

Article

Supplementary Material: Patent Analysis and Structural Synthesis of Epicyclic Gear Trains Used in Automatic Transmissions

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Table S1. The 2-DOF DBGs with hollow vertex of degree four and their basic graphs.

Link Assortment	Basic Graph	DBG
[3; 2; 2]		
[2; 4; 1]		

Table S2. The 2-DOF DBGs with hollow vertex of degree five and their basic graphs.

Link Assortment	Basic Graph	DBG
[4; 1; 2; 1]		
[4; 2; 0; 2]		
[3; 3; 2; 1]		
[3; 3; 1; 1]		

[2; 5; 1; 1]

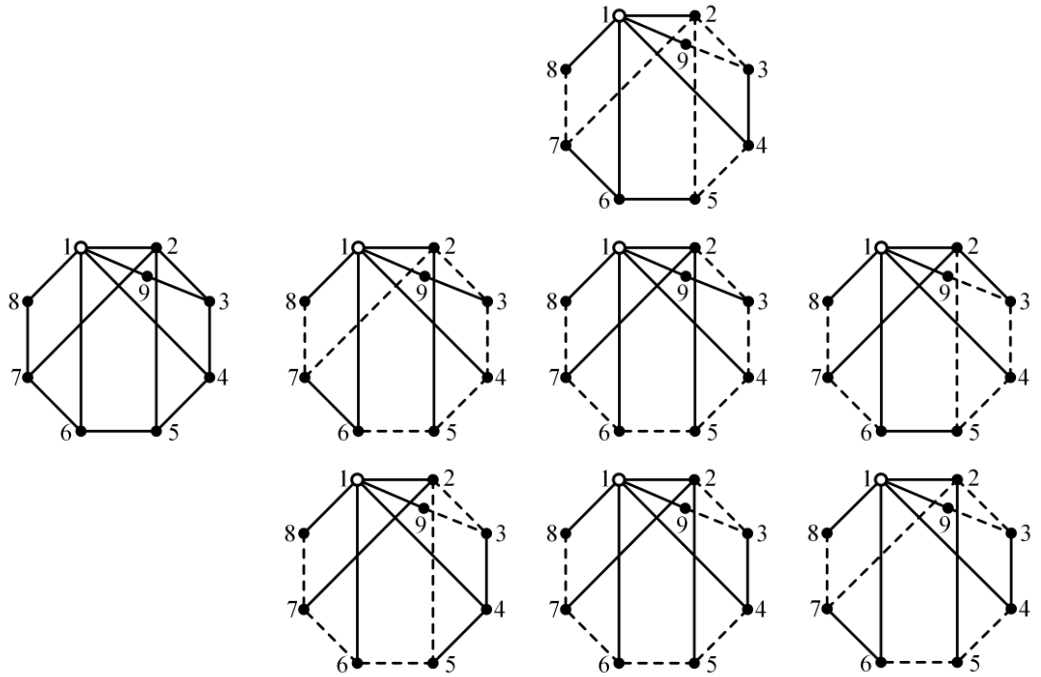


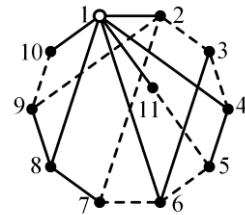
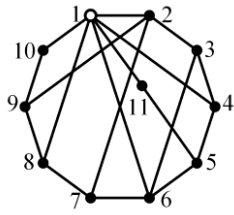
Table S3. The 3-DOF DBGs with hollow vertex of degree five and their basic graphs.

Link Assortment	Basic Graph	DBG
[4; 3; 0; 1]		

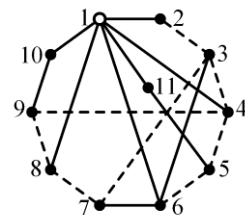
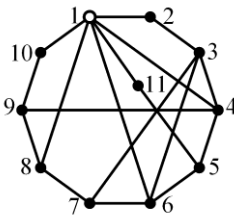
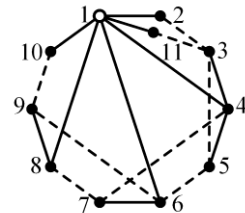
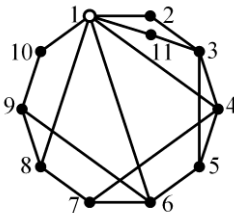
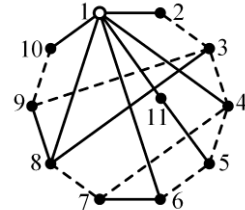
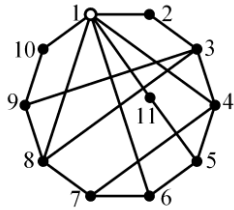
Table S4. The 2-DOF DBGs with hollow vertex of degree six and their basic graphs.

Link Assortment	Basic Graph	DBG
[5; 1; 1; 1; 1]		
[2; 6; 1; 0; 1]		

[2; 6; 2; 0; 1]



[3; 4; 3; 0; 1]



[2; 7; 0; 1; 1]

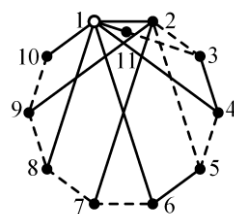
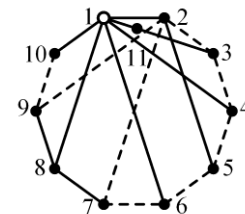
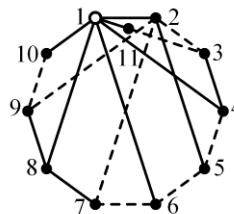
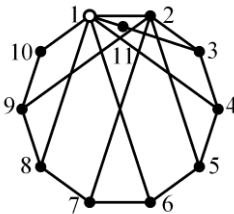
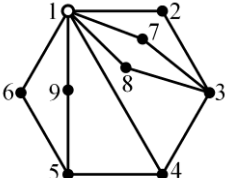
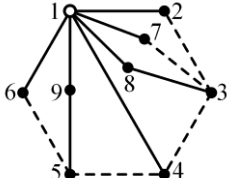

