The stage shop scheduling problem: lower bound and metaheuristic

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Appendix C

Table C.1
The structure of stages for instance size 10×5

Job numbers	Number of stages	Number of operations in the stage				
		1	2	3	4	5
Job 01	1	5				
Job 02	4	2	1	1	1	
Job 03	5	1	1	1	1	1
Job 04	5	1	1	1	1	1
Job 05	2	4	1			
Job 06	5	1	1	1	1	1
Job 07	4	1	1	1	2	
Job 08	1	5				
Job 09	2	1	4			
Job 10	3	2	1	2		

Table C.2
The structure of stages for instance size 15×15

Job numbers	Number of stages	Number of operations in the stage														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Job 01	7	1	2	4	1	3	2	2								
Job 02	12	1	1	2	2	1	1	2	1	1	1	1	1			
Job 03	13	1	1	1	2	1	2	1	1	1	1	1	1	1		
Job 04	4	4	3	5	3											
Job 05	8	1	2	1	1	2	2	2	4							
Job 06	10	1	2	2	1	2	1	2	1	2	1					
Job 07	14	1	1	1	1	1	1	1	1	1	1	2	1	1	1	
Job 08	4	3	6	4	2											
Job 09	8	2	2	2	1	1	1	2	4							
Job 10	11	2	2	2	1	1	1	2	1	1	1	1				
Job 11	11	1	1	1	2	1	1	1	2	2	1	2				
Job 12	2	13	2													
Job 13	5	1	3	1	5	5										
Job 14	14	1	2	1	1	1	1	1	1	1	1	1	1	1	1	
Job 15	14	1	1	1	1	1	1	1	1	2	1	1	1	1	1	

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Table C.3
The structure of stages for instance size 20×15

Job numbers	Number of stages	Number of operations in the stage														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Job 01	9	2	1	1	1	2	1	1	2	4						
Job 02	14	1	1	1	1	1	1	1	1	1	2	1	1	1	1	
Job 03	9	2	1	1	2	1	2	2	2	2						
Job 04	11	1	1	1	1	2	1	2	2	1	2	1				
Job 05	11	2	1	1	2	2	1	1	1	2	1	1				
Job 06	9	2	2	1	1	2	1	1	2	3						
Job 07	5	4	5	2	1	3										
Job 08	8	1	2	1	2	1	1	2	5							
Job 09	8	2	2	1	2	2	1	2	3							
Job 10	13	1	1	1	2	1	1	1	1	1	1	1	1	2		
Job 11	8	1	2	2	1	2	2	2	3							
Job 12	6	4	4	1	1	2	3									
Job 13	1	15														
Job 14	7	1	1	4	1	2	1	5								
Job 15	3	4	3	8												
Job 16	10	1	2	2	1	1	2	1	1	1	3					
Job 17	10	2	1	1	1	2	2	2	1	2	1					
Job 18	11	2	1	2	2	1	1	1	1	1	2	1				
Job 19	8	2	1	2	1	1	1	1	6							
Job 20	7	1	3	3	2	4	1	1								

Table C.4
The structure of stages for instance size 20×20

Job numbers	Number of stages	Number of operations in the stage																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Job 01	10	1	3	3	2	2	4	2	1	1	1										
Job 02	14	1	1	2	1	2	1	2	1	1	1	1	1	2	3						
Job 03	11	2	2	2	1	1	1	1	2	1	2	5									
Job 04	14	2	1	2	2	1	2	1	1	1	1	1	2	1	2						
Job 05	5	3	4	3	2	8															
Job 06	7	1	1	1	1	3	1	12													
Job 07	8	2	2	3	1	1	4	4	3												
Job 08	14	1	2	1	1	2	1	2	2	2	2	1	1	1	1						
Job 09	15	1	1	2	2	1	2	1	2	1	1	2	1	1	1	1					
Job 10	9	3	3	2	4	3	2	1	1	1											
Job 11	8	2	3	3	1	3	2	4	2												
Job 12	14	1	2	1	1	2	2	1	2	1	2	1	1	2	1						
Job 13	3	5	4	11																	
Job 14	11	1	1	1	1	1	1	1	1	2	1	9									
Job 15	13	1	1	2	1	2	2	2	1	1	2	2	1	2							
Job 16	1	20																			
Job 17	6	2	2	1	3	3	9														
Job 18	13	1	2	2	1	2	1	1	2	2	2	1	1	2							
Job 19	4	9	6	4	1																
Job 20	5	6	2	1	4	7															

