Montage Profiling

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Overview

Objective: Try to improve electrode selection process by defining a set of montages with known trends across subjects

Methods: Reconstructed heads of three subjects, developed a scoring system based on desired metrics, simulated frequent used montages and assessed results based on averages across subjects.

Results: V_montage scored best across all three subject on focality and intensity. There are significant individual variabilities across montages. Female head allows for higher intensities.

Bottom line:
1. As you increase your intensity you are always bound to lose some focality, and vice versa.
2. V_montage is a very good candidate for cortical stimulation, while ”little pairs” might be good candidates for deep stimulation. Nested montage is best of both worlds, but still need to assess how field is distributed in the medium.

Scoring

The system normalizes each attribute and gives it a score (0-10)

Parameters: average focality, intensity , standard deviation

Overall Statistics:	
Mean Focality	177.5315698
Standard Deviation Focality	91.25764196
Mean v/m	1.648213023
Standard Deviation v/m	0.693280058

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Summary for MB_TI_Parallel_Vertical_TI.msh
Field Name: TI_max
Region Indices: 2
Max Value: 2.225121 V/m
Percentiles: 95          99         99.9
Percentile Values: 0.76546     0.91984      1.1535 V/m
Focality Cutoffs: 50  75  90  95
Focality Values: 196.8577      13.01382      2.057468      1.228836 (in cubic cm)
XYZ Max: [8.22700513574193 73.5199591737325 3.04639239461729]
XYZ Percentiles: [1.59647541643725 -1.42568935624995 31.8740089305086;1.5386764537
XYZ Std Percentiles: [10.6252737475304 34.9910189697366 24.7974827194497;8.9077216
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Enter focality: 196.8577
Enter volts per meter (v/m): 1.1535
Focality score (1-10 scale): 7.36
V/m score (1-10 scale): 4.52
Total score (v/m - focality): -2.84
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Total score = focality score – intensity score

Focality & intensity are equally weighted

Visualizing data

Subject 1

101 Scores:			
Montage	Focality Score	v/m Score	Total Score
V_Montage	3.08	9.51	6.43
V_Montage(Narrow)	1.76	4.39	2.63
V_Montage(ShiftedNorth)	3.92	6.3	2.38
Nested	5.92	7.55	1.63
Parallel_Vertical(Narrow)	5.36	6.76	1.4
X_Montage(Narrow)	7.03	6.87	-0.16
Parallel_Horizontal(Narrow)	7.81	7.28	-0.53
Parallel_Vertical(Wide)	3.95	2.71	-1.24
Parallel_Vertical	5.45	3.43	-2.02
Little_Pairs	3.31	1.08	-2.23
Parallel_Horizontal	7.53	5.1	-2.43
Parallel_Horizontal(Wide)	6.75	4.27	-2.48
Nested(Narrow)	8.97	5.58	-3.39
X_Montage	10	5.59	-4.41

Subject 2

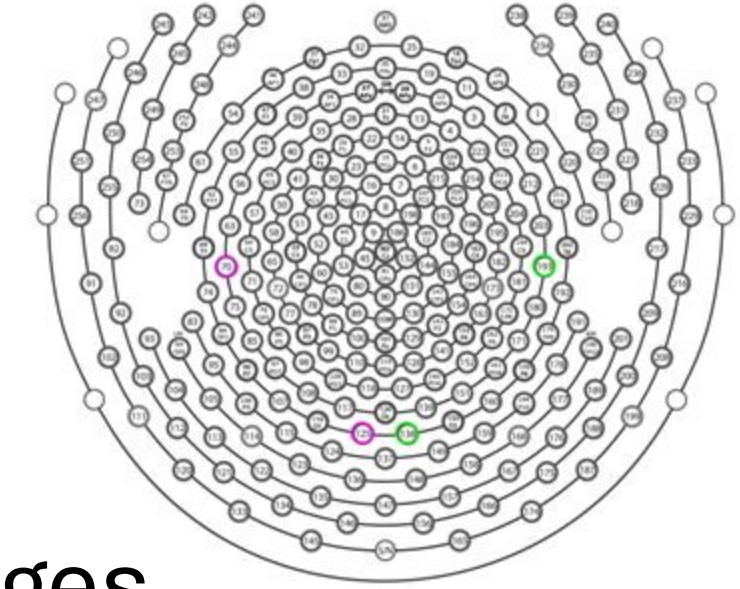
MB Scores:			
Montage	Focality Score	v/m Score	Total Score
V_Montage	1.79	10	8.21
Nested	4.66	9.74	5.08
Parallel_Horizontal(Narrow)	5.61	9.12	3.51
X_Montage(Narrow)	4.67	7.51	2.84
Parallel_Vertical(Narrow)	4.65	7.08	2.43
V_Montage(ShiftedNorth)	4.25	6.63	2.38
V_Montage(Narrow)	3.63	5.12	1.49
Parallel_Horizontal	6.19	5.79	-0.4
Nested(Narrow)	7.21	6.52	-0.69
Parallel_Horizontal(Wide)	5.55	4.61	-0.94
Parallel_Vertical(Wide)	4.61	3.15	-1.46
Parallel_Vertical	5.98	3.89	-2.09
Little_Pairs	3.3	1.1	-2.2
X_Montage	9.7	6.92	-2.78