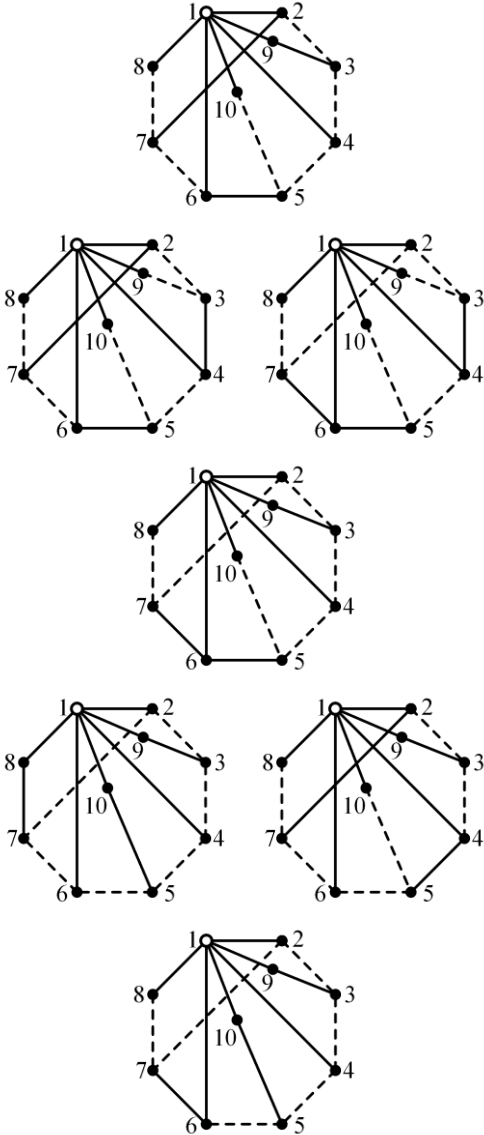
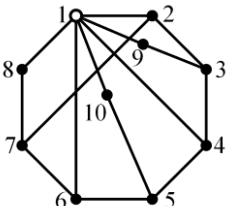
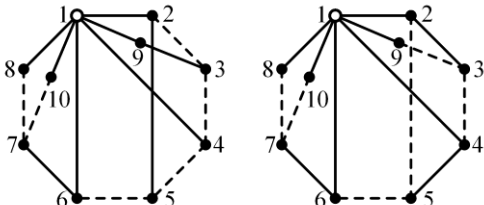
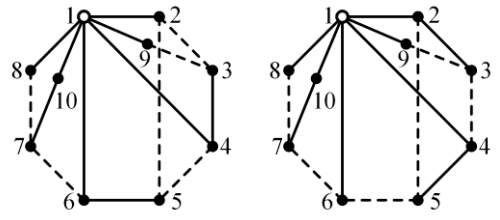
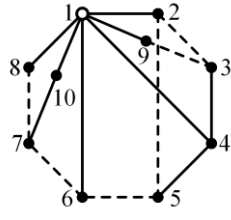
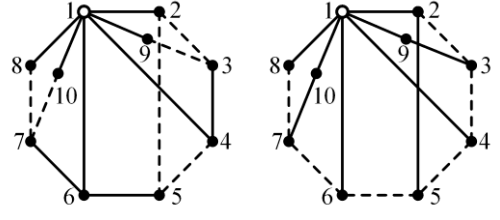
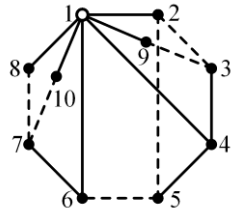
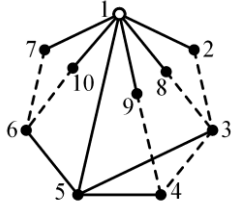
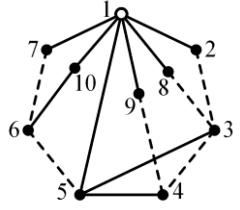
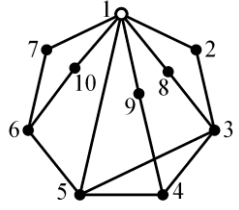


Table S5. The 3-DOF DBGs with hollow vertex of degree six and their basic graphs.

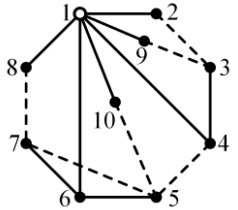
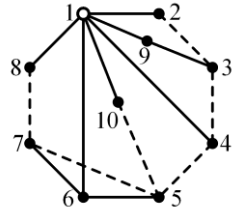
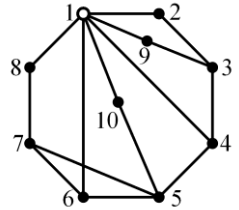
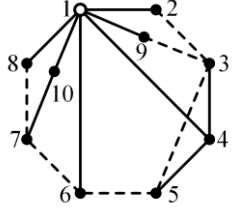
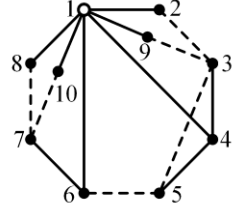
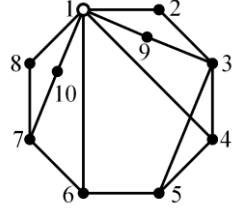
Link Assortment	Basic Graph	DBG
[5; 2; 1; 0; 1]		
		
[3; 6; 0; 0; 1]		



[5; 2; 2; 0; 1]



[4; 4; 1; 0; 1]



