UPPER EXTREMITIES AND BODY MOVEMENT ASSESSMENT USING MARKERLESS MOTION CAPTURE

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The aim of this project is to create a game-based rehabilitation solution for shoulder ability improvement.

01. Develop a game-based application with the help of Microsoft Kinect to implement several training activities.

02. Create a virtual upper-body rehabilitation assessment for patients who suffer from shoulder’s movement disabilities.

03. Optimize the application for the data collection and analysis.
Advantages Over Traditional Methods

1. Patients can perform different exercises in a more challenging and fun way.

2. VR allows to set up the features of the exercise, choose different goals and focus on task-oriented rehabilitation.

3. The system allows to check for the relevant patient’s performance.

4. VR can provide real-time feedback to the patient based on the interaction between the system and patient through the camera.
Skeleton definition is based on a set of joints and bones between these joints.

Descriptive parameters include length of the bones and the rotation of each joint.

Each joint is represented by its 3D coordinates.

**Body Joints**

1. Hip center (v1) / Spine base (v2)
2. Spine (v1) / Spine middle (v2)
3. Shoulder center (v1) / Neck (v2)
4. Head
5. Left shoulder
6. Left elbow
7. Left wrist
8. Left hand
9. Right shoulder
10. Right elbow
11. Right wrist
12. Right hand
13. Left hip
14. Left knee
15. Left ankle
16. Left foot
17. Right hip
18. Right hip
19. Right ankle
20. Right foot
21. Spine shoulder (only v2)
22. Left hand tip (only v2)
23. Left thumb (only v2)
24. Right hand tip (only v2)
25. Right thumb (only v2)
1. Abduction: Bringing up the arm sideways.
   - The user is placed to the path and has to hit the flying obstacles by engaging both hands.

2. Horizontal Flexion: Swinging the arm horizontally.
   - The user has to light up the lighthouses during a period of time to achieve a selected goal.

3. Vertical Flexion: Bringing up the arm in front.
   - The user has to construct a tower of particular height out of blocks.

4. Flexion/Adduction: Engaging several rotations.
   - The user has to follow a path to draw a given geometrical figure.
The settings menu allows to limit the range of motion and select the speed of moving obstacles.

The obstacles are moving towards the player and are placed on a different height.

The final score shows separately the result for each hand and the amount of obstacles hit.
Settings menu allows to select a hand and set the amount of lighthouses that should light up.

The player has to point with a hand to a particular lighthouse to make it light up.

The final score shows the amount of time taken to achieve the selected goal.
GAME 3 AND GAME 4 ARE STILL UNDER CONSTRUCTION
THANK YOU for your attention