A novel detection method for high-order SNP epistatic interactions based on explicit-encoding-based multitasking harmony search

1. disease models

1.1 8 EINME models

Table S1. Eight EINME models. The 3rd column denotes whether the model satisfies the Hardy-Weinberg equilibrium (**HWE**). In column 4–column 8, the values represent the prediction accuracy from k-order (k=1, 2,…,5) epistatic interaction.

Model	k-order	HWE	1-order(sd)	2-order(sd)	3-order(sd)	4-order(sd)	5-order(sd)	tar.gz link
EINME-1	3	No	.502(.001)	.511(.007)	.886(.023)			threewayBests
EINME-2	3	Yes	.504(.002)	.509(.003)	.680(.024)			HWthreewayBests
EINME-3	4	No	.502(.001)	.510(.003)	-	.897(.018)		fourwayBests
EINME-4	4	Yes	.507(.003)	.513(.003)	-	.673(.009)		HWfourwayBests
EINME-5	4	No	.501(.000)	.504(.001)	.518(.003)	.567(.010)		fourwayNoLowBests
EINME-6	5	No	.502(.001)	.510(.002)	-	-	.895(.009)	fivewayBests
EINME-7	5	Yes	.511(.003)	.518(.003)	-	-	.693(.008)	HWfivewayBests
EINME-8	5	No	.503(.001)	.508(.001)	.518(.002)	.543(.004)	.690(.008)	fivewayNoLowBests

The eight datasets are generated by Himmelstein et al, 2011[1], which disables the discovery of disease-causing models for certain existing heuristic methods due to the lack of clues of causative SNP markers.

1.2 12 EIME models

Table S2. The parameters and the values of penetrance of 12 EIME models.

Model type	EIME	order	Heritability(H^2)	MAF	Heterogeneity proportion
Additive model	EIME -1	5	0.1	0.1	1.0
	EIME -2	5	0.1	0.25	1.0
	EIME -3	5	0.1	0.5	1.0
	EIME -4	5	0.1	0.2	1.0
Threshold model	EIME -5	5	0.1	0.1	1.0
	EIME -6	5	0.25	0.1	1.0
	EIME -7	5	0.5	0.1	1.0
	EIME -8	5	0.1	0.2	1.0
Multiplicative model	EIME -9	4	0.005	0.1	1.0
	EIME -10	4	0.005	0.2	1.0
	EIME -11	4	0.005	0.4	1.0
	EIME -12	4	0.004	0.05	1.0

H^2 denotes the genetic heritability. **MAF** represents the minor allele frequencies.

The datasets are generated using GAMETES software.

2. References

[1] Himmelstein et al. Evolving hard problems: Generating human genetics datasets with a complex etiology. BioData Mining 4, 21(2011). doi:10.1186/1756-0381-4-21. http://discovery.dartmouth.edu/model_free_data/.