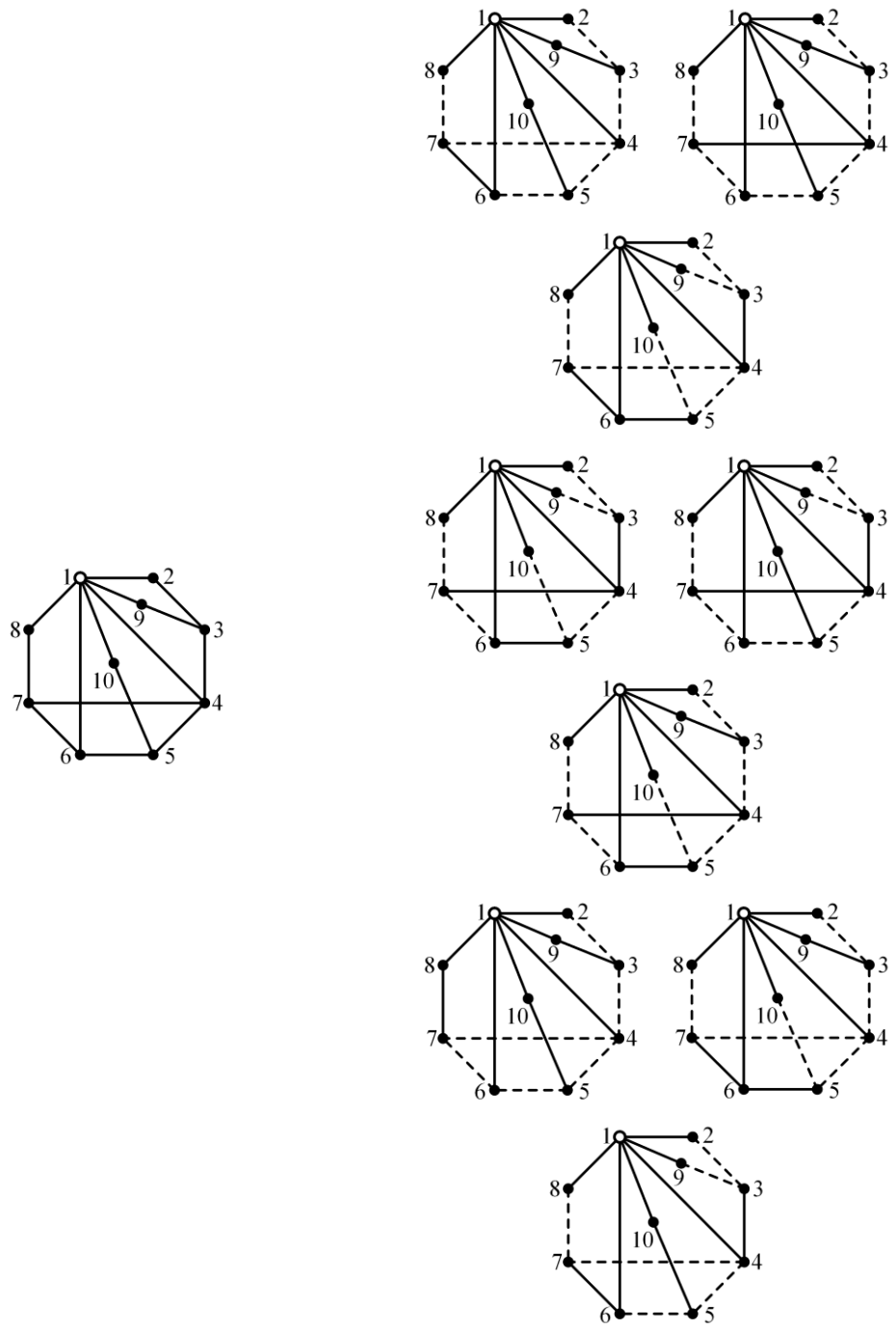


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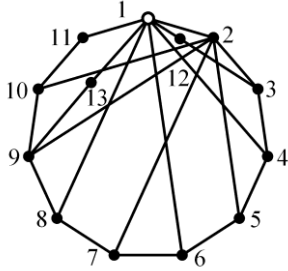
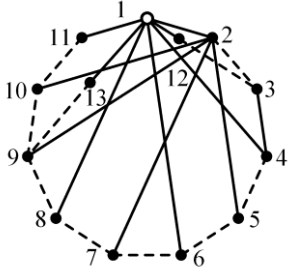
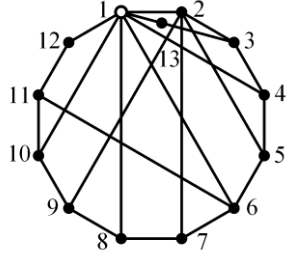
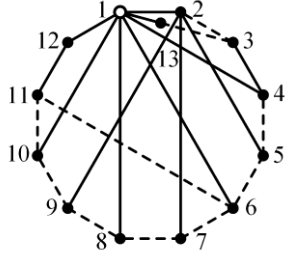
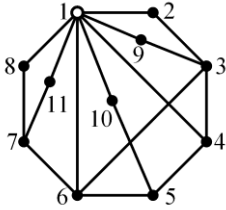
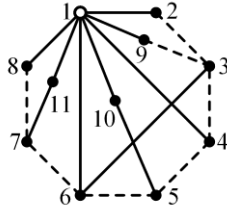
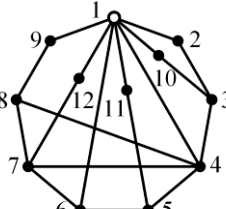
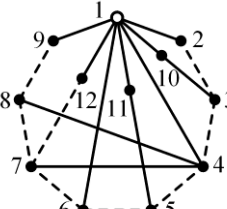
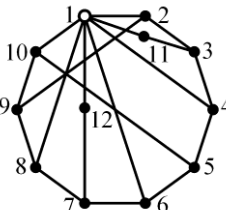
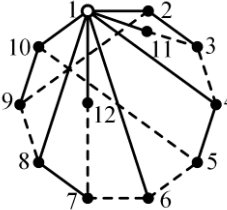
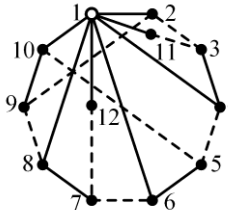
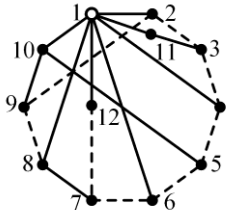
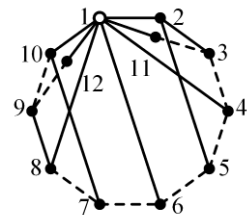
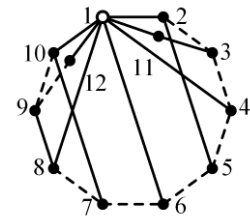
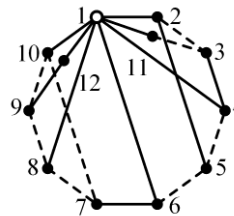
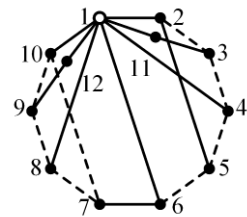
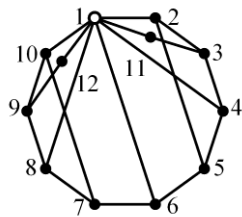
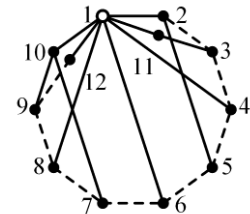
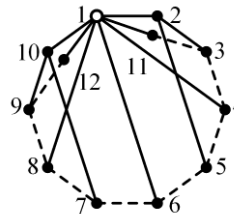
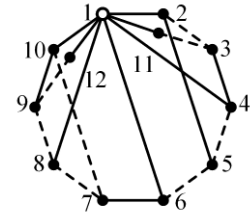
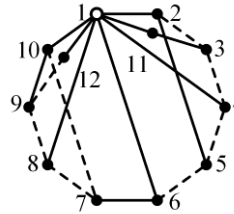
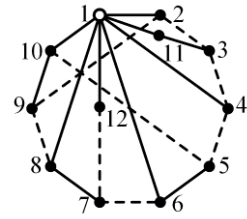
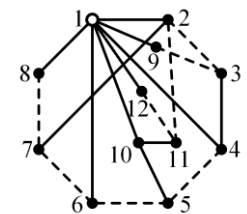
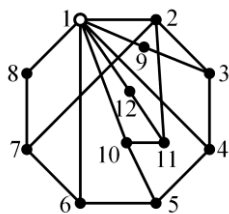
Link Assortment	Basic Graph	DBG
[3; 7; 1; 0; 1; 1]		
[2; 8; 1; 1; 0; 1]		

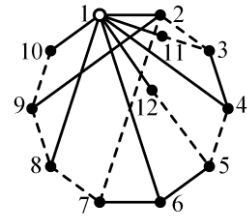
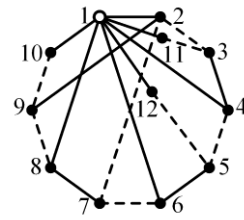
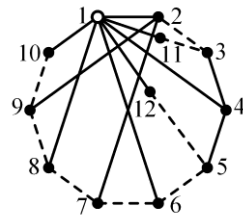
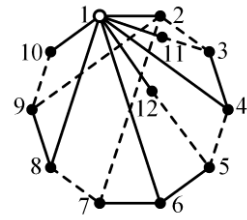
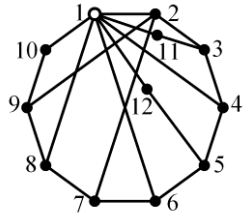
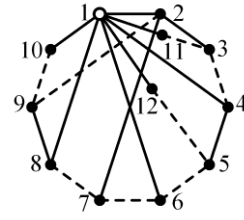
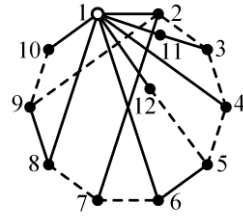
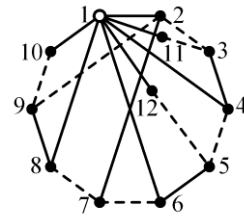
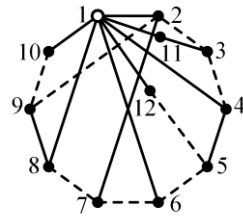
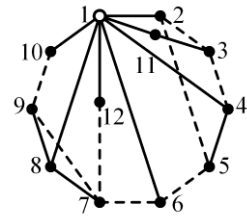
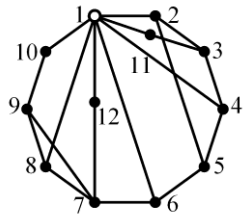
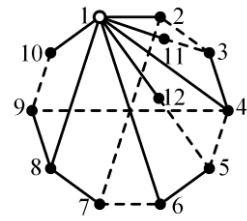
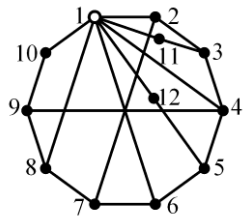
Table S7. The 3-DOF DBGs with hollow vertex of degree seven and their basic graphs.

