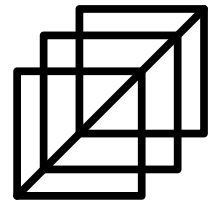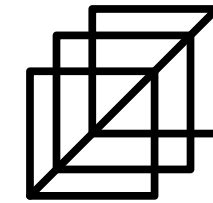# HANDREHAB

COMPUTER VISION BASED HAND REHABILITATION ASSESSMENT

GUIDED BY:

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DATE: 16 NOVEMBER 2023

AGENDA

1. PROBLEM STATEMENT
2. LITERATURE SURVEY
3. ABSTRACT
4. OBJECTIVE
5. REQUIREMENT ANALYSIS
6. DESIGN
7. TECHNOLOGICAL STACK
8. GANTT CHART

PROBLEM STATEMENT

- Hand motor problems encompass a spectrum of difficulties ranging from fine motor skills to gross motor movements.

- These challenges may arise from congenital conditions, acquired disabilities, neurological disorders, injuries, or the aging process. The objective of this project is to design and implement a handmotor assesment and rehabilitation system based on occupational therapy.

- The project provides a platform for such therapy and bridges the gap between the doctors and patients.

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LITERATURE SURVEY

Paper title	Method technologies	Advantages
1.Accuracy and feasibility of a novel fine hand motor skill assessment using computer vision object tracking: <u>Bokkyu Kim</u> & <u>Christopher Neville</u> <u>Scientific Reports</u> volume 13, Article number: 1813 (2023)	hand motor skill assessment using computer vision	Examine the accuracy and feasibility of this approach for detecting changes in a fine hand motor skill.
2.A computer-vision based handrehabilitation assessment suite- Orestis N. Zestas ∗ , Dimitrios N. Soumis, Kyriakos D. Kyriakou, Kyriaki Seklou, Nikolaos D. Tselikas (2023)	Upper-limb rehabilitation	proposes a <u>computer vision</u> hand rehabilitation assessment suite, which stands as a virtual alternative to the real-world scenarios.

3.Applying Hand Gesture Recognition for User Guide Application Using MediaPipe-Proceedings of the 2nd International Seminar of Science and Applied Technology (ISSAT 2021)	**Hand Tracking using Mediapipe**	**The MediaPipe is present as a framework built-in machine learning that has a solution for a hand gesture recognition system**
4.Recognization of hand gestures Using mediapipe hands Volume:04/Issue:06/June-2022	**Hand Gesture Recognition**	**Gestures of a hand can be determined using Mediapipe library**
5.Computer vision system for tracking players in sports games	**Human tracking**	**Tracking of players in Indoor games**

