

Claims:

1. A compensation-aware rehabilitation system for assisting psychomotor training of an individual with movement disabilities comprising:

5 a processing unit having a processor and a memory;

a gesture-based camera;

a haptic device;

a display; and

instructions store on said memory executed by said processor to:

10 | provide a calibration procedure to obtain a best match motion data;

initiate a game session comprising:

initiate a game task comprising:

capture motion data of said individual via said gesture-

based camera, wherein said motion data comprises orientation and

15 position of seven joints of said individual;

determine a compensatory motion of said individual

comprising:

determine angle differences between each of said

seven joints in motion data with respective joints in said

20 | ~~determined~~-best match motion data;

normalise each of said determined differences to a

value between 0 and 1 comprising:

assign said value of said difference as 1 in

response to said angle difference being more than

25 60 degrees;

assign said value of said difference as 0 in

response to said angle difference being 0; and

3. The system according to claim 1 wherein said instruction to provide a calibration procedure comprises instructions to:

display a posture sample stored on said memory of said processing unit;

5 obtain motion data of individual from said gesture-based camera; and

determine said best match motion data.

4. The system according to claim 3 wherein said instruction to determine said best match comprises instructions to:

10 retrieve a standard motion data from said memory;

compare each of said motion data of said individual with said standard motion data; and

determine said best match motion data based on one said motion data of said individual being the closest to said standard motion data.

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5. The system according to claim 1 wherein said instruction to determine angle differences between each of said seven joints in motion data with respective joints in said determined best match motion data comprises instructions to:

determine each of said angle differences, A, between each of said seven joints in

20 motion data with respective joints in said determined best match motion data with the following expression,

$$A = \arccos (P_x \times S_x + P_y \times S_y + P_z \times S_z)$$

where P is the individual's joint orientation defined along x, y, z dimensions as Px, Py, Pz, and S is the best-matched joint orientation defined along x, y, z dimensions as Sx, Sy, Sz.

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15. The system according to claim 14 wherein said instruction to determine three distances values between unaffected (left) wrist joint and the affected (right) upper limb in response to said difference of shoulder centre being below said predetermined threshold comprises instructions to:

- 5 determine a first distance between left and right wrist of said individual,
- determine a second distance between left wrist and right elbow of said individual;
- and
- determine a third distance between left wrist and right shoulder of said individual.

10 16. A method for assisting psychomotor training of an individual with movement disabilities, said method comprising:

 providing a calibration procedure to obtain a best match motion data;

 initiating a game session comprising:

 initiating a game task comprising:

15 capturing motion data of said individual via said gesture-based camera, wherein said motion data comprises orientation and position of seven joints of said individual

 determining a compensatory motion of said individual comprising:

20 determining angle differences between each of said seven joints in motion data with respective joints in said ~~determined~~-best match motion data;

 normalising each of said determined differences to a value between 0 and 1 comprising:

25 assigning said value of said difference as 1 in response to said angle difference being more than 60 degrees;

18. The method according to claim 16 wherein said step of providing a calibration procedure comprises:

- 5 displaying a posture sample stored on said memory of said processing unit;
obtaining motion data of said individual from said gesture-based camera; and
determining said best match motion data.

19. The method according to claim 18 wherein said step of determining said best match comprises:

- 10 retrieving a standard motion data from said memory;
comparing each of said motion data of said individual with said standard motion data; and
determining said best match motion data based on one said motion data of said
15 individual being the closest to said standard motion data.

20. The method according to claim 16 wherein said step of determining angle differences between each of said seven joints in motion data with respective joints in said determined best match motion data comprises:

- 20 determining each of said angle differences, A, between each of said seven joints in motion data with respective joints in said determined best match motion data with the following expression,

$$A = \arccos (P_x \times S_x + P_y \times S_y + P_z \times S_z)$$

- where P is the individual's joint orientation defined along x, y, z dimensions as Px, Py, Pz, and S is the best-matched joint orientation defined along x, y, z dimensions as Sx, Sy, Sz.
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