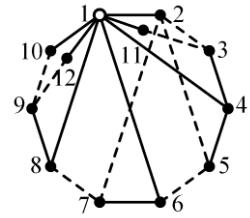
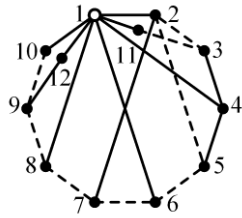
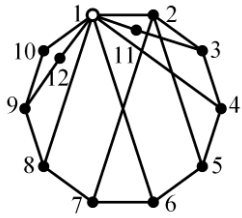
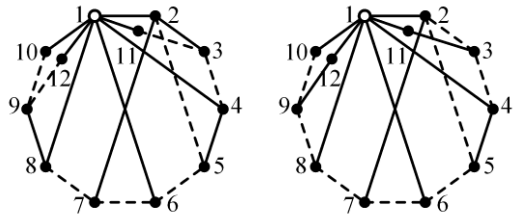
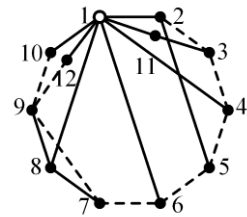
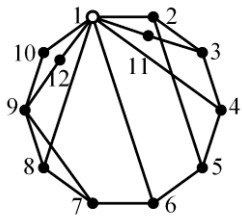
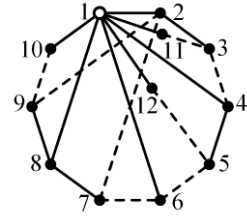
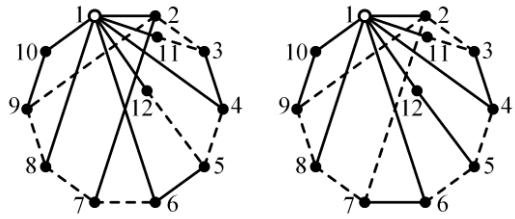
Link Assortment	Basic Graph	DBG
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[5; 4; 1; 1; 0; 1]		
[2; 9; 0; 0; 0; 1]		
		
		



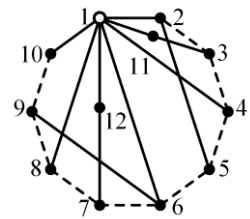
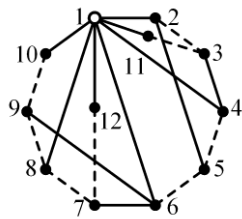
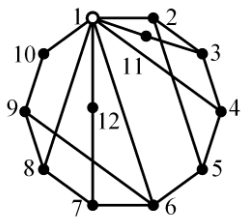
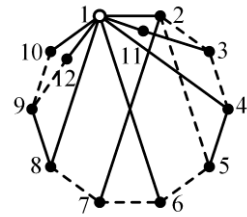
[3; 7; 1; 0; 0; 1]

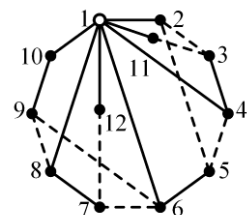
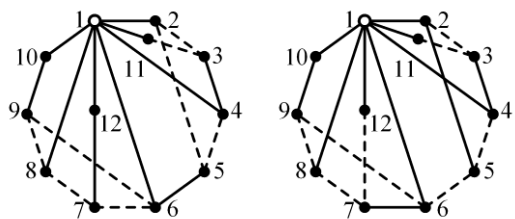
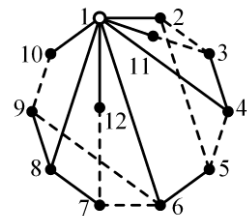
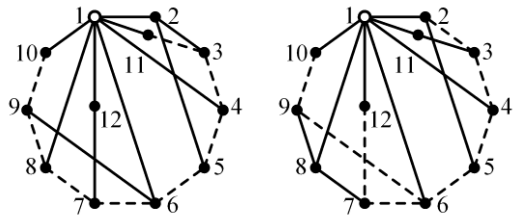
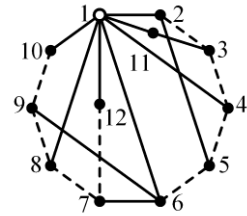
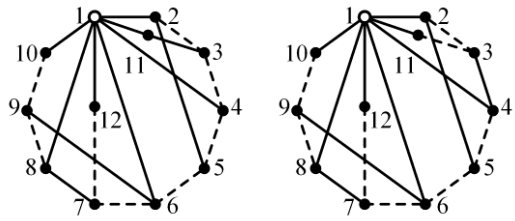




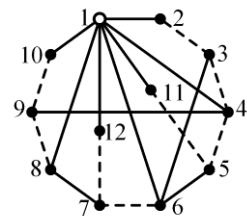
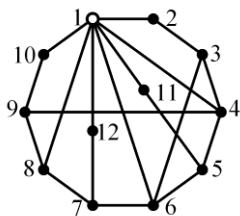


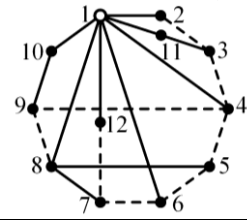
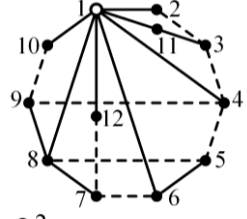
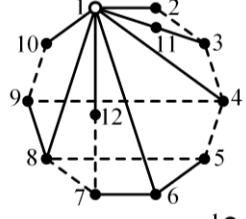
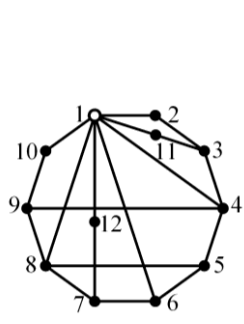
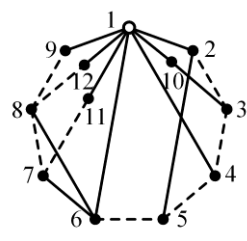
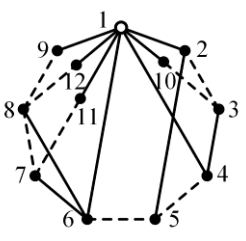
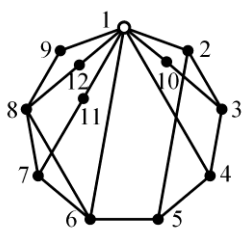
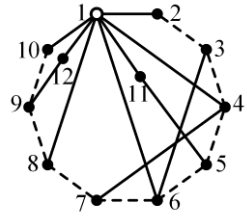
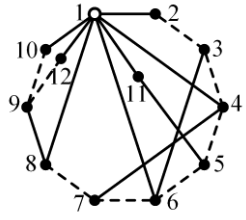
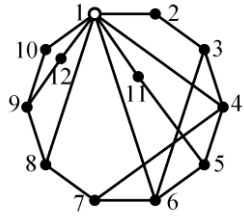
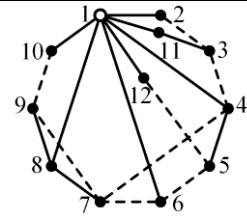
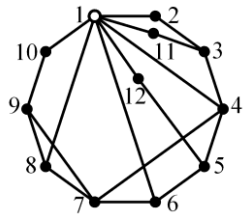
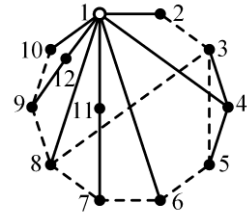
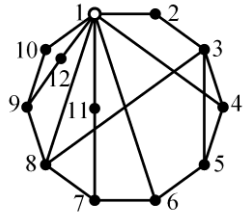
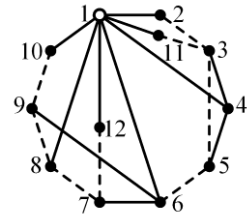
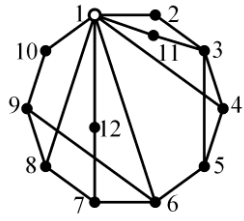
[3; 7; 1; 0; 0; 1]



