

UPPER EXTREMITIES AND BODY MOVEMENT ASSESSMENT USING MARKERLESS MOTION CAPTURE

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AIMS

and objectives

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

used in rehabilitation

1



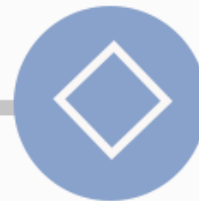
Patients can perform different exercises in a more challenging and fun way

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

2



3



VR can provide real-time feedback to the patient based on the interaction between the system and patient through the camera

The system allows to check for the relevant patient's performance

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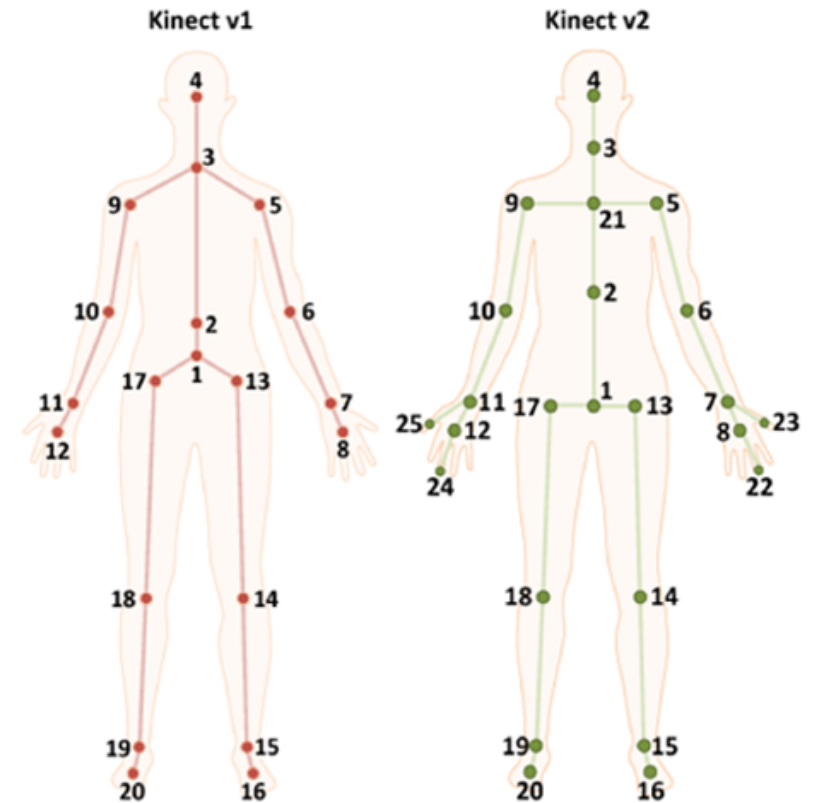
unity

SKELETON BUILDING

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



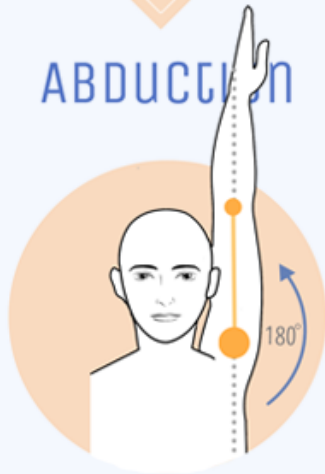
Body Joints

- | | | |
|---------------------------------------|------------------|-------------------------------|
| 1 – Hip center (v1) / Spine base (v2) | 11 – Right wrist | 21 – Spine shoulder (only v2) |
| 2 – Spine (v1) / Spine middle (v2) | 12 – Right hand | 22 – Left hand tip (only v2) |
| 3 – Shoulder center (v1) / Neck (v2) | 13 – Left hip | 23 – Left thumb (only v2) |
| 4 – Head | 14 – Left knee | 24 – Right hand tip (only v2) |
| 5 – Left shoulder | 15 – Left ankle | 25 – Right thumb (only v2) |
| 6 – Left elbow | 16 – Left foot | |
| 7 – Left wrist | 17 – Right hip | |
| 8 – Left hand | 18 – Right hip | |
| 9 – Right shoulder | 19 – Right ankle | |
| 10 – Right elbow | 20 – Right foot | |