ABSTRACT

- Problem Focuses on upper limb deficits in patients, commonly assessed using tests like Box and Block Test (BBT) and Sollerman Hand Function Test (SHT).
- Proposes a virtual alternative using a Computer Vision Hand Rehabilitation Assessment Suite.
- Utilizes advanced technologies like MediaPipe Hands for precise hand and finger tracking.
- System requires only a mid-range PC and a camera, eliminating the need for additional peripherals or physical equipment.
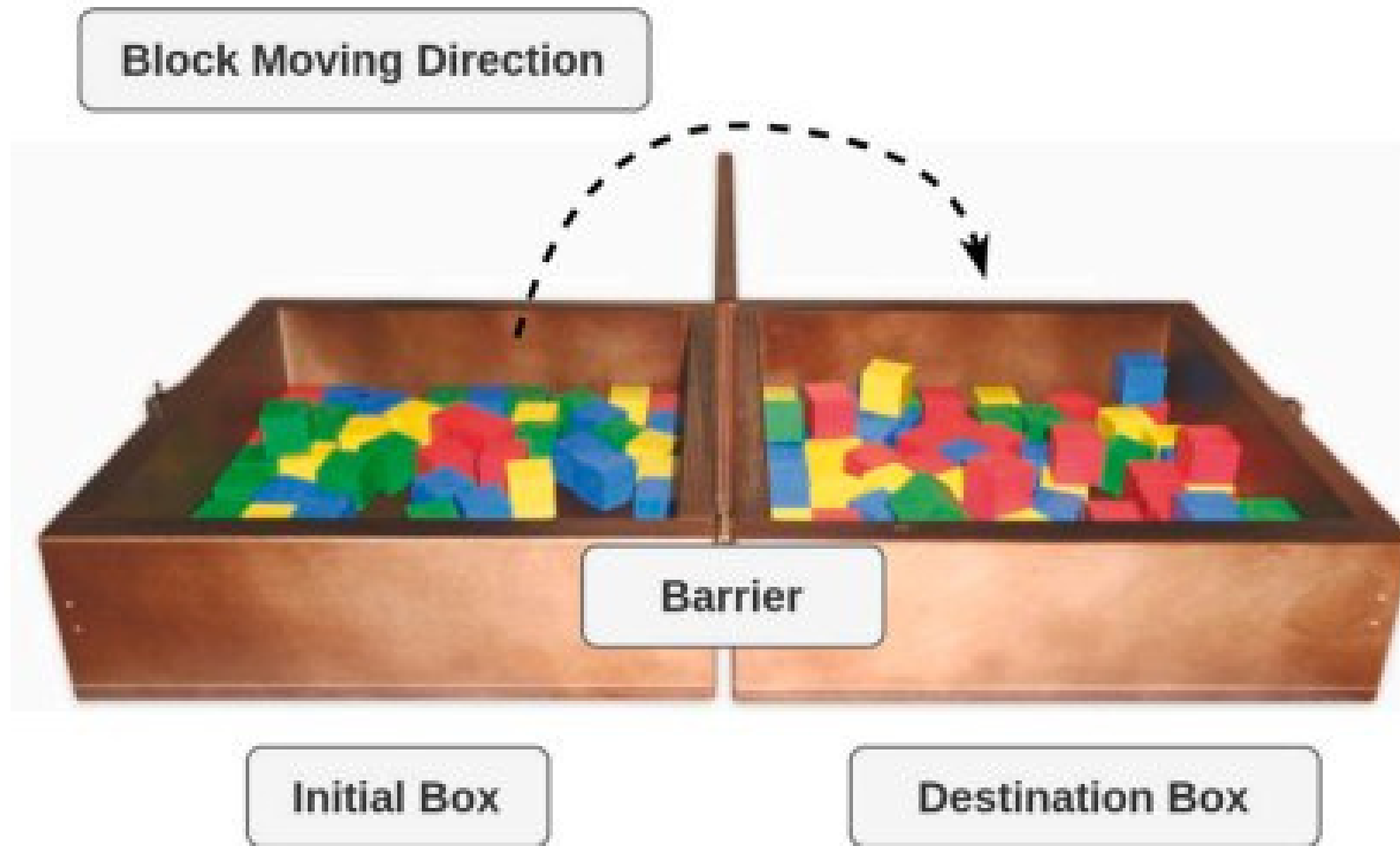
Fig. 1. Demonstration of the original BBT.

OBJECTIVES

- Our proposed system **"HANDREHAB"** is to Eliminate the need for specialized equipment and streamline the rehabilitation process for individuals with hand motor deficits.
- It utilize advanced computer vision technologies, such as MediaPipe Hands, for accurate hand and finger tracking.
- Enable remote assessments, allowing healthcare professionals to monitor and evaluate hand motor recovery progress from a distance.
- Develop a cost-effective system that requires only a mid-range PC and a camera, making it accessible to a broad range of users.

