

## **CRCNS.org mc-1 data description**

### **Version 0.6 (Dec 30, 2022)**

ECoG Recorded from rhesus macaque monkey's brain (motor cortex, dorsolateral prefrontal cortex, ventrolateral prefrontal cortex) during ipsilateral, contralateral, and bilateral movements.  
Contributed by Farrokhi B and Erfanian A.

### **Summary**

The experiments were conducted on an adult healthy male rhesus macaque monkey. The monkey was trained to retrieve food from experimenter at random locations. Three different experimental paradigms were considered in this study: the ipsilateral, contralateral, and bilateral movements. During ipsilateral and contralateral movements, the monkey was trained to retrieve food with his right hand and left hand, respectively, while the other hand was touched with the experimenter to inform him not to use it. For unilateral movements, 20 sessions of experiment were conducted over 3 months; 10 sessions for ipsilateral movement and 10 sessions for contralateral movement. The duration of each recording session was 15 min.

For the bilateral movement, the length of each experiment was 12 min. The experiment consisted of a number of movement cycles. Each cycle of movement consisted of getting food by the right or left hand, putting food to the mouth, and returning the hand to the initial position. The first 2 min, the monkey was fed with its left or right hand and for the next 2 min with the other hand.. Repeating this until the end of experiment. Totally, six recording sessions of experiment were performed over 3 months.

The ECoG signals were recorded at a sampling rate of 1 kHz using a custom-made 64-channel electrode array implanted in the subdural space of the cortex of the brain of a male Rhesus monkey. The array covers the right hemisphere of the brain surface from the motor to the frontal cortex. The wrist positions were simultaneously recorded with an optical motion capture system at a sampling rate of 50 Hz. The following paper describes results from these experiments:

A state-based probabilistic method for decoding hand position during movement from ECoG signals in non-human primate. Behraz Farrokhi & Abbas Erfanian, *J Neural Eng.* 17 026042 (2020). DOI: 10.1088/1741-2552/ab848b

### **Conditions for using the data**

If you publish any work using the data, please cite the publication above (Farrokhi and Erfanian, 2020) also cite the data set in the following recommended format:

Farrokhi B & Erfanian A. (2022); ECoG Recorded from rhesus macaque monkey's brain (motor cortex, dorsolateral prefrontal cortex, ventrolateral prefrontal cortex) during ipsilateral, contralateral, and bilateral movements. CRCNS.org  
<http://dx.doi.org/10.6080/K0FN14DZ>

## Methods

All recording and experimental methods are what have been described in the mentioned paper (above).

### Data files organization

Data files are organized in three main folders including Ipsilateral, contralateral and bilateral, corresponding to the three experimental paradigms. Each folder includes some subfolders related to the recording sessions. Totally, there are 10 subfolders for the ipsilateral experiment, 10 subfolders for contralateral, and 6 for the bilateral experiments. Each subfolder has a name of form YYYY-MM-DD\_(S#) while YYYY-MM-DD indicates the date of recording and S# indicates the number of experimental sessions. Each subfolder contains the data for one recording session and contains two files: ECoG.mat and motion.mat. The ECoG.mat file contains the recorded ECoG signals and the motion.mat contained the recorded positions of the hand. Total size of the data is about 5.2 GB.

### Data format

Data are in .mat Matlab format.

1) File ECoG.mat includes:  $ECoG^{n \times m}$ ,  $ECoG_{time}^{n \times 1}$ , and  $F_s$

- $ECoG$  represents the electrocorticographic signals
  - $m$  is the number of channels
  - $n$  is the number of samples;
- $ECoG_{time}$  consists of the sampling times of the signal samples.
- $F_s$  is the sampling frequency of ECoG.

2) File motion.mat includes: Right\_wrist<sup>t\*p</sup>, Left\_wrist<sup>t\*p</sup>,  $Motion_{time}^{t \times 1}$ , and  $F_{sm}$

- Right\_wrist and Left\_wrist are the 3D ( $x$ -,  $y$ - and  $z$ -direction) wrist positions of the right and left hand, respectively,
- $p$  is the dimension of the hand position ( $x$ -,  $y$ - and  $z$ -direction);
- $Motion_{time}$  consists of the sampling time of the recorded hand positions
- $F_{sm}$  is the sampling frequency of motion capture system.

Of note, during unilateral movement, file Motion.mat includes only the hand position of the right or left hand.

Also of note, the 3D wrist positions were transformed from the global to local coordinates ( $X$ : backward–forward,  $Y$ : right- left,  $Z$ : down–up) by referencing the wrist position of the

reaching hand with the sagittal plane. The wrist positions were then z-score normalized during each session of experiment.

### **Getting help using the data**

If you have questions about using the data, please post them on the [forum for using data sets](#).

### **Change history**

Version 0.6 (Dec 30, 2022) – Initial version.