D3.3.3
Glove Integrated Prototype
(third iteration)

ID and title	**D3.3.3 Glove Integrated Prototype (third iteration)**
Description	This document describes the third integration of hardware developed in WP2 and software developed in WP3
Work package	WP3 Software development & integration
Status	External release
Type	Report
Confidentiality	PUBLIC
Version	V2.0
Actual date of delivery	30.10.2015 (Internal release) 14.01.2016 (external release)
Contractual date of delivery	31.10.2015
Reviewer	Bioservo

Project name	**ironHand**
Project number	AAL-2013-6-134
Project start date	1 May 2014
Project duration	3 years

Document history

Version	Date	Status	Changes	Author(s)
V1.0	30/10/2015	First release		Alejandro Melendez, Hocoma
V1.1	3/11/2015	Reviewed		Martin Wahlstedt, Bioservo
V1.2	3/11/2015	Reviewed		Alejandro Melendez, Hocoma
V2.0	14/01/2016	External release	Approved by SG	

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Following the developments of the previous delivery (D3.3.2) software development for D3.3.3 focused on *i)* bug-fixing of the previously released version; *ii)* enhancement to existing therapeutic exercises; *iv)* new calibration exercise; *v)* new therapeutic exercise for finger coordination and *iii)* stability of the communication between glove and therapeutic software.

Enhancement to therapeutic exercises

Exercise 1 - Octopus

Therapy goal: Simultaneous finger coordination.

Usability tests revealed that the character's movements did not correctly reflect the user's movements – bugs with delays and calibration of range of motion (ROM). These problems have been efficiently corrected.

Exercise 2 – High Flyer

Therapy goal: Hand strength

Usability test revealed that the exercise was too challenging for a patient to interact with. The logic behind this exercise has been adapted accordingly.

New therapeutic exercise

Exercise 3 – Birds on Strings (new version)

Therapy goal: Finger coordination

According to usability tests, the previously released exercise - *Bird on Strings* - was too difficult and not very well comprehended by stroke patients. Based on several discussions the following changes were specified:

- Change the rhythm-aspect of the game
  - Users should not require to press at the right moment as this is too difficult for the target population.
  - Recorded music could still be part of the game but the game dynamics should not depend on that.
- Change the game dynamics
  - Users do not need to "capture" musical notes; but could 'shoot' notes instead.

Several prototypes were developed and one was selected for further implementation. The new exercise (**Error! Reference source not found.**) requires users to do coordinated finger tapping movements, involving thumb opposition. In the new game dynamics each finger tapping "shoots" a music note (a sound is played at the same time) towards an "enemy" that slowly approaches a bird,

representing each finger. This exercise, avoids dependency in the timing, yet keeping the musical and engaging aspect of the exercise.

New calibration exercise

Previous usability tests highlighted the importance of a good calibration procedure in order for all the exercises to function properly. To overcome this problem, we have develop a new exercise which encourage the user to do active and passive hand opening and closing movements. Hand movements are mapped to the movement of a virtual crane. The goal is to use the crane collect coins brought by a submarine (same submarine as in the Octopus exercise) and release them over a platform (see **Error! Reference source not found.**). Several repetitions of hand opening and closing movements are collected and the calibration procedure is completed.

The new software has been tested at Hocoma following internal quality guidelines and officially released on 30.10.15