

# STUDY AND ANALYSIS OF IMPLEMENTATION OF ROBOTICS IN THE FIELD OF PHYSIOTHERAPY

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**Abstract** - Physical therapy is used to improve a patient physical functions through physical examination , diagnosis , prognosis , patient education , and health promotion. It is practiced by physical therapists, usually at a clinic or at the patient suitable place . Even though physiotherapists are efficient and effective, there are some difficulties faced by patients like travel distance , works in rural areas Robotic technology designed to assist physiotherapy can potentially increase the efficiency of and accessibility to therapy. It helps to assist therapists to provide consistent training for extended periods of time, and collecting data to assess progress. Robotic devices also offer flexibility in their operation, as feedback of the user's performance based on the data from the sensors can be used to provide appropriate movements and forces during training . It enables consistent training of the prescribed intensity for extended periods of time. It has the potential to completely change the way physiotherapists deliver treatment to patients in the future.

**Key Words:** Physiotherapy,Robotics,Sensors.

## 1. INTRODUCTION

Asian countries such as Japan and China developed the classic massage techniques as a safety therapy to cure and build up human health science olden times . Eventually Europe introduced the modern massage methods which are also available Asian countries . Massage is the best helpful method for the human body to remove muscle fatigue and pain quickly and also to relax muscles . Massage is a part of physiotherapy .Physiotherapy stands for studying giving therapy in physical bodies. By entering of industrial revolution and modernization in developing countries machines are also introduced in the field of physiotherapy.

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The main objectives are

- To Study the chance of robotics in physiotherapy
- To design suitable robotic device which user friendly .

- To improve efficiency of the physiotherapeutic sessions and save time and money.

## 2. LITERATURE REVIEW

### 2.1 [11] APPLICATIONS ASSISTED TAPPING CONTROL FOR THERAPEUTICAL PERCUSSIVE MASSAGE ROBOT.

A percussive massage based on robotic tapping motion which is different from the common contact motion. It satisfies with the short-time contact on human muscles, and the robot end-effector itself has an initial velocity and acceleration to make an impulse contact. After contacting human muscles with dual robotic arm, the robot manipulator stops and end-effector repeatedly performs the tapping motion.

Pros:

-The developed robotic tapping motion can effectively imitate the tapping motion of massage therapists. The robot can recognize various body shapes and mark acupuncture points by image processing.

Cons:

-this device does not suit everyone nor massage effectively

-Safety mechanism is weak.

### 2.2 [21] AN ORTHOPAEDIC ROBOT - ASSISTED REHABILITATION METHOD OF THE FOREARM IN VIRTUAL REALITY PHYSIOTHERAPY.

A robotic-assisted rehabilitation system with an enhanced end-effector haptic interface mounted in a passive mechanism for allowing patients to perform upper-limb exercising and integrates virtual reality games conceived explicitly for assisting the treatment of the forearm after injuries at the wrist or elbow joints. The system allows the therapist to tailor the difficulty level on the observed motion capacity of the patients and the kinesiology measurements provided by the system itself.

Pros:

-offers the possibility of new methods of physiotherapy in orthopaedics.

Cons:

-Rehabilitation only limited to forearm

### 2.3 [31] PROTOTYPE OF AN ANKLE NEUROREHABILITATION SYSTEM WITH HEURISTIC BCI USING SIMPLIFIED FUZZY REASONING

A rehabilitation system for treating patients such as those with stroke hemiplegia. The system can smoothly perform rehabilitation training on the day of admission to the hospital. It contains a heuristic BCI with simplified fuzzy reasoning, which can detect motor intention signals from an electroencephalogram (EEG) within several tens of minutes. The detected signal is sent to the newly developed ankle rehabilitation device (ARD), and the patient repeats the dorsiflexion motion by the ARD.

Pros:

-Rehabilitation training can be performed by the patients on their own without the need for pre-setting by therapists.

Cons:

Robotic function limited to ankle rehabilitation

### 2.4 [41] THE IMPROVEMENT IN DESIGN AND CONTROL OF A MASSAGE ROBOT ON HUMAN BACK

A type of small back intelligent massage robot with 6 kinds of massage techniques for the robot: hammer, pinch, twirling, screwing, pushing and rolling. The robot can independently adjust the massage technique to massage the back skin of the human body in actual use. The robot uses a new flexible massage mechanism that reduces space usage and has high portability.

Pros:

-Improved accuracy of the massage path and increased coverage area of the massage.

-Highly portable

Cons:

-The function of the robot is limited to massaging purpose only.

### **3.EXISTING SYSTEM**

Massage is one of the most distinctive clinical subjects in traditional Chinese medicine. It can eliminate fatigue, relieve back muscles and promote blood circulation . With the increase in social pressure and the intensification of the aging society , the number of experienced Chinese medical masseurs is far from meeting the demand. The contradiction between supply and demand of massage therapy has become one of the problems that the society urgently needs to solve . In order to solve this problem , massage equipment has become a social need. Existing ideal massage equipment has massage chair, massage table, massage robot arm, massage clothes and so on. However, the intelligence of the instruments and the comfort of the massage still need to be improved . More and more research institutions are researching massage robots , such as robotic massage effects , massage paths , and massage techniques.