Subject 3

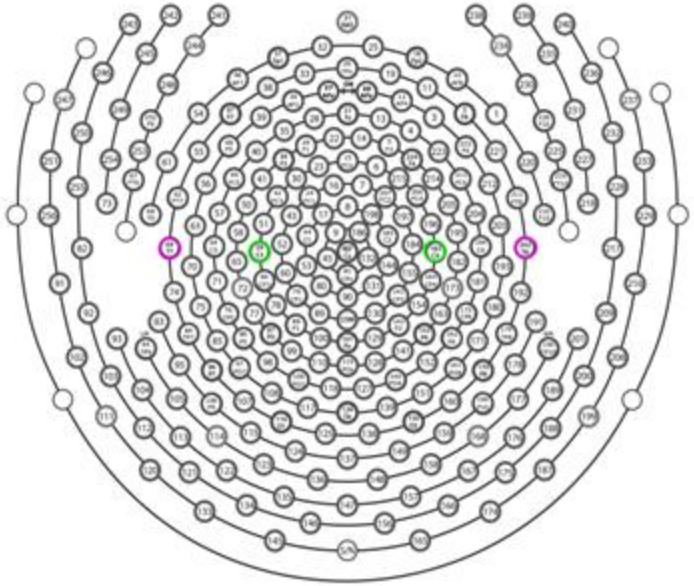
Ernie Scores:			
Montage	Focality Score	v/m Score	Total Score
V_Montage	1.78	7.54	5.76
Parallel_Horizontal(Narrow)	5.92	7.01	1.09
V_Montage(Narrow)	2.68	3.7	1.02
Parallel_Vertical(Narrow)	4.96	5.77	0.81
V_Montage(ShiftedNorth)	4.24	4.98	0.74
Nested	6.07	6.71	0.64
X_Montage(Narrow)	6.49	5.67	-0.82
Little_Pairs	2.61	1.05	-1.56
X_Montage(Wide)	6.7	4.75	-1.95
Parallel_Vertical	5.13	3.13	-1.99
Parallel_Horizontal	6.7	4.61	-2.09
Nested(Narrow)	7.4	5.26	-2.14
Parallel_Vertical(Wide)	4.61	2.42	-2.19
Parallel_Horizontal(Wide)	6.36	3.48	-2.88
X_Montage	8.8	5.55	-3.25

