Device designed for fabrication of finger rehabilitation along with virtual reality

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Abstract: This paper presents a virtual reality-enhanced hand rehabilitation support system with a systematic master-slave motion assistant for independent rehabilitation therapies. Our aim is to provide a more interactive way of providing hope losing patients a better way to improve themselves. The VR system will be able to track the motion of the finger virtually in the desktop and encourage the patient to move along with the displaying module. Here the stiffness and the intensity of the patient's stroke which has impact on its finger reusability will be understood and the facilitating animation will be provided. All these are assisted by a set of tests after which the patient for the particular program is qualified and grouped accordingly.

Keywords- *VR, motion assistant, animation.*

I. INTRODUCTION

The VR framework will have the capacity to track the movement of the finger for all intents and purposes in the work area and urge the patient to move alongside the showing module.

- The VR support for this device takes it to an egde from the remaining system.
- Interactive sessions will be provided to the patient for easy way to provide service
- Patients will be further tested for group formation based on the stiffness, duration after stroke, intensity of impact or any brains malfunction.

The abnormal behavior of the brain tends to make it difficult for the patient to recover after some time, but now such an interactive session can even encourage them with a believe of their improvements.

The hand restoration is to some degree troublesome in light of the fact that the hand has numerous degrees of freedom of movement, and movement is facitated by this gadget that could be wore in hand as it is little in estimate(small in size).

The proposed system under development works as a motion facilitating assistant for the patients who are in learning process. This system has three main parts: 1) An Virutal Reality which provides an interactive environment 2) A rehabilitation device controller and 3] with the help of safety supervisor who will guide with the appropriate attributes for the rehabilitation facility asked by the patient.

II. SYSTEM OVERVIEW

We have built up a hand recovery gadget that has 18 DFMs of movement: 4 DFMs for the thumb movement help system, 3 DFMs for each finger movement help component,also, 2 DFMs for the wrist joint as appeared in Fig. 1(a). Virtual reality activities ought to incorporate agreeable developments (between a finger and another, or between the finger and the wrist) and talented developments. In this paper, ideas of the virtual reality-upgraded hand recovery emotionally supportive network and the assessment consequences of the patient's remarks are exhibited.

Several scenarios to be supported are considered:

- If a patient is facing problem with arm or complete hand movement, the patient must approach as soon as he or she realises of its disability.
- If a supervisor is absent or the patient is left alone then in such situation i.e in the absence of the mentor the device would likely guide the patient with the feasible rules of using the device
- The most appealing and convenient situation where the system can play a vital role is to know the understanding capabilities as well as the improvements in terms of measures with who much the patient has improved.
- Finally the patient the device easy to be used and very interactive as well.

III. REHABILITATION THERAPY

The main motive of this device is to provide complete setup facilitating the hand movements as well as a satisfaction and comfort that he or she may surely improve and soon be able perform all work normally.

Most patients who require hand restoration are crippled just on one side of the body. In view of that, we

have built up a self-movement controlled hand movement help gadget. The solid hand creates the reference movement for the activity, while the movement associate gadget joined to the handicapped hand imitates the movements, accordingly empowering the debilitated hand to make the reference movements symmetrically.

Oneself movement control will bring the accompanying favourable circumstances to the hand recovery:

(1) Patients can envision preparing movements for an impeded hand on the grounds that such movements are produced by their very own hand on the inverse side. This capacity is required to encourage the recuperation of the crippled capacity.

(2) Patients control the movement help gadget independent from anyone else. In this way, they can stop the gadget right hand at whatever point they need, e.g., in the event that they feel torment amid the activity.

(3) The movement aide gadget is improbable to compel the disabled hand to broaden or flex past the portable reaches. This is on account of the reference movements for the hindered hand are built from the genuine joint points of the solid hand since the two hands would be comparable in size and structure.

(4) Place your affected arm on the table and place a water bottle in your affected hand. Keep your hand and fingers relaxed.

(4) The ace movement of the ordinary side keeps the decay of unused muscles on that side; such decay would happen even in an ordinary hand if not utilized adequately.

(a) Stroke therapy exercises for upper part of palm

(b)Thump rehabilitation exercise

Fig 3(a) Rehabilitation therapy exercises.

It is accounted for that a hand recovery treatment called reflect treatment has a therapeutic impact. In it a patient sees solid hand movement through a mirror and feels the debilitated hand move with the ordinary hand. Selfmotion control by a patient is relied upon to have an impact like the mirror treatment. This task accomplished by utilizing self-movement control.

IV. EXOSKELETON HAND TRAINING GLOVE

Specially designed an exoskeleton handrobotic training device for person after

(c) Exercise for finger rehabilitation

stroke to actively train their impaired hand functions. By measuring his/her surface lectromyography (EMG) signals from the impaired hand muscles, this robotic device detects the stroke person's intention and assists in hand opening or hand closing.