A portable back massage robot that is compact and space saving was designed by Wang, WD et al which can be used on human back instead of traditional large-scale structure robots . To design the massage robot , the models of electric circuit , magnetic circuit and mechanics were analyzed to achieve optimal massage force. For reproducing the manipulation of Traditional Chinese Medicine (TCM ) remedial massage and meanwhile guaranteeing safety, a 4- degreeof-freedom anthropomorphic robotic arm with integrated elastic joints is developed by Huang et al, and a passivity-based impedance control is used. An oral rehabilitation robot is developed by Ishii et al, which can massage the maxillofacial tissues for this purpose.

They propose a control system for oral rehabilitation robots. The method control system consists of a massage path generator , virtual compliance calculator , and inverse kinematics calculator . There are also some massage robots that were developed for specific body parts, such as the head, the lower extremities , the face, and the chest. Although the development of massage robots is very rapid nowadays , most of the robots have limitations because of the size, mechanism and other reasons.

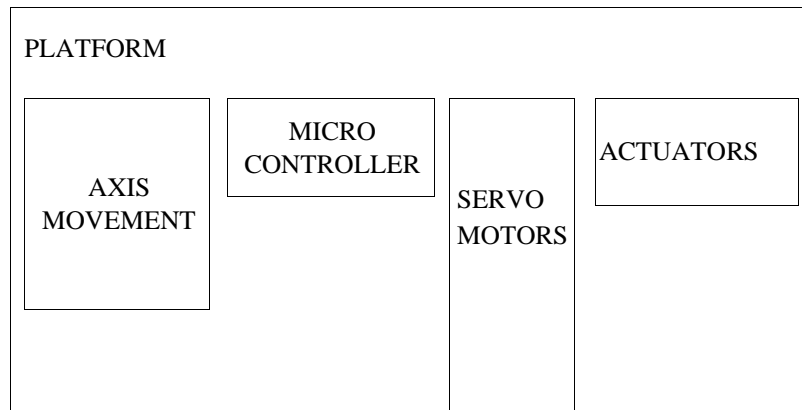
In response to this situation, we designed a new type of small back intelligent massage robot , and studied its massage structure , massage technique and path planning . There are 6 kinds of massage techniques for the robot : hammer , pinch, twirling , screwing , pushing and rolling . The robot can independently adjust the massage technique to massage the back skin of the human body in actual use . Unlike the existing large massage robots, our robots use a new flexible massage mechanism that reduces space usage and has high portability . At the same time , based on a variety of miniature sensors, the robot can adjust the path in real time, which improves the accuracy of the massage path and increases the coverage area of the massage.

### **4.PROPOSED SYSTEM**

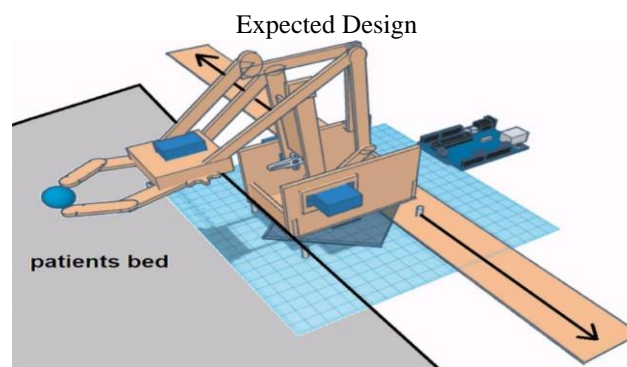
Robotic technology were designed to assist physiotherapy. It helps to assist therapists to provide consistent training for extended periods of time, and collecting data to assess progress.

Our system consists of a rail that supports the movement of the physiotherapy robot when a patient fixes our system in a suitable place and lies down The system works based on swarm technologies like master and slave the master is in hands of the doctor and the slave in hands of the patient for every each individual their therapy can be customized and feed from master to slave the patient must have to get treated by the doctor by using a master robot and the values and the ways of treatment are noted and pass down to the robot which is in the hands of that patient so the robot can do exactly what the doctor did to the patient with this master robot our device is portable so wherever the patient is he can use it when ever he needs it

**5.BLOCK DIAGRAM**



The X,Y Axis enables the device to move and get to the exact position of therapy .The micro controller controls the whole process also it holds the data of what type of therapy is to be delivered depending on the patents type. The servo motors and actuators work like the therapists hand which delivers the physiotherapy



**3. CONCLUSION**

Robotic Physiotherapist has the potential to completely change the way physiotherapists deliver treatment to patients in the future . One of the main goals of current robotic development is to pair information technology with rehabilitation robotics to deliver assessment and treatment over the internet . The multipurpose of this Robotic Physiotherapist can be further developed as the technology advances.

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