Montages

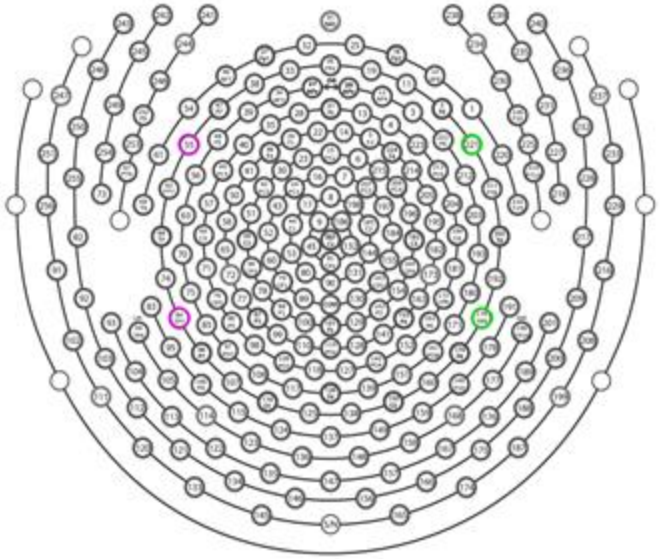
V_Montage



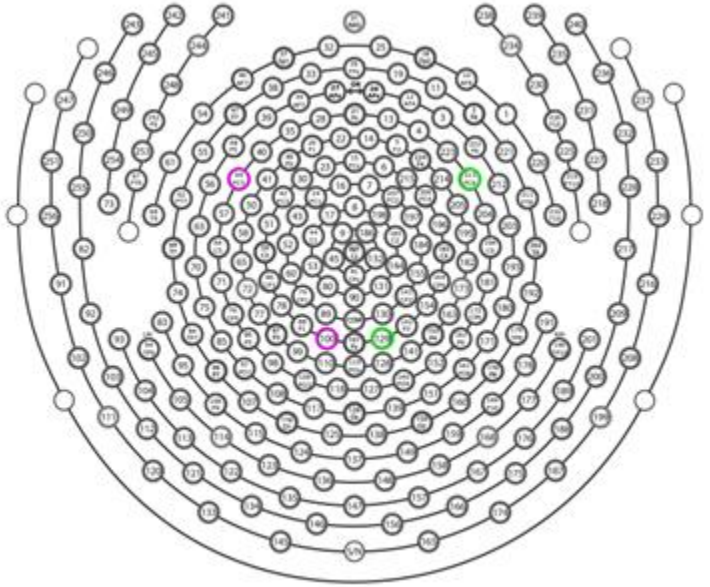
Nested(Narrow)



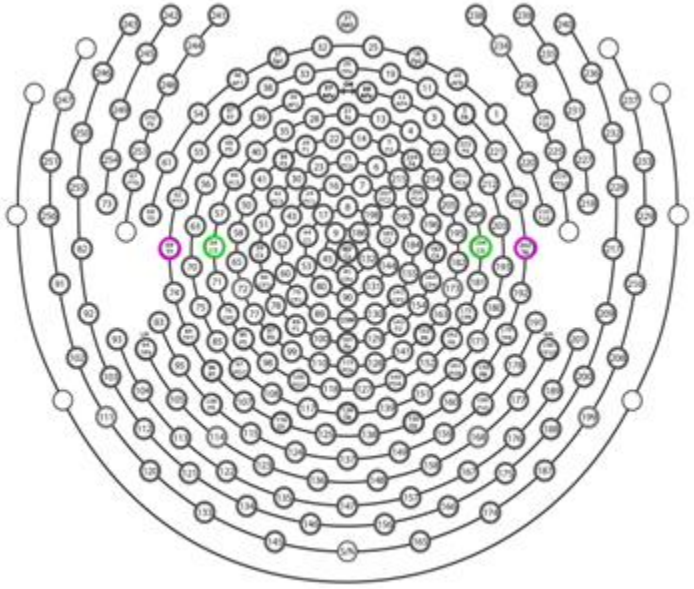
Para Vertical Wide



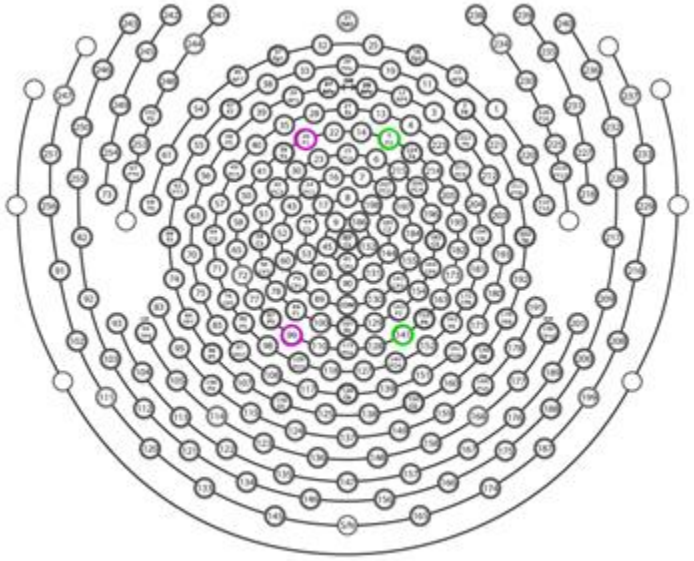
V (ShiftedNorth)



