



# Assessing Functional and Occupational Hand Mobility in Rehabilitation with Augmented Reality and Artificial Intelligence Enabled Systems

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## Introduction

- This research addresses design of AR based rehabilitation for people regaining hand mobility.
- Sustained physical therapy that includes functional and occupational tasks is critical for recovering from hand injuries and strokes.
- AR technologies can support remote therapy and at home practice to enable faster recovery times.

## Methodology

- AR sensors capture visual information in the user's environment that can be applied for rehabilitation practice.
- Scene information is transferred to Machine Learning (ML) and AI models to identify their potential for PT application - A WebSocket connects AR with Unity and ML models.
- AR User is recommended to interact with objects identified suitable for PT.
- AR hand tracking application records finger joint positions, time taken during tasks and other relevant metrics that support assessment and progress.

## Features Measured for Assessment

- Convert finger joint positions to joint angles (PIP) during grasping tasks.
- Fingertip position tracking .
- Task completion time for repeated actions.

## AR (Augmented Reality) Assisted Object Identification and Hand Tracking

AR Device



: Capture Objects in User's Scene

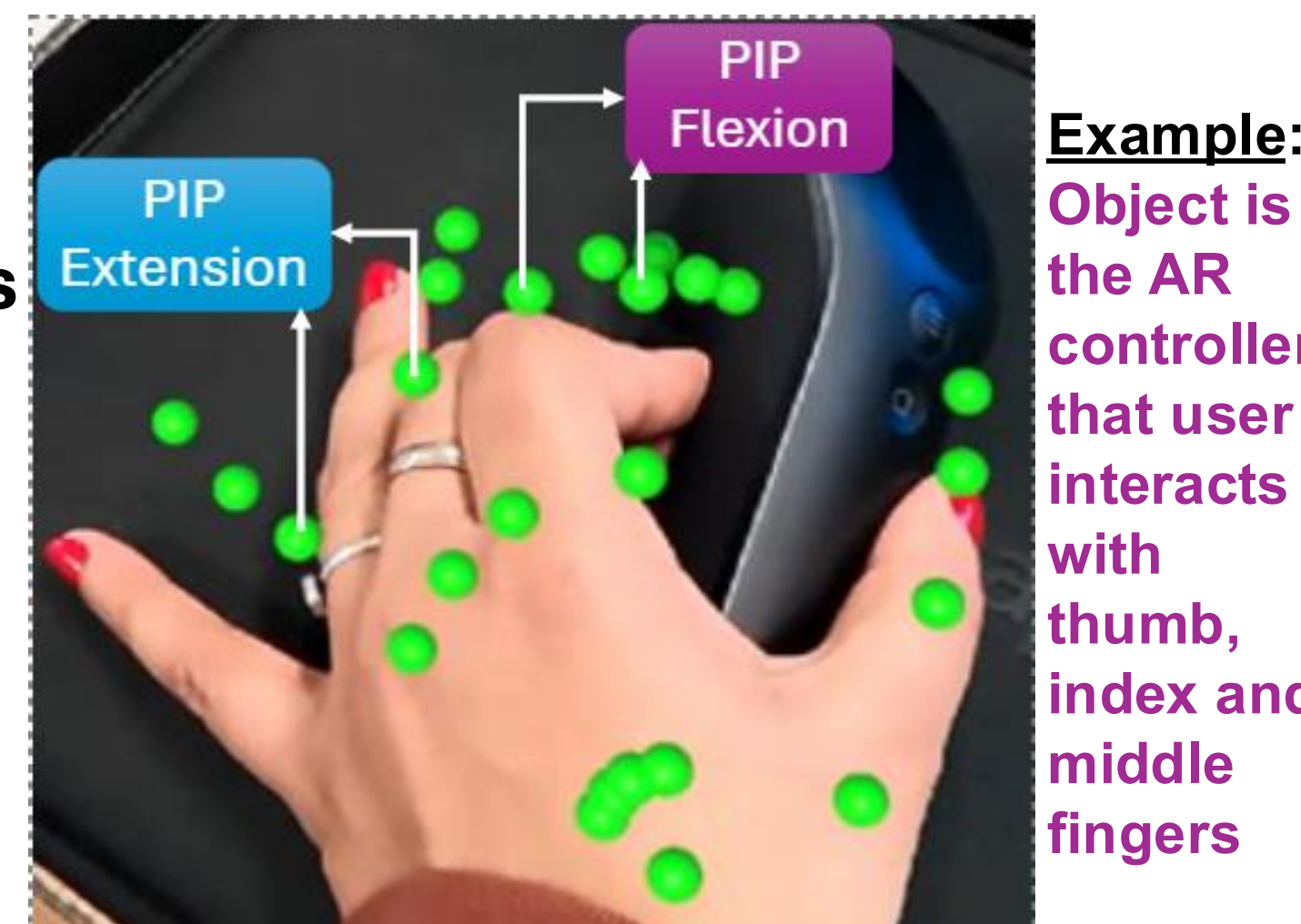


: ML/AI based object identification and labeling



: Allow Users to Select Objects for Therapeutic Exercise

: Track users hand joints

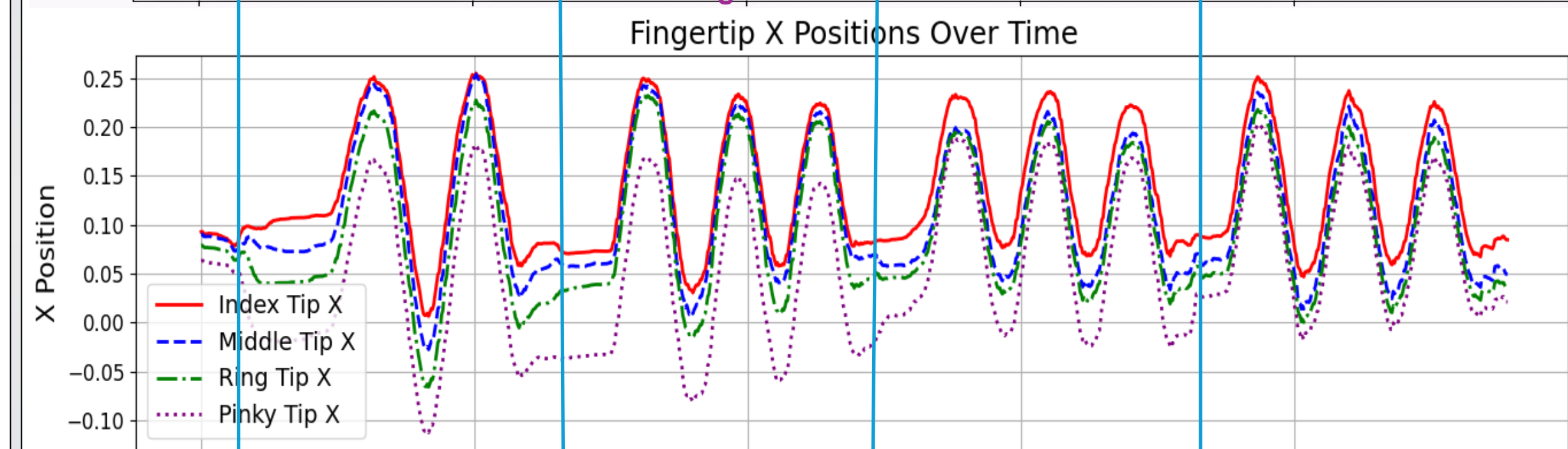
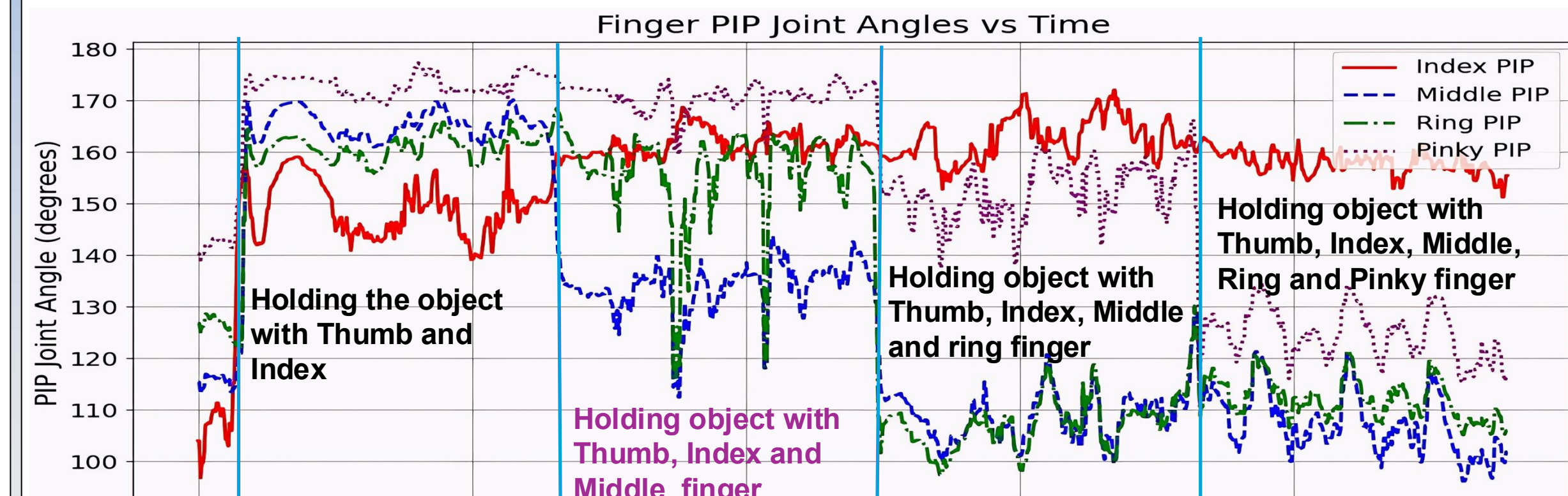


: Record joint positions

: Transfer data to computing engine

: Data Analysis on Hand Range of Motion (ROM) during task

Examples of finger joint angle changes in time at four stages of interacting with the object



Repeated translational movement of the objects along the X-axis and Calculating tip position of fingers while moving the object.

## Future Work

- Detect precise finger-object contact points.
- Analyze additional finger joint movements.
- Provide automated therapist feedback systems
- Implement objects used by PT department

## Reference

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