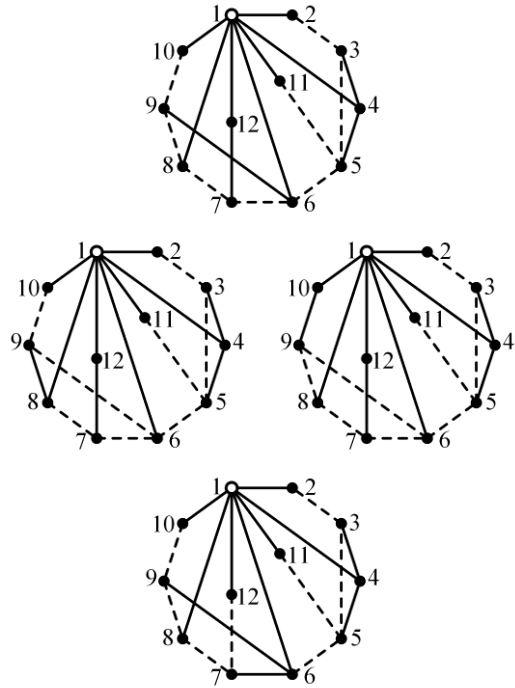
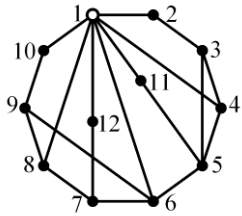


[4; 5; 2; 0; 0; 1]





[4; 5; 2; 0; 0; 1]



[4; 6; 0; 1; 0; 1]

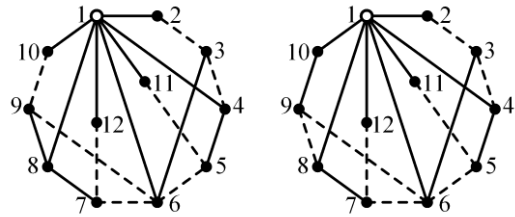
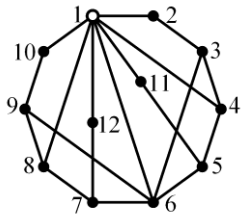


Table S8. The 4-DOF DBGs with hollow vertex of degree seven and their basic graphs.

Link Assortment	Basic Graph	DBG		
[6; 3; 1; 0; 0; 1]				
[5; 5; 0; 0; 0; 1]				

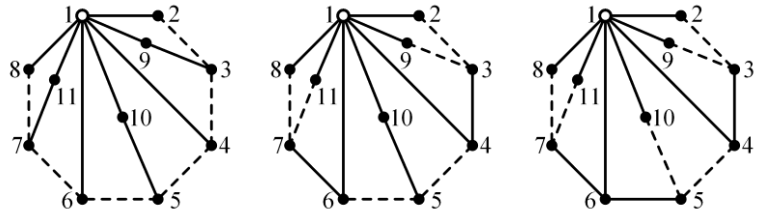


Table S9. The 2-DOF DBG with hollow vertex of degree eight and their basic graphs.

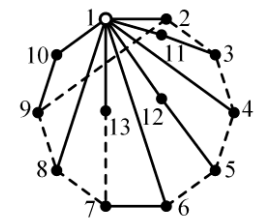
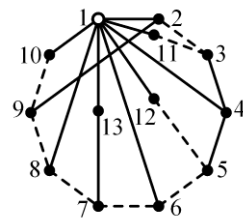
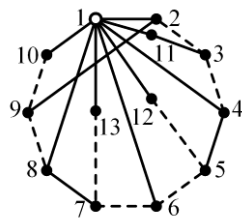
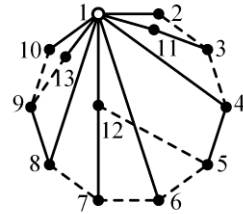
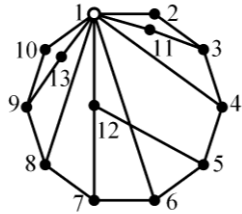
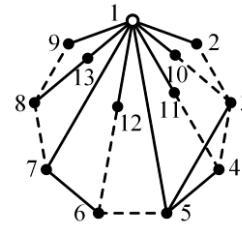
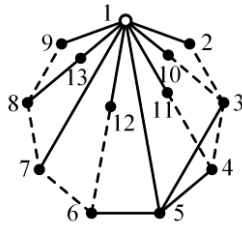
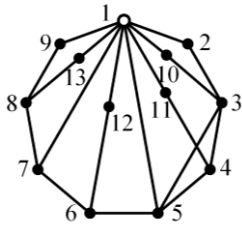
Link Assortment	Basic Graph	DBG
[2; A; 1; 0; 1; 0; 1]		

Table S10. The 3-DOF DBG with hollow vertex of degree eight and their basic graphs.

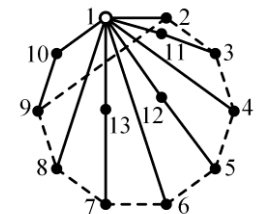
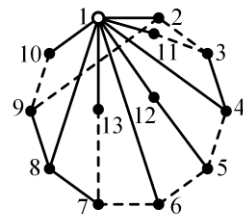
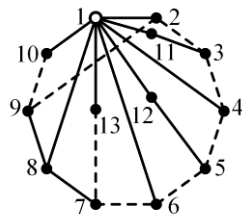
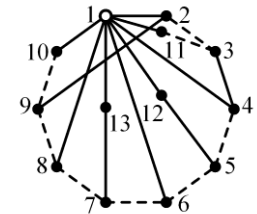
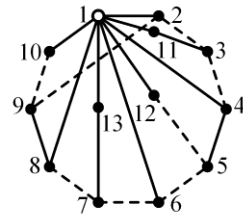
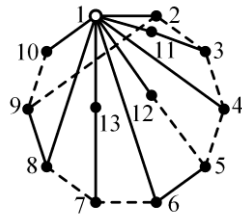
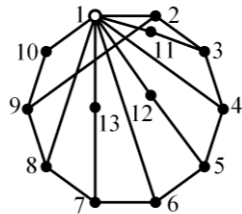
Link Assortment	Basic Graph	DBG
[3; 8; 2; 0; 0; 0; 1]		

Table S11. The 4-DOF DBGs with hollow vertex of degree eight and their basic graphs.

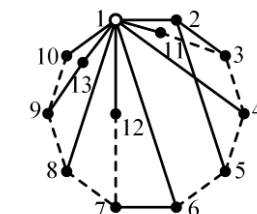
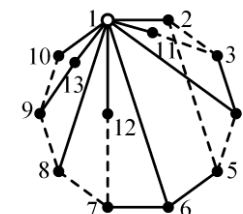
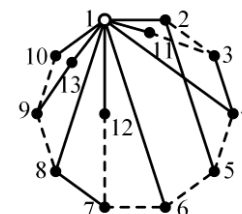
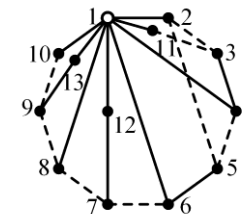
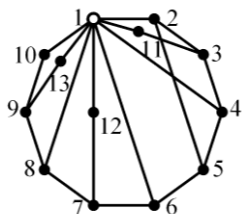
Link Assortment	Basic Graph	DBG		
[6; 4; 2; 0; 0; 0; 1]				