Nested

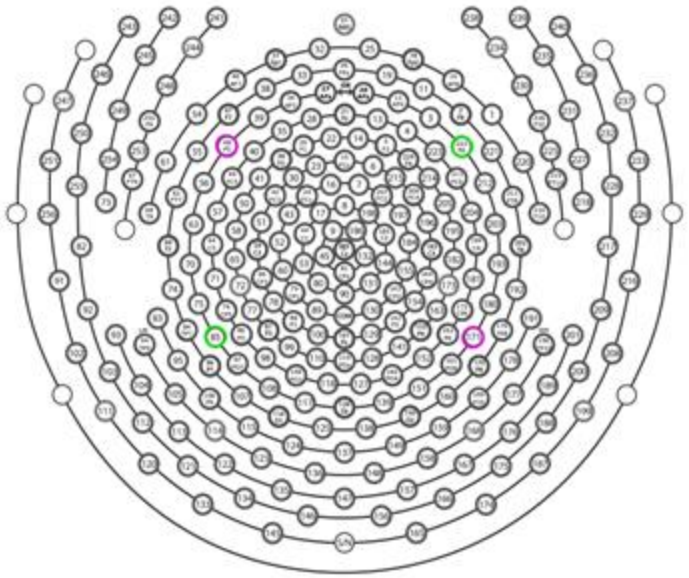


Para Vertical Narrow

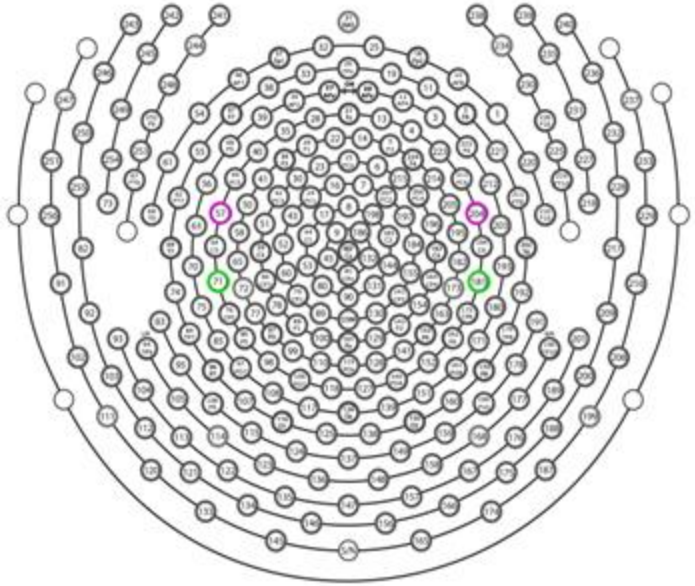


Montages

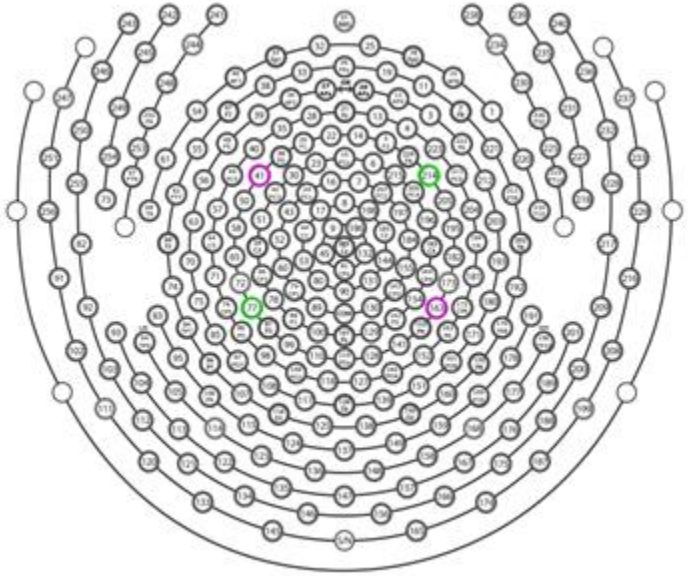
X_montage



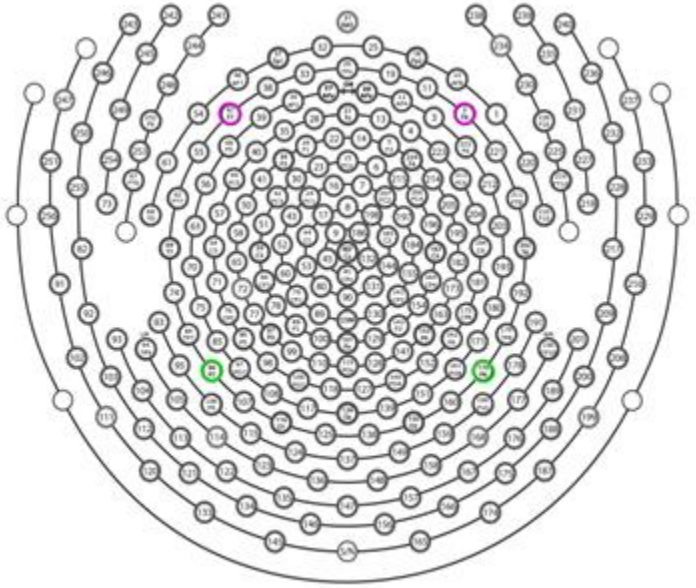
Para Horizontal Narrow



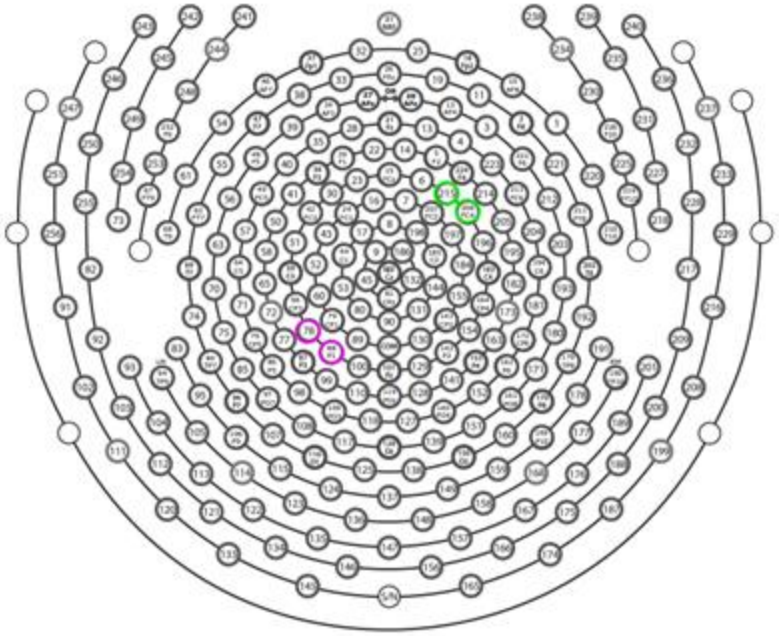
X_montage Narrow



Para Horizontal Wide



Little Pairs



Montage	101_Focality	Ernie_Focality	MB_Focality	101_Intensity	Ernie_Intensity	MB_Intensity	Focality_Mean	Focality_StdDev	Intensity_Mean	Intensity_StdDev
Little_Pairs	88.73	60.17	88.38	0.288	0.27	0.29	79.09	16.38	0.28	0.008
Nested(Narrow)	318.46	254.69	246.78	1.67	1.57	1.96	273.31	39.30	1.73	0.20
Nested	194.72	200.74	143.64	2.27	2.02	2.95	179.70	31.36	2.41	0.48
Parallel_Horizontal(Narrow)	271.28	194.73	182.04	2.19	2.11	2.76	216.02	48.27	2.35	0.35
