Parameters			*Performance*		
Targets	Hold time (ms)	Trials	Success rate	**Bitrate**	Std dev
09	250	0396	0.58	**0.77**	1.49
09	450	0520	0.96	**2.85**	0.68
09	650	0364	1.00	**2.56**	0.17
09	850	0377	0.99	**2.10**	0.27
25	250	1170	0.71	**2.10**	1.83
25	450	1066	0.96	**3.42***	0.73
25	650	1032	0.98	**2.82**	0.45
25	850	1066	0.98	**2.40**	0.45
49	250	1994	0.77	**2.97**	1.59
49	450	1998	0.92	**3.21**	0.88
49	650	1926	0.90	**2.28**	0.83
49	850	1654	0.87	**1.68**	0.70
64	250	2417	0.67	**1.84**	1.84
64	450	2340	0.86	**2.64**	1.05
64	650	1495	0.90	**2.03**	0.72
64	850	0901	0.68	**1.23**	0.75

Supplementary Table 1: Grid Task - Monkey J

Parameters			*Performance*		
Targets	Hold time (ms)	Trials	Success rate	**Bitrate**	Std dev
09	250	0325	0.39	**0.00**	1.74
09	450	0367	0.86	**2.14**	0.82
09	650	0373	0.98	**2.27**	0.37
09	850	0374	1.00	**2.11**	0.15
25	250	0853	0.47	**0.00**	2.18
25	450	1156	0.92	**3.00***	0.79
25	650	1004	0.96	**2.51**	0.56
25	850	1013	0.93	**1.92**	0.51
49	250	1087	0.51	**0.10**	2.05
49	450	2048	0.88	**2.63**	0.98
49	650	1830	0.92	**2.19**	0.68
49	850	1134	0.78	**1.38**	0.61
64	250	1547	0.57	**0.74**	2.14
64	450	1973	0.79	**1.83**	0.93
64	650	1614	0.80	**1.57**	0.73
64	850	0979	0.55	**0.80**	0.50

Supplementary Table 2: Grid Task - Monkey L

Parameters			*Performance*		
Targets	Distance (cm)	Trials	Success rate	**Bitrate**	Std dev
02	05	0158	0.93	**1.40**	0.31
02	07	0306	0.96	**1.14**	0.21
02	09	0219	0.96	**1.17**	0.22
02	11	0156	0.99	**1.15**	0.12
02	13	0051	1.00	**1.06**	0.14
04	05	0418	0.89	**2.43**	0.70
04	07	0309	0.94	**2.57**	0.53
04	09	0303	1.00	**2.42**	0.16
04	11	0412	0.99	**2.22**	0.19
04	13	0303	0.94	**1.60**	0.46
08	05	0706	0.72	**1.99**	1.50
08	07	0808	0.84	**2.60**	1.03
08	09	0831	0.93	**3.06***	0.70
08	11	0807	0.90	**2.61**	0.97
08	13	0403	0.90	**2.38**	0.75
12	05	0601	0.47	**0.00**	1.77
12	07	1611	0.74	**2.20**	1.41
12	09	0907	0.84	**2.88**	1.12
12	11	1205	0.88	**2.87**	0.98
12	13	0928	0.90	**2.84**	0.84
16	05	1207	0.49	**0.00**	2.18
16	07	1614	0.65	**1.40**	1.64
16	09	1290	0.79	**2.55**	1.40
16	11	0801	0.85	**2.78**	1.05
16	13	0400	0.83	**2.68**	1.21

Supplementary Table 3: Radial Task - Monkey J

Parameters			*Performance*		
Targets	Distance (cm)	Trials	Success rate	**Bitrate**	Std dev
02	05	0268	0.98	**1.18**	0.19
02	07	0257	0.99	**1.08**	0.14
02	09	0220	0.97	**0.86**	0.23
02	11	0305	0.99	**0.87**	0.09
04	05	0504	0.98	**2.39**	0.31
04	07	0507	0.99	**2.24**	0.26
04	09	0554	1.00	**1.97**	0.18
04	11	0506	0.96	**1.45**	0.36
08	05	1006	0.81	**2.23**	1.32
08	07	1229	0.95	**2.96***	0.56
08	09	1048	0.93	**2.46**	0.73
08	11	1010	0.94	**2.17**	0.56
12	05	1321	0.61	**0.93**	1.99
12	07	1221	0.79	**2.09**	1.29
12	09	1202	0.90	**2.64**	0.74
12	11	1507	0.88	**2.11**	0.81
16	05	0402	0.50	**0.05**	1.92
16	07	0802	0.65	**1.22**	1.57
16	09	0402	0.73	**1.59**	1.34
16	11	0413	0.77	**1.66**	1.09

