SMARTS C++ Code

to be used with

Microsoft Visual Studio 2010 Express,

Windows 7,

and Matlab 2012b (or higher)

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**1. SMARTS package**

The SMARTS paradigms were written to, in large part, emulate the operations of the original Kinereach Mac software paradigms that were used in Phase 1 of SMARTS.

* Note that there are a few key differences. (1) The joint angles are not being estimated; if these values are desired, it is necessary to manually measure the lengths of the limb segments prior to testing. (2) Any delays and calibrations in the original Mac system are unknown; here we apply calibrations that have been performed during set-up (see Section 1.5). Currently, timing delays have not been completely characterized but are believed to be on the order of 100 ms. (3) The point system for near-misses was found to be somewhat arbitrary on the Mac platform, and therefore has not been perfectly replicated here.

This code is written to perform 2 specific tasks: an evaluation of movement extent and point-to-point (PTP) reaching to a target located at either 8cm or 12cm away from the home position. Both paradigms are run from the SMARTS project, and are selected for by choosing the appropriate trial table.

Data from the SMARTS project is parsed by trial into separate files. Data files contain information from all 4 trackers, along with position and velocity information, as well as display stimulus information about the current targets being shown to the subject. In general, negative numbers indicate the absence of a target on screen.

**1.1 Setting up experimental parameters**

To begin, open the SMARTS project in Visual Studio. Open config.h, and set the DATA\_PATH parameter to be the path (folder) in which data for the current block is to be saved. Also indicate which hand (Left, 1 or Right, 3) will be primarily recorded and displayed during the current block by setting the HAND parameter. Finally, indicate the name of the trial table by setting the TRIALFILE parameter. Save config.h.

**1.2 Running the paradigm**

The first step in running the paradigm is to ensure that all of the hardware is powered on correctly. Make sure that the HDMI cable for the screen and the USB cable for the TrakStar or the Flock of Birds (via the USB-to-Serial adaptor) are connected to the PC. Turn on the Ascension device as normal. For the Flock of Birds system, this means starting from the Bird controlling the transmitter and moving systematically in order (generally that means starting from the bottom of the stack and working upward). Also turn on the TV monitor and ensure that the volume is set properly. Note that sound will be played directly from the TV via the HDMI cable, so no additional speakers are necessary.

Next, in Visual Studio, open the SMARTS project. Once all the parameters are set (see Section 1.1), select the Run option at the top of the screen. Allow the subject to complete the block of trials (which will either be comprised of Extent or PTP trials). If necessary, the block may be stopped early by hitting the “escape” key on the keyboard. Otherwise, the program should automatically quit at the end of the block. If Visual Studio does not return to its original state, hit the “Stop” button to completely end execution of the paradigm.

Note that occasionally, quitting out of the previous block does not shut down the Ascension tracker properly, and the tracker gets stuck in a strange state. When this happens, performing a hard reset of the Ascension device (by switching the power off and back on) usually resolves this problem.