Parallel_Horizontal(Wide)	228.39	212.29	179.73	1.26	1.02	1.37	206.80	24.78	1.22	0.17
Parallel_Horizontal	259.69	226.20	205.56	1.52	1.37	1.73	230.49	27.31	1.54	0.18
Parallel_Vertical(Narrow)	171.77	155.52	142.98	2.03	1.73	2.13	156.75	14.43	1.96	0.21
Parallel_Vertical(Wide)	114.64	141.38	141.41	0.78	0.70	0.92	132.48	15.44	0.80	0.11
Parallel_Vertical	175.48	162.34	196.85	1.01	0.91	1.15	178.23	17.41	1.02	0.11
V_Montage(Narrow)	25.96	63.17	101.88	1.30	1.09	1.53	63.67	37.96	1.30	0.21
V_Montage(ShiftedNorth)	113.36	126.39	126.86	1.89	1.48	1.99	122.20	7.66	1.79	0.26
V_Montage	79.53	26.73	27.19	2.88	2.27	3.42	44.49	30.35	2.86	0.57
X_Montage(Narrow)	239.70	217.53	143.89	2.07	1.70	2.26	200.35	50.19	2.01	0.28
X_Montage	497.24	311.47	348.0159	1.6752	1.66	2.08	385.57	98.41	1.80	0.24
Overall							177.53	92.33	1.64	0.70