REQUIREMENT ANALYSIS

FUNCTIONAL REQUIREMENTS

- HAND DETECTION

- SCORE ANALYSIS

- MOVEMENT OF OBJECTS IN VIRTUAL ENVIRONMENT

- COLLISION DETECTION ON BARRIERS

- FINGER MOVEMENT TRACING AND DETECTION

- REHABILITAION ACTIVITIES

NON - FUNCTIONAL REQUIREMENTS

- UI SHOULD BE MINIMAL AND INTUITIVE

- SYSTEM SHOULD RESPOND WITHIN 1 S AFTER CHECKING USER INFORMATION

- WEBSITE SHOULD BE CONNECTED TO THE INTERNET

- SECURED ACCOUNTS BY USING A UNIQUE USER-ID AND PASSWORD

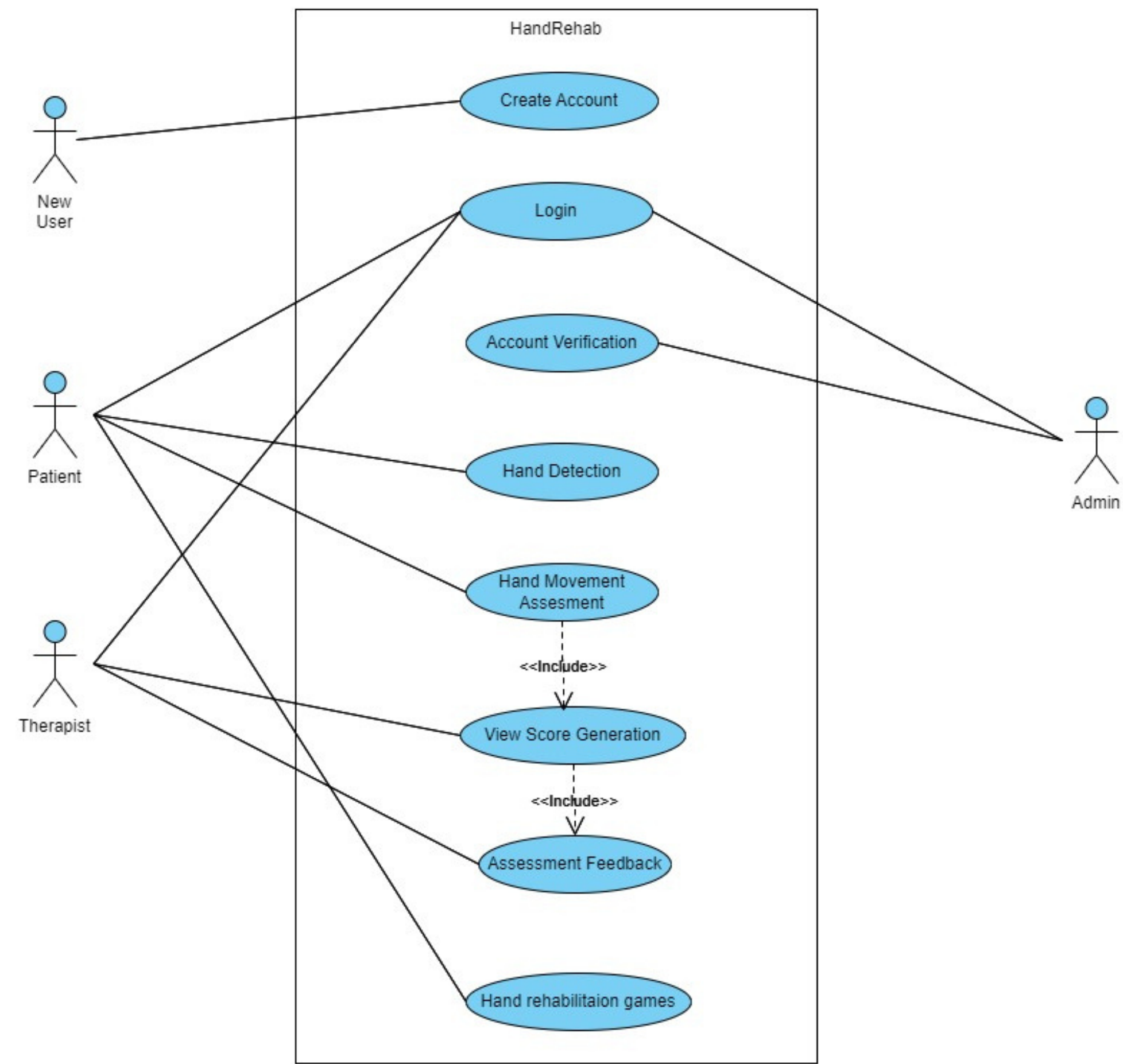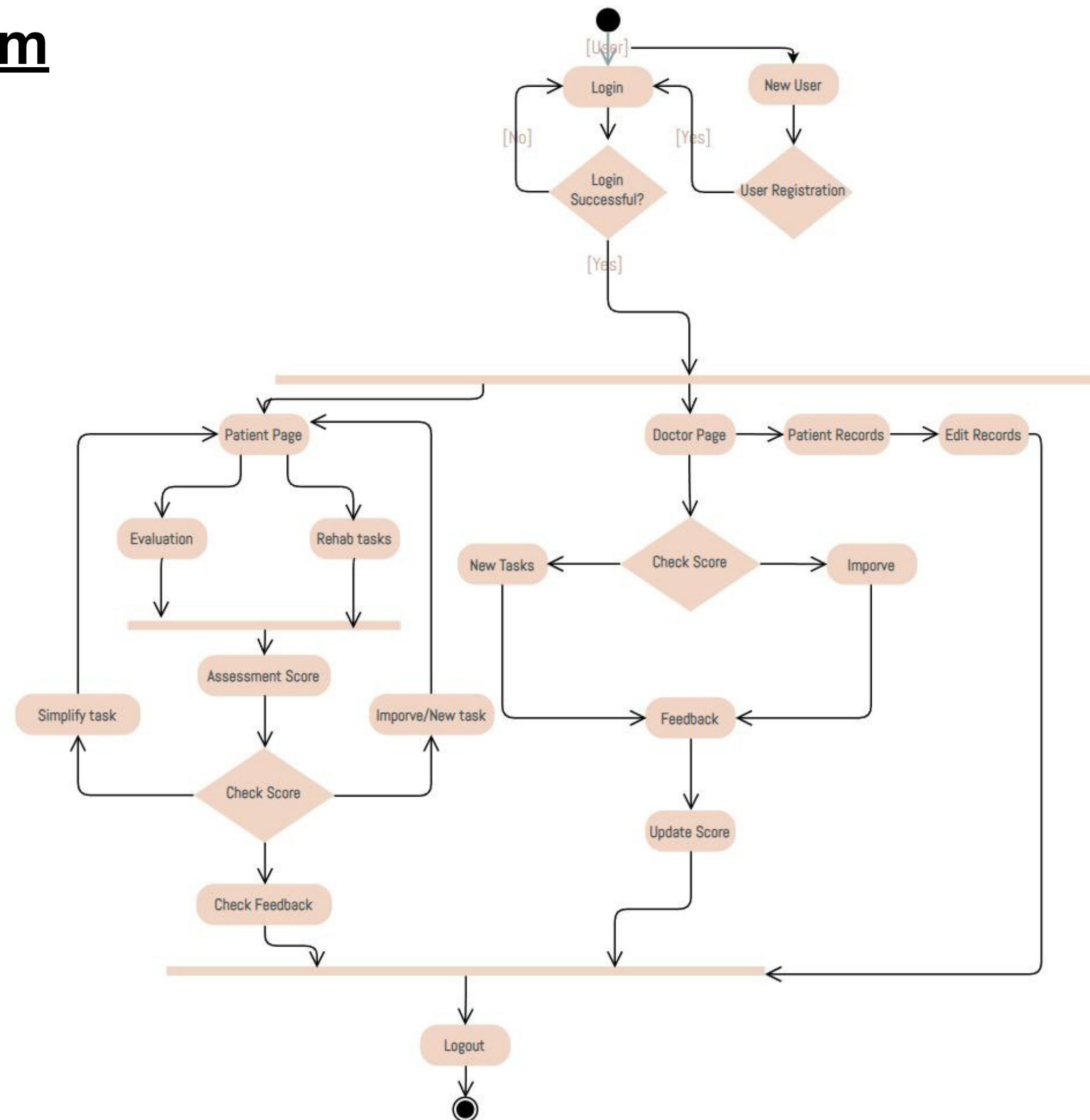- EASILY ACCESSIBLE TO ANYONE HAVING A PC