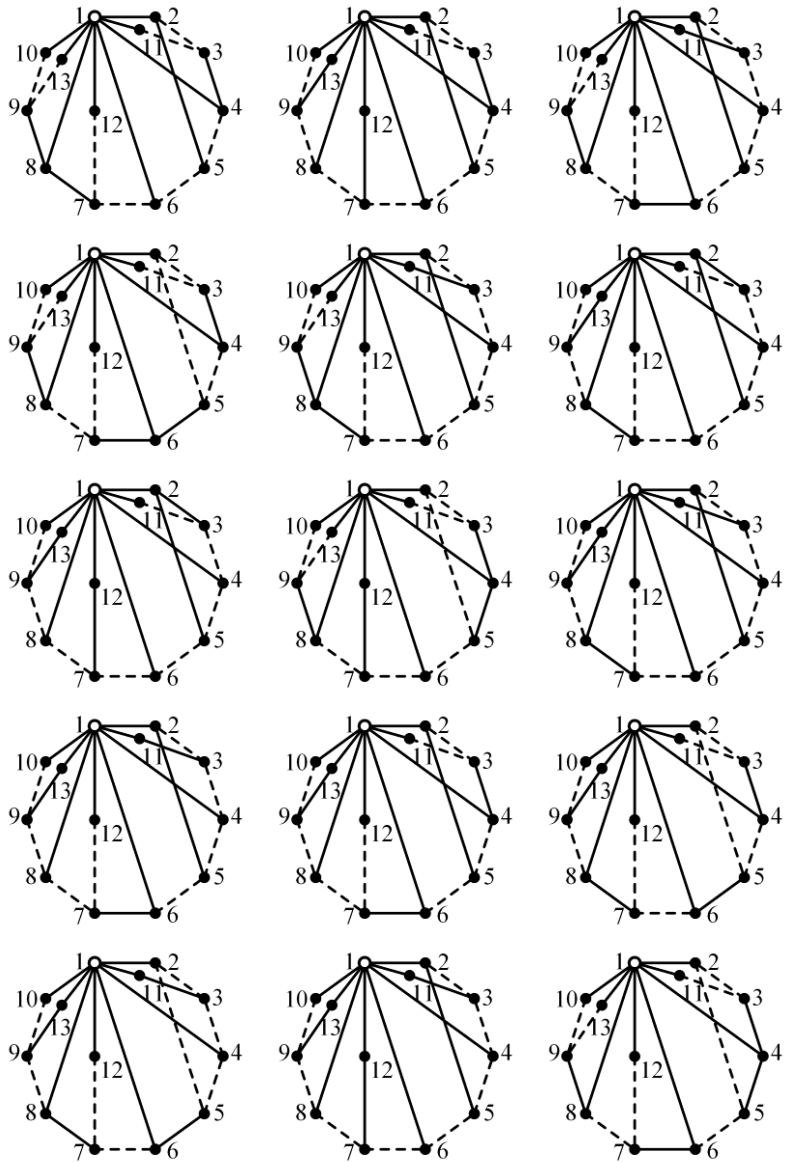


[4; 8; 0; 0; 0; 0; 1]

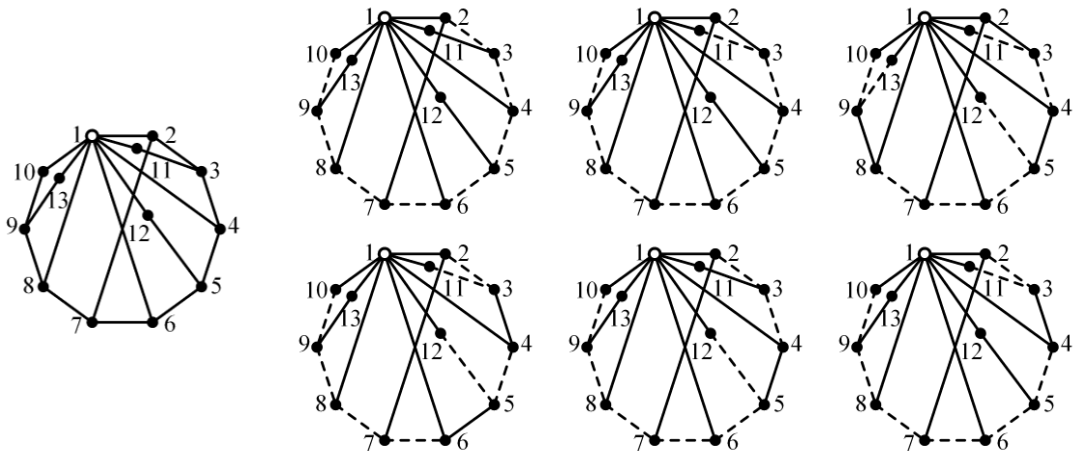


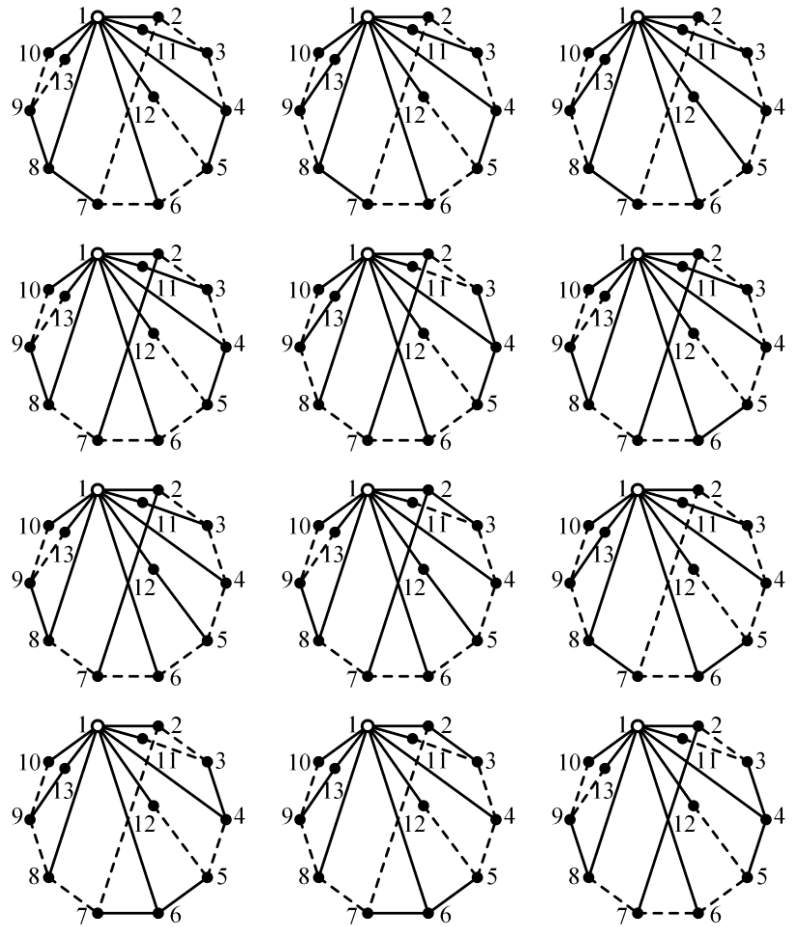
[4; 8; 0; 0; 0; 0; 1]



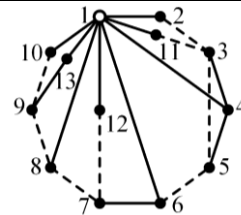
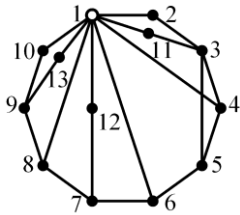


[4; 8; 0; 0; 0; 1]

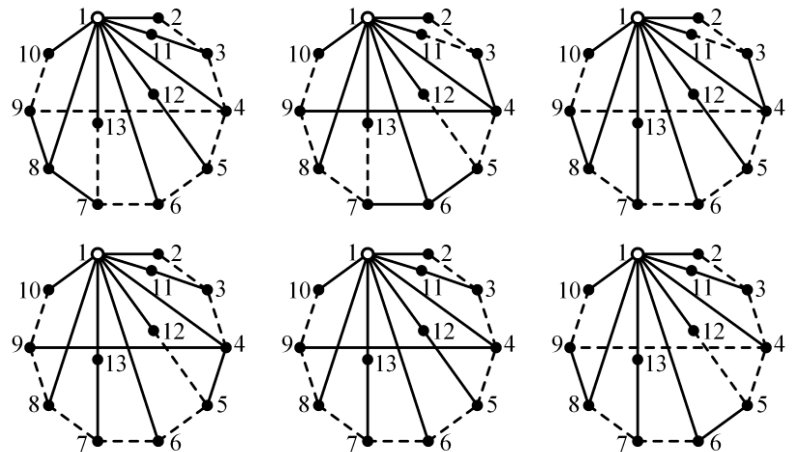
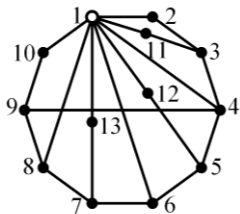