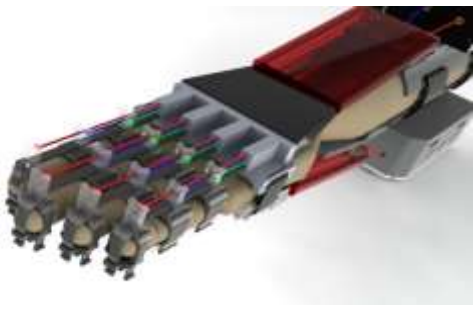

Fig 4(a). Device Overview.

Most patients who need hand rehabilitation are disabled only on one side of the body. With that in mind, we have developed a self-motion controlled hand motion assistance device .

Fig 4(b). Exoskeleton hand robotic training device.

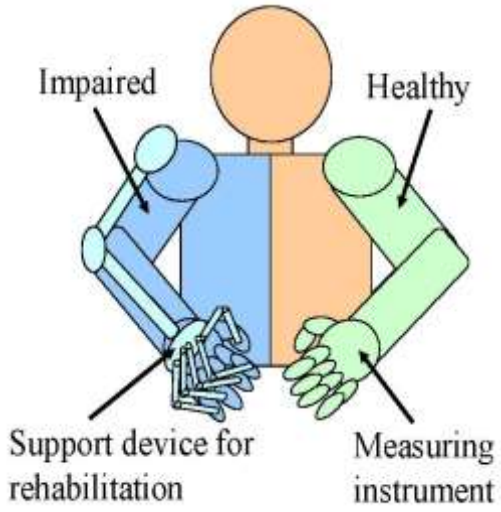

Fig 4(c). Self-motion control

The normal patient hand produces the reference motion for the exercise, while the motion assistant device attached to the disabled hand reproduces the motions, thus enabling the impaired hand to make the reference motions symmetrically. The self-motion control for arm motion has been presented , and the actual recovery of shoulder and elbow functions in clinical tests has been reported. However, this control method has not been realized for fine hand movement with man DFMs.

V. VIRTUAL REALITY SYSTEM

A virtual reality-improved hand recovery emotionally supportive network with a symmetric ace slave movement associate has been exhibited for self-performing recovery treatments. In this framework, singular finger joint movement of a weakened hand is bolstered by the exoskeleton gadget, which is controlled by the finger joint movement of the patient's solid hand. A VR condition showing a compelling activity.

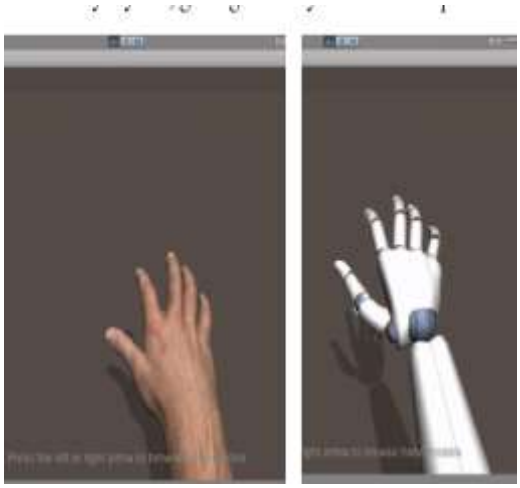

Fig 5(a) VR interface

Fig 5(b) VR in monitor

To confirm the viability of this framework, the clinical test was executed for six patients. Accordingly, the framework added to make strides what's more, improve the patient's inspiration for the restoration,anyway since neither subject nor period were sufficient, it did not come to demonstrate the factually huge viability of the framework.We are persuaded that the created recovery framework has a high potential for self-performing recovery treatment for hand-debilitated people with hemiplegia.

As what's to come work, we are intending to enhance nature of the framework and to assess the recuperation impact by directing a clinical preliminary on more patients.A virtual reality-upgraded hand recovery emotionally supportive network with a symmetric masterslave movement colleague for autonomous restoration treatments. Our point is to give fine movement exercise to a hand and fingers, which permits the debilitated hand of a patient to be driven by his or her sound hand on the contrary side.

Fig 5(c) Patient using the VR supported device.

Since most handicaps caused by cerebral vascular mischances or bone cracks are hemiplegic, we embraced a symmetric ace slave movement partner framework in which the hindered hand is driven by the sound hand on the contrary side. A VR domain showing a successful exercise was made in light of framework's trademark.

VI. CONCLUSION

The proposed gadget can possibly be utilized for other medicinal or mechanical applications . Notwithstanding post-stroke restoration, this model could be utilitarian for the recovery of hand wounds. Since run of the mill hand wounds influence just a single finger, it could be utilized to enhance the non-intrusive treatment after tasks and help the patient recover scope of movement of the finger . By sufficient plan of the exoskeleton, it could likewise help avoid work environment wounds or help enhance execution of various undertakings.

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