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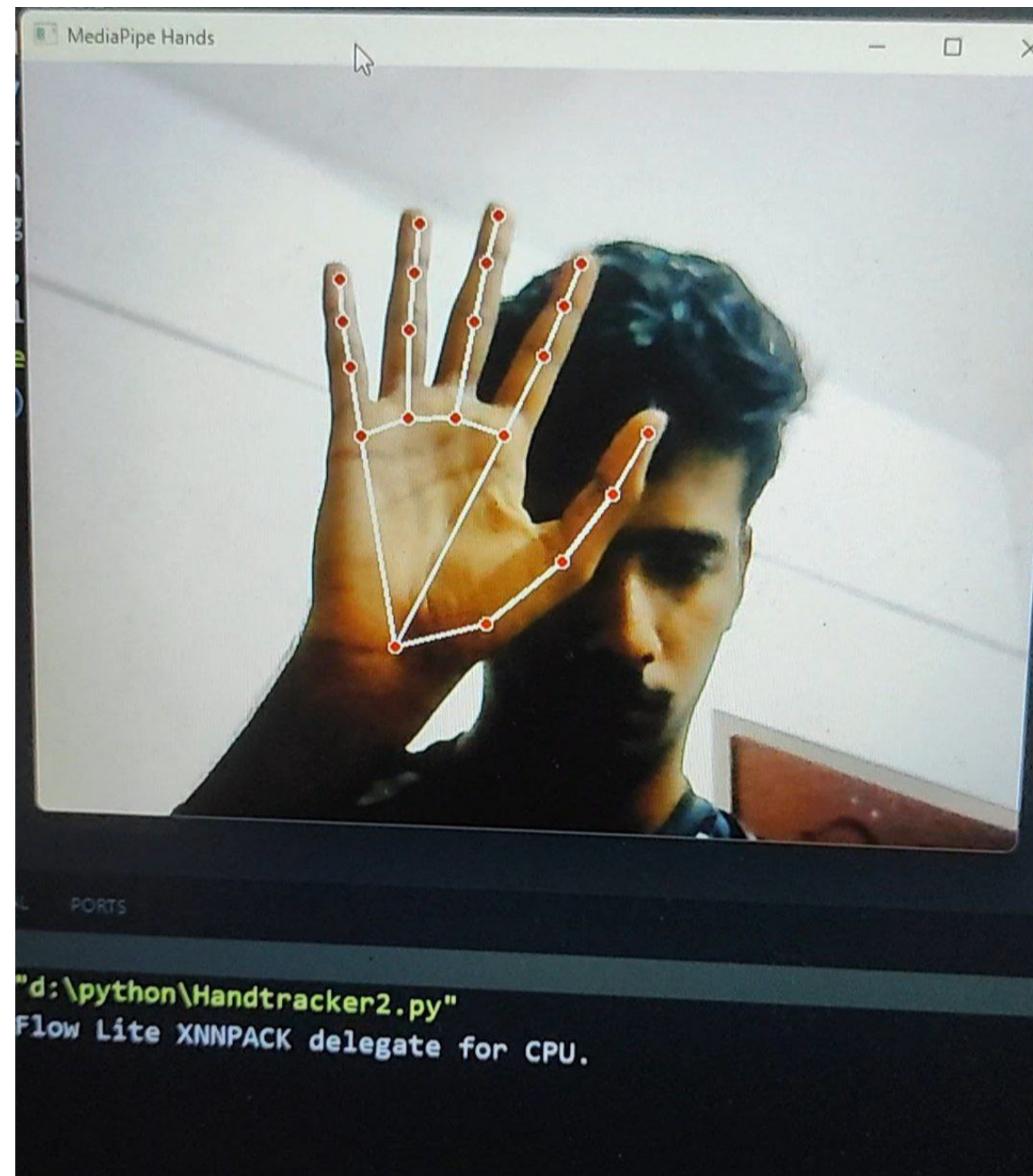
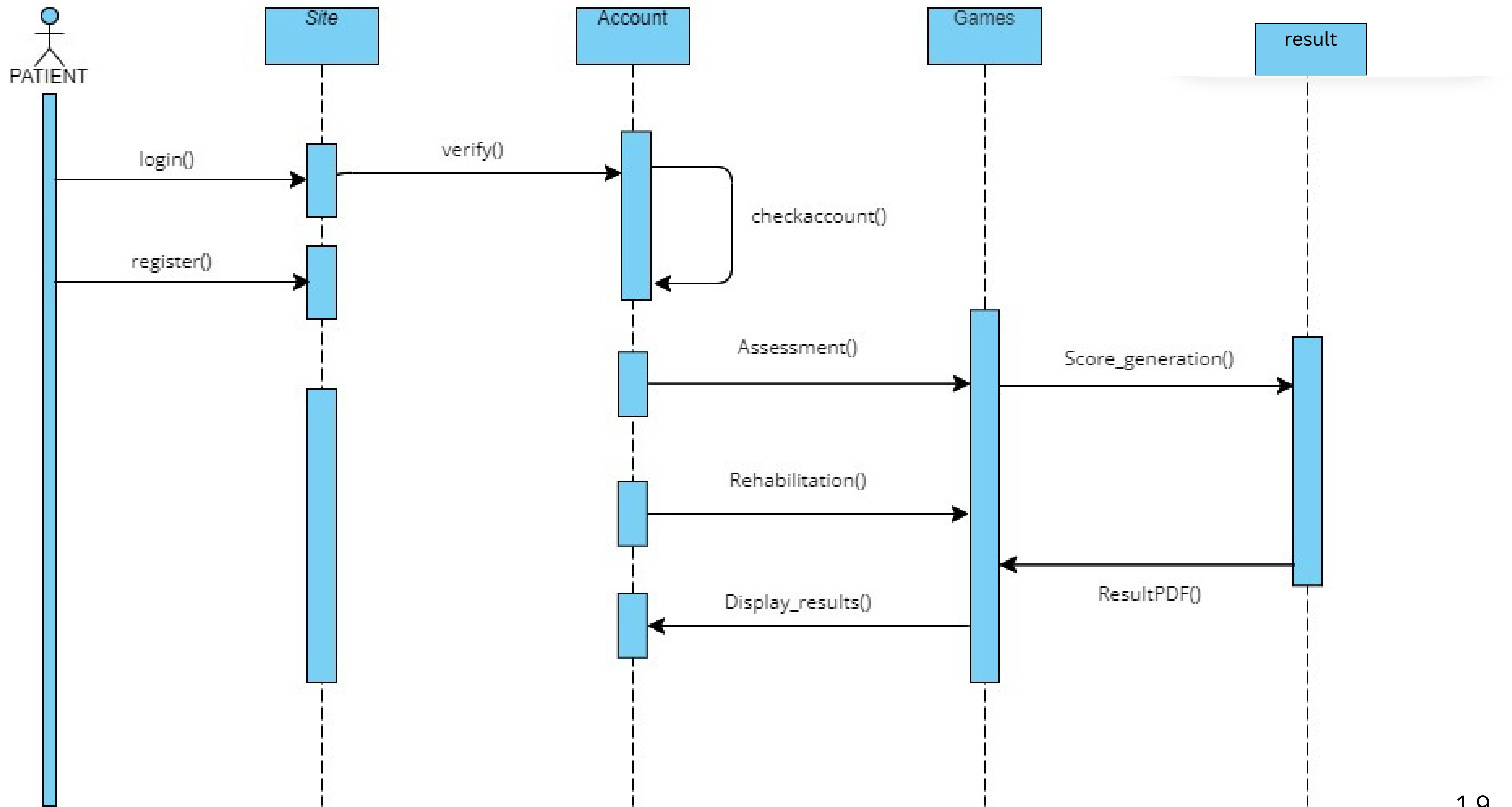# DESIGN

