

## A telehealth monitoring system for targeted physical therapy in Parkinson's

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### Introduction

Parkinson's disease is a neurological movement disorder that affects more than 10 million people worldwide [1]. Symptoms start gradually, sometimes as a barely noticeable tremor in one hand. These symptoms worsen as the condition progresses [2]. A rating scale, MDS-UPDRS is used universally to assess the symptoms of Parkinson's, it's used to provide information on the severity of the condition and the quality of life of the patient. [3]

Studies have supported that those who exercise or attend physical therapy sessions regularly have better function and quality of life as well as slowing disease progression [4]. However, some problems associated with these therapies are subjective evaluations, lack of accessibility, or lack of continuous data [5]. COVID has brought further limitations in the delivery of clinical care, reducing time with therapists and doctors, whilst increasing the preference for at-home care. [6]

### Objectives

- ❖ Create a sensor-based system that replicates or improves the standard assessment of tremors. (MDS-UPDRS).

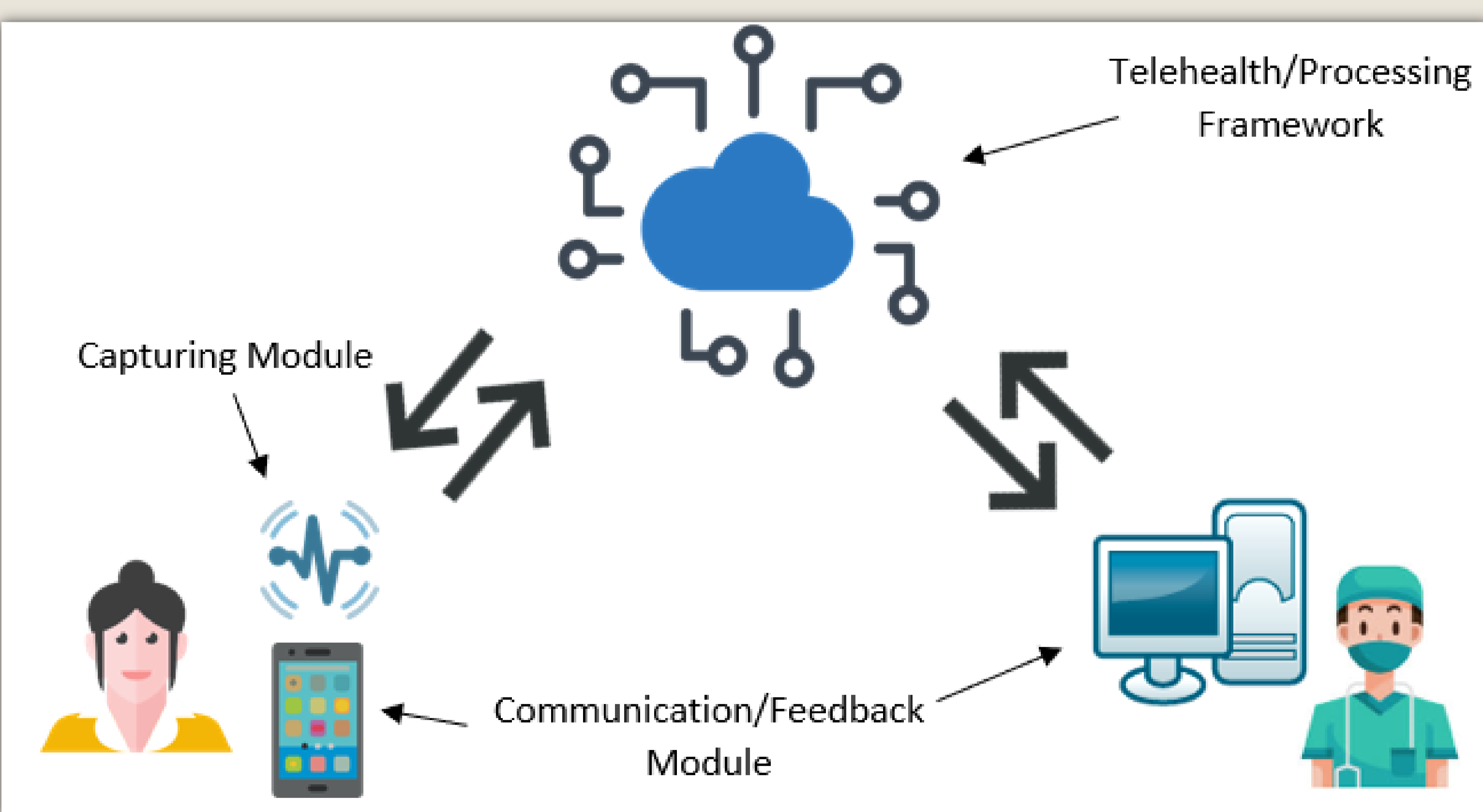


Figure 1 - System Architecture [7,8,9,10,11]

- ❖ Develop a feedback system for long-term, and home-based physical therapy.
- ❖ Use Telehealth for distant and continuous tremor monitoring for patients and clinicians.

### Methods

The sensor system will be designed through replication and improvement of the revised MDS-UPDRS scale assessments. Output will replicate the scale results on a normal to severe rating. Patient will perform a number of scale tasks and their performance will be assessed using the original scale. This will then be repeated, using a sensor to record the severity of tremors during these tasks. The sensors should capture discriminative data that is missed during the traditional assessment methods.



Figure 2 - Sensor Placement [12]

Further testing can be approached by introducing at-home tests. Physical therapy activities and natural tasks will be assessed, to determine if the sensors readings of tremors remain accurate away from a set environment.

Telehealth can then be implemented to have consistent communication between the patient and clinician, where at-home personalised care can be achieved.

### Conclusion

Wearable sensors have the potential to provide an objective, large-scale, continuous measurement of symptom fluctuation with minimal patient burden. Unfortunately, many assessments associated with these require the patient to sit still in order to complete them, or a pre-defined set of movements must be completed, [13] which interrupts the normality of the patient's life. This system will allow for continuous assessment of tremor severity, to assist in diagnosis and personalised treatment, without the patient needing to sit still or be in a controlled environment.

