Supplementary data

Animal ID	Sex	Age	Weight	SCI	Anesthetized Experiments	Behavioral experiments	Brain array position	Brain - Controlled EES
Mk-Sa	F	9 Yr	4 kg	yes	Recruitment curves	Reach only	M1 and PMd	no
Mk-Br	F	3 Yr	3.4 kg	yes	Recruitment curves and single joint movements	Reach and pull	S1, M1 and PMv	yes
Mk-Yg	F	3 Yr	2.9 kg	yes	Recruitment curves and single joint movements	Reach and pull	S1, M1 and PMv	yes

Supplementary Table 1: Identification information, license numbers, characteristics and type of procedure performed for the three monkeys involved in the study

	Reach		Grasp		Pull	
mean ± std (success/min)	No Stim	Stim	No stim	Stim	No Stim	Stim
Mk-Yg	0.48±0.13	0.53±0.06	0.07±0.049	0.1±0.03	0±0	0.015±0.01
Mk-Br	3.08±0.32	3.21±0.29	0.51±0.13	1.06±0.16	0.07±0.05	0.24±0.07
Mk-Sa	0±0	0.13±0.06	N.A.	N.A.	N.A.	N.A.

Supplementary Table 2: Mean and standard deviation values for non-normalized values of task performance frequency shown in Figure 4C.

Video 1: Single-joint movements elicited by pulse trains of EES at different segmental locations. Shoulder abduction: stimulation at C5; Elbow extension: stimulation at C7; Finger flexion: stimulation at T1; reach, grasp and pull sequence: cascade stimulation at C7, T1 and C5.

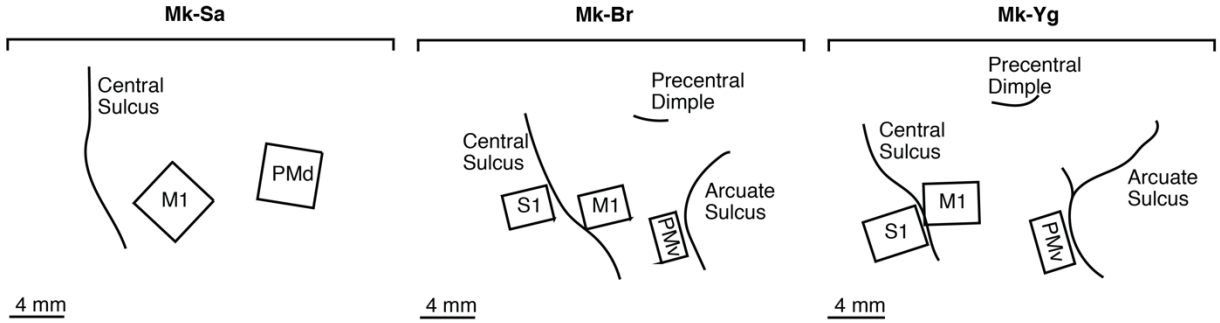
Video 2: Effects of EES on reach movement performance on Mk-Sa. Top left: lateral vision of the animal performing the task; Bottom left: delivered stimulation pulses; Top right: electromyographic activity from Deltoid, Biceps and Triceps muscles; Bottom right: neural activity from M1 and PMd cortex.

Video 3: Effects of brain-controlled EES on reach and pull movement performance on Mk-Br Top left: lateral vision of the animal performing the task; Middle left: delivered stimulation pulses; Bottom left: pulling force applied on the robot end effector; Top right: neural activity from S1, M1 and PMd cortex; Bottom right: electromyographic activity from Deltoid, Flexor Carpi radialis and Abductor Pollicis.

Video 4: Effects of EES on pull movement performance on Mk-Yg. Top left: lateral vision of the animal performing the task; Middle left: delivered stimulation pulses;

Bottom left: pulling force applied on the robot end effector; Top right: neural activity from S1, M1 and PMd cortex; Bottom right: electromyographic activity from Biceps, Triceps, Extensor Digitorium Communis and Flexor Digitorium Superficialis.

Video 5: Effects of a EES burst optimized to recover pull, delivered during a reach movement on Mk-Yg. Lateral view of the animal performing the task.



Supplementary Figure 1: Position of intracortical arrays. Location of intracortical arrays implanted in the sensory (S1), Motor (M1) and dorsal or ventral premotor (PMd, PMv) cortex in the three monkeys.