Supplementary Table 4: Radial Task - Monkey L

Parameters			*Performance*		
Targets	Hold time (ms)	Trials	Success rate	**Bitrate**	Std dev
09	0650	0181	0.94	**2.07**	0.55
25	0250	0055	0.29	**0.00**	2.33
25	0450	0514	0.82	**2.24**	1.10
25	0650	0507	0.93	**2.38**	0.72
25	0850	0499	0.91	**1.91**	0.62
25	1050	0525	0.98	**2.15**	0.27
25	1250	0502	0.82	**1.31**	0.56
49	0650	0941	0.96	**2.66***	0.59
64	0650	0849	0.93	**2.53**	0.76

Supplementary Table 5: Grid Task - Monkey J: both arms restrained

Parameters			*Performance*		
Targets	Hold time (ms)	Trials	Success rate	**Bitrate**	Std dev
09	0650	0281	0.70	**0.93**	0.86
25	0250	0063	0.10	**0.00**	1.51
25	0450	0559	0.59	**0.68**	1.36
25	0650	0788	0.84	**1.79**	0.88
25	0850	0786	0.94	**1.90***	0.52
25	1050	0885	0.95	**1.74**	0.44
25	1250	0793	0.92	**1.44**	0.42
49	0650	1442	0.85	**1.86**	1.05
64	0650	1140	0.80	**1.55**	0.88

Supplementary Table 6: Grid Task - Monkey L: both arms restrained

Parameters			*Performance*		
Targets	Distance (cm)	Trials	Success rate	**Bitrate**	Std dev
02	07	0106	1.00	**1.07**	0.07
04	07	0204	0.95	**1.80**	0.44
08	03	0246	0.53	**0.30**	2.11
08	05	0411	0.83	**2.15***	1.28
08	07	0468	0.90	**2.11**	0.89
08	09	0402	0.85	**1.48**	1.03
08	11	0406	0.84	**1.40**	0.99
12	07	0590	0.76	**1.65**	1.47
16	07	0810	0.72	**2.02**	1.67

Supplementary Table 7: Radial Task - Monkey J: both arms restrained

Parameters			*Performance*		
Targets	Distance (cm)	Trials	Success rate	**Bitrate**	Std dev
02	07	0136	0.98	**0.75**	0.09
04	07	0202	1.00	**1.52**	0.16
08	03	0405	0.68	**1.06**	0.94
08	05	0405	0.89	**1.97**	0.62
08	07	0385	0.96	**1.91**	0.38
08	09	0400	0.97	**1.66**	0.27
08	11	0403	0.88	**1.48**	0.38
12	07	0606	0.91	**2.16***	0.54
16	07	0806	0.71	**1.03**	1.04

Supplementary Table 8: Radial Task - Monkey L: both arms restrained

Supplementary Movies

All movies are reconstructions of the neural prosthetic task from collected data during the respective closed-loop experiment. The movies playback in real time, approximated to the nearest frame (30 frames per second). For each movie, the blocks of 200 contiguous trials were selected at random among the blocks available for the optimization point.

Movie 1

Grid task of Monkey J on 2010-09-15 at optimal parameters of 25 targets and 450 ms hold time. In this segment, the monkey sustained a bitrate of 3.5 bps.

Movie 2

Grid task of Monkey L on 2010-09-16 at optimal parameters of 25 targets and 450 ms hold time. In this segment, the monkey sustained a bitrate of 2.5 bps.

Movie 3

Radial task of Monkey J on 2010-09-03 at optimal parameters of 8 targets and 9 cm distance. In this segment, the monkey sustained a bitrate of 3.0 bps.

Movie 4

Radial task of Monkey L on 2010-09-01 at optimal parameters of 8 targets and 7 cm distance. In this segment, the monkey sustained a bitrate of 3.1 bps.