Addendum to the BCI2000 User Manual
5DT 7-Sensor Data Glove
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Introduction

The executable D2BoxGlove.exe is identical to the D2Box.exe user application with the exception that it also provides support for the 5DT data glove. It allows for complete control over what sensor controls cursor movement and how it controls cursor movement.

Parameters in Section 'Joystick'

GloveCOMport	The serial port that the glove is connected to, e.g., COM2
GloveControlX	Describes what and how glove sensors control horizontal cursor movement (see equation below for details)
GloveControlY	Same as above, except for vertical movement
JoyXgain	Controls the gain for the horizontal glove control signal (i.e., the cursor's horizontal speed); applies to glove and joystick
JoyYgain	Same as above, except for vertical movement
UseJoyStick	0=brain control; 1=joystick control; 2=glove control
XOffset	The value that is being subtracted from the horizontal glove control signal in the equation described below
YOffset	Same as above, except for vertical glove control signal

Cursor Movement Equation

The nature of cursor movement is defined by the matrix parameters GloveControlX/Y. These matrices have to have 7 columns (for the 7 sensors) and 3 rows. The first row defines the weight of a particular sensor's previous sensor value. The second row defines the weight of a particular sensor's current sensor value. The third row defines the resulting sign for a particular sensor (i.e., the sign will be positive for values >= 0, and negative for values < 0).

The incremental cursor movement Δx or Δy for horizontal and vertical movements, respectively, are computed as follows:

$$\Delta x = \left(\left(\sum_{sensor=1}^{sensor=7} \left| GloveControlX_{1,sensor} * glove_{sensor,t-1} + GloveControlX_{2,sensor} * glove_{sensor,t} \right| * sign_{sensor} \right) - XOffset \right) * JoyXGain$$

In this equation,

$GloveControlX_{1,sensor}$ represents the value of the first row in the matrix GloveControlX and column that corresponds to the sensor,

$GloveControlX_{2,sensor}$ represents the value of the second row in the matrix GloveControlX and column that corresponds to the sensor,

	thumb	index	middle	ring	little	pitch	roll

$glove_{sensor,t-1}$ represents the previous absolute flexion of a particular sensor,

$glove_{sensor,t}$ represents the current absolute flexion of a particular sensor,

$sign_{sensor}$ is +1 if the entry in the GloveControlX in the third row and in the column that corresponds to the indicated glove sensor >= 0, and -1 otherwise

XOffset and

JoyXGain   represent the values of the corresponding parameters.

Example

As an example, consider the following parameter GloveControlX:

	thumb	**index**	**middle**	**ring**	**little**	**pitch**	**roll**
t-1	-1	0	0	0	0	0	0
t	1	0	1	0	0	0	0
sign	-1	0	1	0	0	0	0

In this example, the cursor will go left with continuous movements of the thumb (the absolute difference between the current and the previous movement, times -1). The cursor will go to the right (sign 1) with the absolute flexion of the middle finger (weight of 0 for the previous sensor value, thus only an influence of the current absolute sensor value). You could also set the values for the middle finger to 0, set the sign for the thumb to +1, and assign a positive value (e.g., +2) to XOffset. In this case, the cursor would go to the left by itself (because XOffset is > 0 which is being subtracted from the signal) and would go to the right using repeated flexion/extension of the thumb.

State Variables

The state variables in D2BoxGlove.exe are identical to the ones in D2Box.exe, except the states 'GloveSensor1..7' that represent the 8-bit sensor values for each of the 7 sensors.