MATLAB/LSL

Starting up

Please download the Lab Streaming Layer package found on the following website:
https://github.com/sccn/labstreaminglayer

Once downloaded, add the folders to your MATLAB path.

Beginning Experimentation

Prior to opening the HDSC application, please run the following code on MATLAB, preferably on a separate script.

```
%Initiating LSL Library
lib = lsl_loadlib();
info = lsl_streaminfo(lib,'HD-SC_Markers','Markers',1,0,'cf_string');
outlet = lsl_outlet(info);
```

Notes

HD-SC uses 2 types of stream

1. Listens to stream for commands. It accepts commands in specific format which are then processed by the application.
    a. Details for creating stream for commands:
    Name: "HD-SC_Markers"
    Type: "Markers"
    Channel count: 1
    Nominal srate: 0
    Channel format: "channel_format_t.cf_string"
    Source Id: "973D9621-CE2A-499E-AD33-1CA9D07450F5"
2. Output stream with details from the application
    a. Details for listening to this stream:
    Name "HD-SC_Stimulation"
    Channel format: "channel_format_t.cf_string"

HD-SC receives commands in JSON format. Each Command must contain an “Action” which specifies how the command will be handled. Additionally, it can contain some data specific for the command.

Action can be following:

1. AddChannel = 0
2. AddChannelFromFile = 1
3. DeleteChannel = 2
4. StartStimulation = 4
5. StopStimulation = 5
6. UpdateSettings = 7

Following action ‘7’ (Update Settings), the following parameters can be updated:

“Duration”:100,

“SamplePeriod”:100,

"Delay": 100,

“Intensity”: 1.2,
“WaveformType”: “TDCS”,
“Polarity”: “BIPOLAR”,
“ChannelSelection”: “SINGLE”,
“SHAM”: true,
“RampUp”: 2

The following are some examples of JSON formatted commands:

Add channel from file

Command will add channel to the application and load function values from a file

JSON Example:

```
{
  "ChannelNumber":1,
  "Action":1,
  "PathToFile":"C:\\AM.txt",
  "Delay": 100,
}
```

Start stimulation

Start sending signals.

JSON Example:

```
{
  "Action":4,
}
```

Stop stimulation

Start sending signals.

JSON Example:

```
{
  "Action":5,
}
```

MATLAB Commands

In order to translate the JSON structure into a MATLAB variable, you must initially create a struct() variable containing an 'Action' and command prompt. A struct variable can be made in the following format:

(start stimulation comman)

sstartStimulation = struct("Action",4);

The struct variable then needs to be converted into JSON format using jsonencode()

JSONstartStimulation = jsonencode(sstartStimulation);

Attached to this document are two .m files. The first is names "Start_up" which will need to be run prior to opening the HDSC app. The second is named 'Stimulation_example' which is a code which does the following:

1) Add Channel
2) Update current intensity
3) Update duration
4) Update delay
5) Update ramp up time
6) Load Device
7) Start stimulation