsible for monitoring and evaluating the user's performance while he or she exercises as indicated by the virtual agent. With these results, the difficulty level of the game can be increased or decreased based on the movements recorded by the camera and pressure sensors.

The INAOE researcher, who is also an active member of the Mexico Academy of Engineering, said another utility of [artificial intelligence](#) is detection of "compensation" for the patient, which happens when he or she moves the whole body instead of just the affected arm.

While the visual tracking software analyzes images obtained from the camera, it tracks the position of the hand in three dimensions. The system targets a color ball at the side of the handle, estimating its position using digital vision techniques that combine color and texture information of the object.

The system maps the coordinates of the patient's hand in "real" space, and transfers them to the virtual space, where it interacts with an imaginary world, which is observed through the computer screen, Sugar added.



The researcher, who is currently on a sabbatical stay in Italy, said that to achieve the development of therapy gestures, the collaboration of researchers and physicians from several institutes and universities was required.

The evaluation was carried out at the Rehabilitation Unit of the INNN where the results showed an improvement in the movement of the affected limb, increasing motivation and adherence to treatment.

The next step is a simultaneous series of clinical trials with about a hundred patients from various hospitals like INNN, the National Institute of Rehabilitation, the University Hospital of Puebla and CRIT (Children Rehabilitation Center), to establish The therapy of gestures as a commercial product.

Finally, the researcher added that he already has a patent in Mexico for the concept called "3D therapy system with monocular visual tracking for the rehabilitation of the upper limb in humans".

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