DESIGNS ADDED

1. Use Case diagram

2. Activity diagram

3. Sequence diagram

Usecase diagram

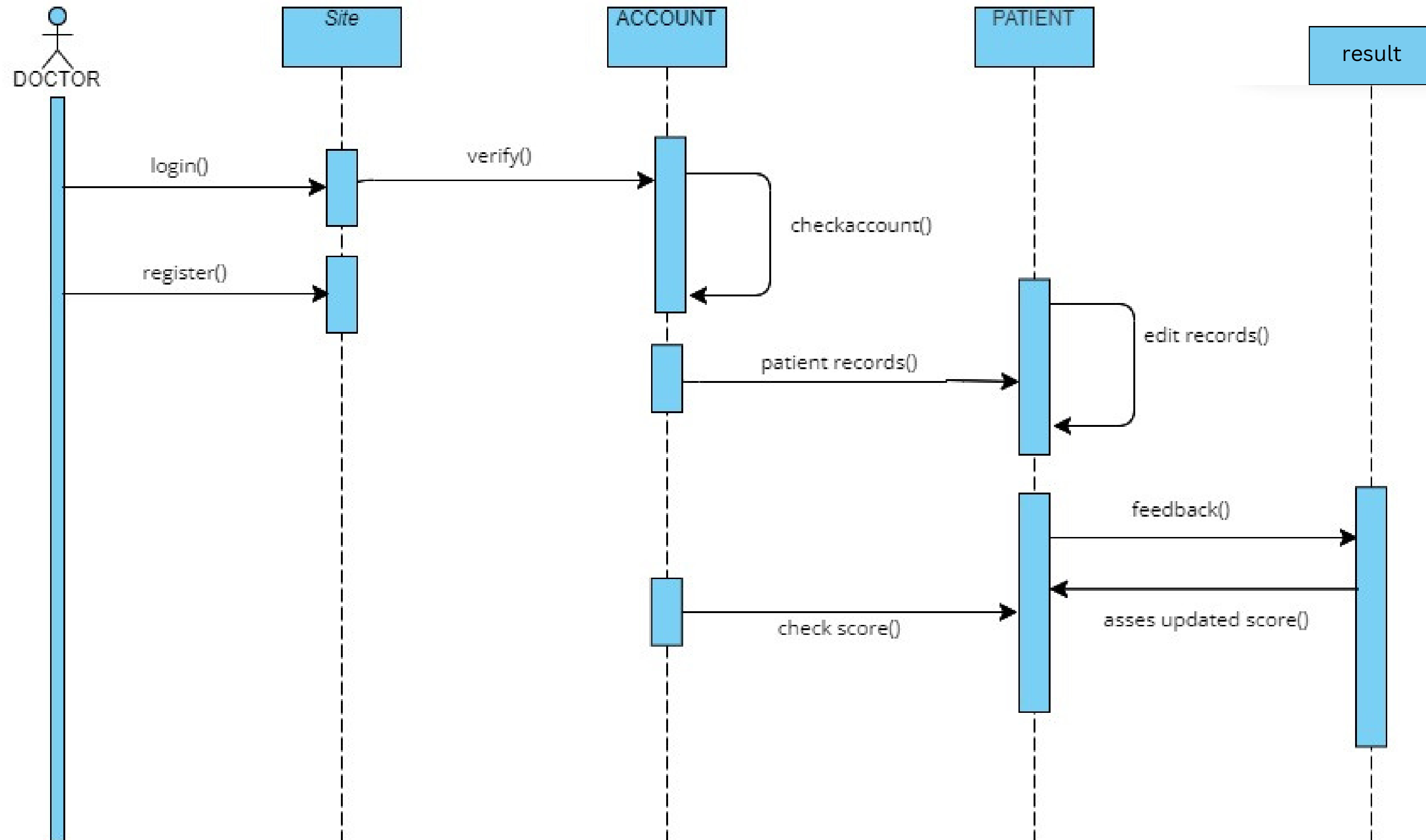# Activity diagram

Sequence diagram : Patient

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Sequence diagram : Doctor

TECHNOLOGY STACK

COMPUTER VISION

PYTHON

https://github.com/amal1231/HandRehab

GANTT CHART

ID	Task name	Start	Finish	Duration	Complete	2023				
						Aug	Sep	Oct	Nov	Dec
1	ABSTRACT SUBMISSION	2023-08-04	2023-08-24	15.0 d.	100.0%					
2	ZEROTH REVIEW	2023-09-19	2023-09-19	0.0 d.	100.0%					
3	LITERATURE SURVEY	2023-09-26	2023-11-16	37.2 d.	100.0%					
4	REQUIREMENTS GATHERING	2023-09-26	2023-11-16	37.2 d.	100.0%					
5	DESIGN DOCUMENTS	2023-10-30	2023-11-15	12.0 d.	100.0%					
6	REVIEW 1	2023-11-16	2023-11-16	0.0 d.	0.0%					
7	DOCUMENTATION	2023-11-16	2023-12-16	21.8 d.	0.0%					

Conclusion

- We have described a computer-vision based hand rehabilitation suite, which reliably measures the unilateral manual dexterity of patients, as well as enable them to be distantly monitored and assessed by therapists.

- It provides virtual implementations for some of the most used and validated tools available regarding hand rehabilitaion and evaluation, The box and block test, and two sollerman hand function sub-tests.

- This approach requires neither any additional physical equipment nor any kind of specialized computer peripheral, thus providing ease of access.

THANK YOU