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ABDUCTION

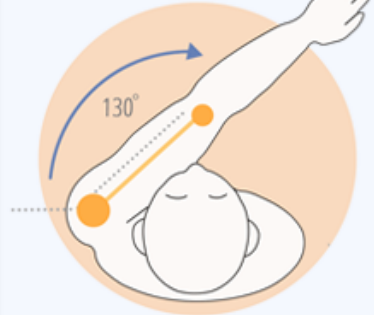


BRINGING UP THE ARM SIDEWAY

- THE USER IS PLACED TO THE PATH AND HAS TO HIT THE FLYING OBSTACLES BY ENGAGING BOTH HANDS

A

2

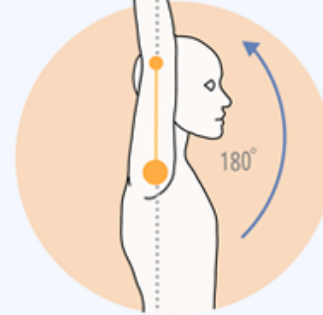
HORIZONTAL
FLEXION

SWINGING THE ARM HORIZONTALLY

- THE USER HAS TO LIGHT UP THE LIGHTHOUSES DURING A PERIOD OF TIME TO ACHIEVE A SELECTED GOAL

M

3

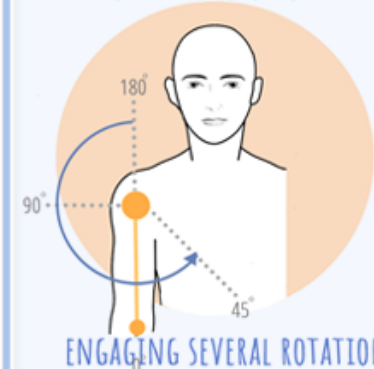
VERTICAL
FLEXION

BRINGING UP THE ARM IN FRONT

- THE USER HAS TO CONSTRUCT A TOWER OF PARTICULAR HEIGHT OUT OF BLOCKS

E

4

FLEXION/
ADDUCTION

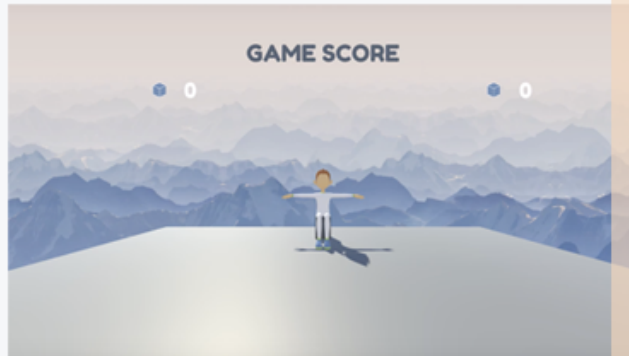
ENGAGING SEVERAL ROTATIONS

- THE USER HAS TO FOLLOW A PATH TO DRAW A GIVEN GEOMETRICAL FIGURE



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SETTINGS MENU ALLOWS TO LIMIT THE RANGE OF MOTION AND SELECT THE SPEED OF MOVING OBSTACLES



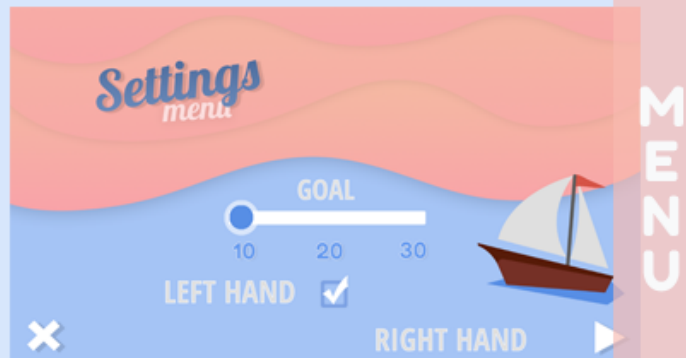
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THE OBSTACLES ARE MOVING TOWARDS THE PLAYER AND ARE PLACED ON A DIFFERENT HEIGHT



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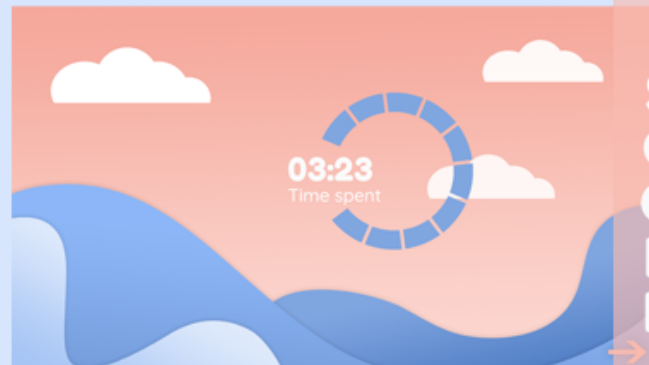
THE FINAL SCORE SHOWS SEPARATELY THE RESULT FOR EACH HAND AND THE AMOUNT OF OBSTACLES HIT



MENU



GAME



SCORE

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



DEMO



THANK YOU

for your attention