Brain-navigation dataset

**1. Sensor data**

* **Neural-Pace (NP) signal:** 250Hz, 4 channels
  + Remove the large spikes
* **Physics sensor system:** Gopro videos (60Hz), Pupil videos (60Hz), Xsens (100Hz, acc),Chestphone (acc, gyro, mag, GPS, light),PupilePhone (acc, gyro, mag, GPS, light)

2. **Annotation of the events: 16 in total**

* Doorway, Talking Beg/End, Correct Turn Beg/End, Incorrect Turn Beg/End, Lost Beg/End, Stop Beg/End, Abnormal, Pointing, Notes, Outdoor, Choice Point, Stare, Held Door, Clapper, Landmark, Beg/End, New Context Beg/End
* **Events of Interests (13 events):** Doorway, Talking, Correct Turn, Incorrect Turn, Lost, Stop, Abnormal, Pointing, Outdoor, Choice Point, Stare, Beg/End, New Context

**3. Task of data processing**

* **Extract and put all valid sensor data in the same folder:** extract\_mat\_data.py
  + **currently all npy from mat file, need to copy other 5 files/folders**
* **Synchronize all sensor data using NTP timestamp; Split them according to each event and same corresponding labels:** syncronize.py
* **Select data from 13 events of interest.**
* Videos:
  + We use videos from the “**Synced**” folder, as they are concatenated to one video. And we split audio from videos.
    - Data in “Synced” folder: pupil and Gopro video are both 60fps; synchronized and have the same length
    - Data in “Original” folder: pupil video is 80fps; Gopro video is 60fps and has multiple videos; Gopro and pupil videos have time shifts.
  + We use frames from “RWNApp\_RW1\_Walk1.mat” for synchronization.
* Xsense:
  + We use data from “**Original**” folder, and only choose “xs\_Center-of-Mass.csv”
  + We use timestamps from “RWNApp\_RW1\_Walk1.mat” for synchronization.
* Phone data:
  + We use data from “**Original**” folder,
    - “ChestPhone”: light, acc, gyro, mag, GPS
    - “PupilPhone”: acc, gyro, mag, GPS
  + We use NTP time in each csv file for synchronization.
* Label: “label\_RWNApp\_Output\_Jan2024”

“We already have a .Mat file that has all of the data synchronized with the videos. I’ve copied these .mat files to a folder called RWNApp\_Output\_Jan2024 in the RealWorldNavigationCory Box Folder that I shared the other day. This file has all of the brain data included in the .mat file and references to the path to each file required to synchronize, visualize, and annotate the data with a GUI application we call RWNapp. The latest version of the RWNapp is also in the RealWorldNavigationCory folder (should be v1.5).

Once you download all of the patient data do your UCSD server or computer, you should be able to run this Matlab app to see and scroll through the videos. These file paths would then need to be aligned with your workflow directory. The data for each participant for each walk you’ll want to use is always in the RW#/Original folder. You can find the name of the path for our server in the “file\_list" field of the .mat data structure. The file\_list will refer to the videos you can use to apply your computer vision algorithm (example path: 'D:\Data\RealWorldNavigationCory\RW4\Original\Walk4\Pupil\2c908285\_0.0-1024.822.mp4’ for Eye tracking video or 'D:\Data\RealWorldNavigationCory\RW4\Original\Walk4\Gopro\Gopro\_RW4\_Walk4\_Combined.MP4’). Most of the annotations were made to the Eye tracking (pupil video), but these are synchronized to the gopro video. I think it might be interesting to try to decoding on each of the videos relative to the annotations. Maybe even training on one video and testing on the other video stream (they have different frame rates and resolutions, but might be interesting).

I’m attaching a standard operating procedure from our lab’s documentation for how the annotations were made for each annotation in the evnts\_tbl field of the data structure (I.e. “doorways”). We have also added descriptions to all of the doorways in brackets (e.g. "[in2out] [closed] [patientOpens] [transparent]”) to give some extra details on each of the doorways. Doorways were used as our general Spatial Transition category. You can further break exclude some types of transitions by filtering out the [out2out] transitions as those are not “doorways”. All of the in2in, in2out, and out2in transitions should be some type of doorway. You’ll find two doorway annotations for every doorway, one without this extra descriptive info and one with the extra descriptive info.

Another file that might be useful in the RealWorldNavigationCory folder is the excel file called RealWorldSpatialNavigation\_PatientDataOverview.xlsx. This has some basic notes on each patient’s data for each walk (like if some information was not properly recorded on a given walk).

I think that is all of the information you should need to get started, but happy to provide more. Thanks and best of luck playing with the data!”

You’ll want to use the original folder to pull the data in. For the data in the .mat file those are d = data, so d\_np is neuropace data (brain recordings), d\_xs is Xsens data (movement data from accelerometers), ntp\_gp is the network time protocol time for the led that flashed in front of the GoPro video (this method of sync for the GoPro was only used for RW1, but no other participants. For other participants we used the audio from the GoPro to sync the GoPro videos).