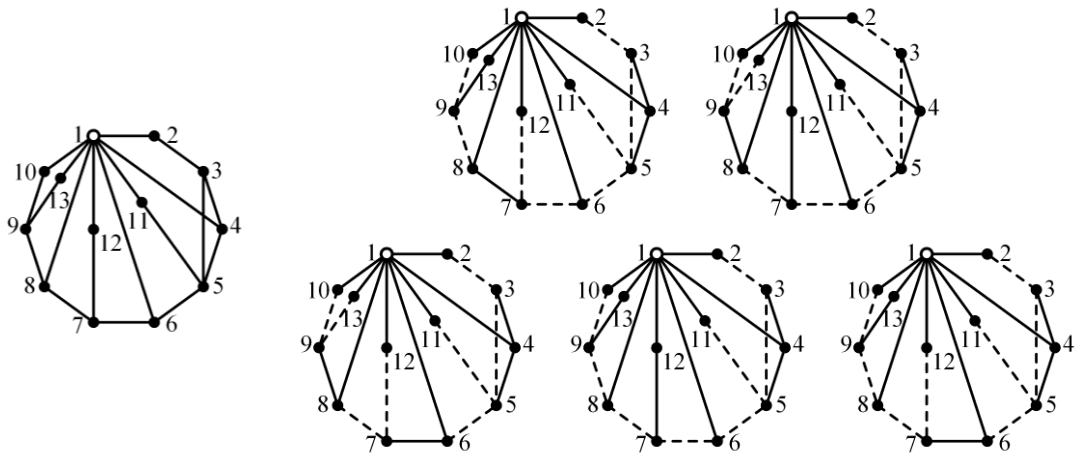
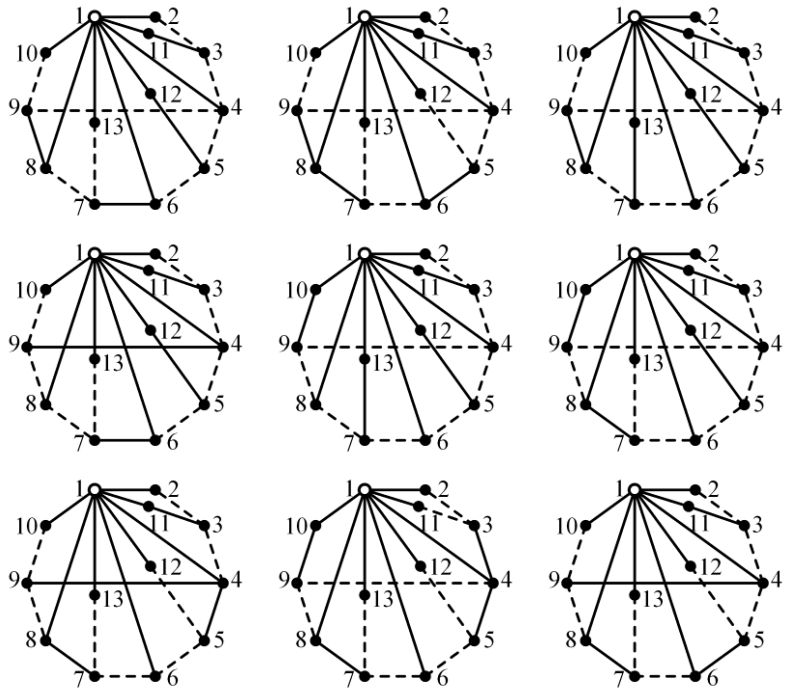


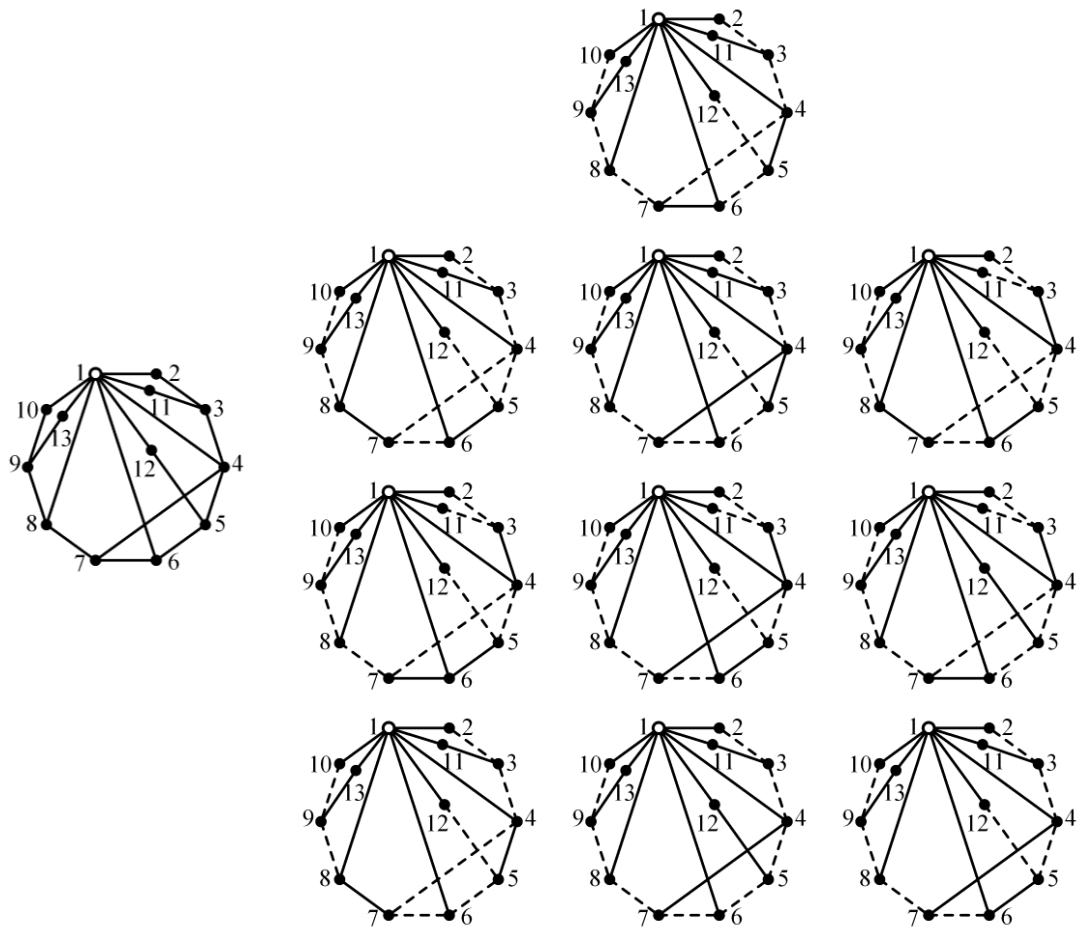
[5; 6; 1; 0; 0; 0; 1]



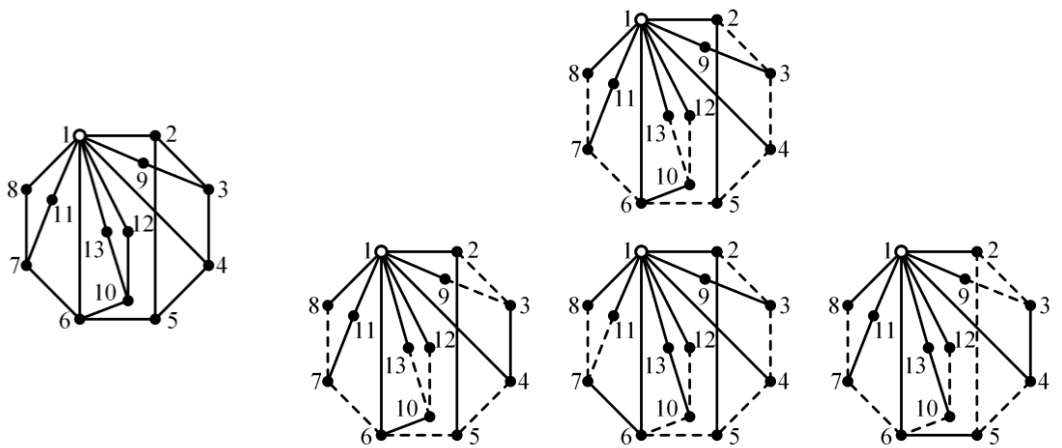
[5; 6; 1; 0; 0; 0; 1]



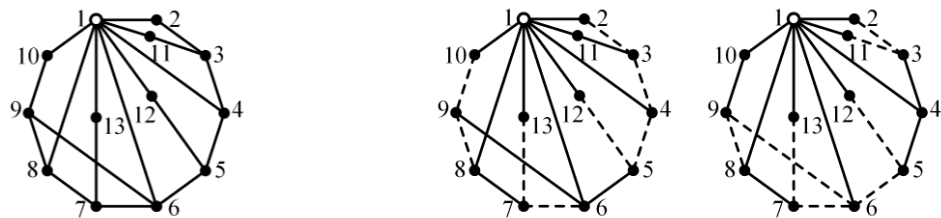


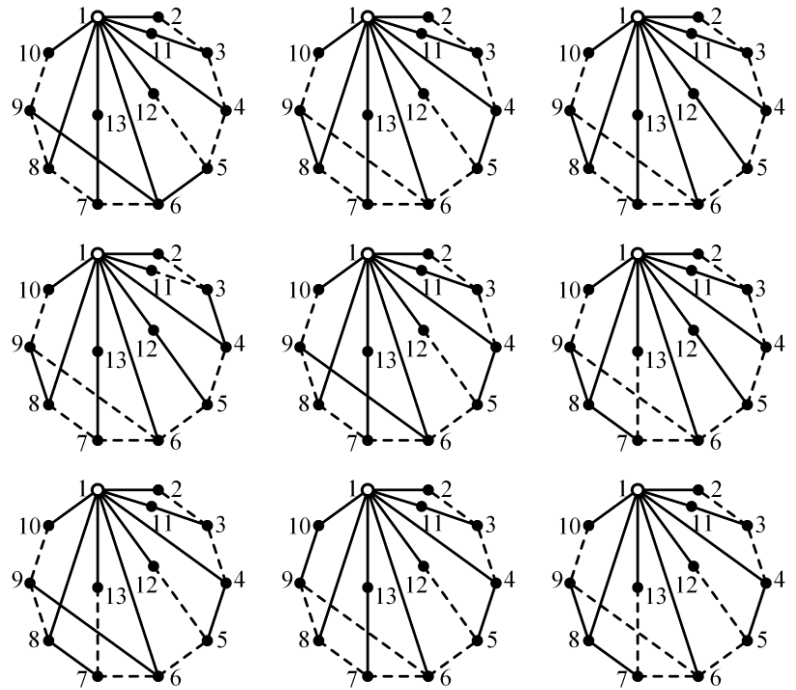


[5; 6; 1; 0; 0; 0; 1]



[5; 6; 1; 0; 0; 0; 1]





[6; 5; 0; 1; 0; 0; 1]

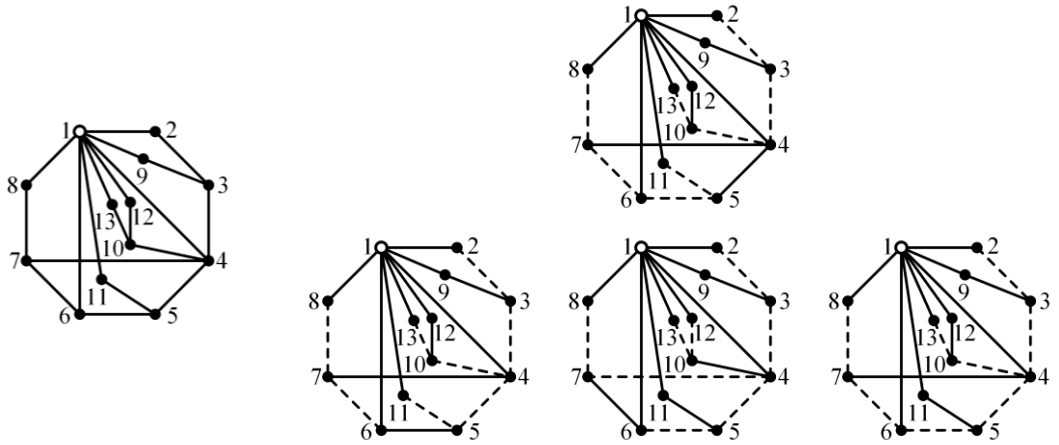
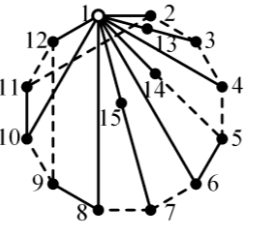
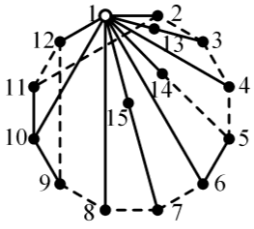
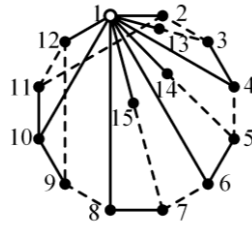
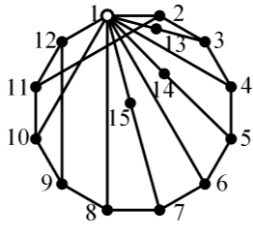


Table S12. The 4-DOF DBGs with hollow vertex of degree nine and their basic graphs.

Link Assortment	Basic Graph	DBG
[5; 7; 2; 0; 0; 0; 0; 1]		

[3; B; 0; 0; 0; 0; 0; 1]



[4; 9; 1; 0; 0; 0; 0; 1]

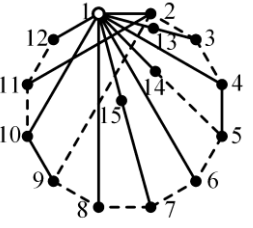
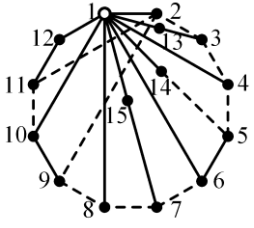
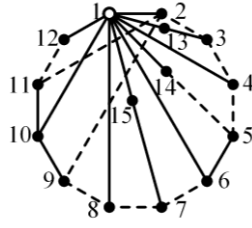
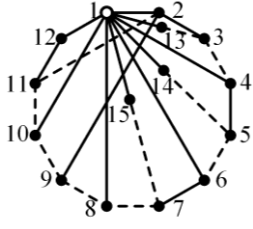
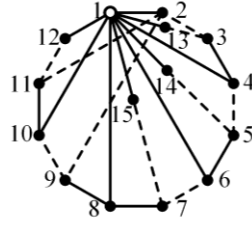
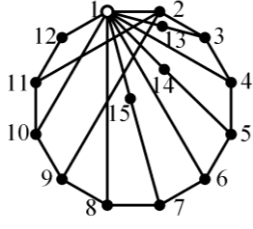


Table S13. The 5-DOF DBGs with hollow vertex of degree nine and their basic graphs.

Link Assortment	Basic Graph	DBG			
[6; 7; 0; 0; 0; 0; 1]					
	[7; 5; 1; 0; 0; 0; 0; 1]				