Table C.5
The structure of stages for instance size 30×15

Job numbers	Number of stages	Number of operations in the stage														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Job 01	14	2	1	1	1	1	1	1	1	1	1	1	1	1	1	
Job 02	14	1	1	1	1	2	1	1	1	1	1	1	1	1	1	
Job 03	7	3	3	2	1	1	3	2								
Job 04	6	2	1	4	1	1	6									
Job 05	9	1	1	2	1	1	1	1	1	6						
Job 06	10	1	2	1	2	1	2	1	1	2	2					
Job 07	4	1	5	2	7											
Job 08	13	1	1	1	1	2	1	1	1	1	2	1	1	1		
Job 09	3	10	1	4												
Job 10	6	2	1	2	2	3	5									
Job 11	7	1	2	1	4	3	1	3								
Job 12	15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Job 13	12	1	2	1	1	2	1	1	1	1	2	1	1			
Job 14	3	9	2	4												
Job 15	12	2	1	1	1	1	2	1	1	2	1	1	1			
Job 16	10	2	1	1	2	2	2	1	1	2	1					
Job 17	8	2	2	1	1	1	2	2	4							
Job 18	9	1	1	1	1	1	2	1	2	5						
Job 19	3	3	2	10												
Job 20	14	1	1	1	1	1	1	1	1	1	2	1	1	1	1	
Job 21	12	2	1	2	1	2	1	1	1	1	1	1	1			
Job 22	11	1	1	2	1	2	1	2	2	1	1	1				
Job 23	15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Job 24	10	2	2	1	2	1	2	1	1	1	2					
Job 25	8	1	2	1	2	1	2	1	5							
Job 26	8	2	2	2	1	2	1	1	4							
Job 27	5	3	3	6	2	1										
Job 28	2	1	14													
Job 29	14	1	1	1	1	1	2	1	1	1	1	1	1	1	1	
Job 30	8	2	1	1	1	1	1	1	7							

Table C.6
The structure of stages for instance size 30×20

Job numbers	Number of stages	Number of operations in the stage																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Job 01	8	3	2	3	3	3	3	1	2												
Job 02	10	1	3	2	1	2	1	1	4	4	1										
Job 03	6	3	4	5	2	2	4														
Job 04	11	2	2	1	1	1	1	2	1	1	1	7									
Job 05	9	1	1	1	2	4	4	4	2	1											
Job 06	10	1	2	3	3	1	2	1	1	3	3										
Job 07	3	9	8	3																	
Job 08	15	1	1	1	2	1	1	2	2	1	1	2	1	1	1	2					
Job 09	14	1	2	1	2	2	1	2	1	1	1	2	1	2	1						
Job 10	6	1	4	3	1	2	9														
Job 11	4	7	1	4	8																
Job 12	4	4	3	3	10																
Job 13	14	1	2	1	1	1	2	1	1	2	1	1	1	2	3						
Job 14	2	7	13																		
Job 15	4	5	5	8	2																
Job 16	13	2	1	1	1	2	1	2	1	2	1	1	2	3							
Job 17	15	1	2	1	1	2	1	1	1	1	1	1	1	1	2	3					
Job 18	13	1	1	1	2	2	1	1	1	1	2	2	2	3							
Job 19	1	20																			
Job 20	8	2	1	4	1	1	3	3	5												
Job 21	9	2	4	1	1	1	2	2	3	4											
Job 22	4	5	10	3	2																
Job 23	14	1	1	2	1	2	2	1	1	1	1	2	1	2	2						
Job 24	7	2	3	2	1	3	2	7													
Job 25	14	2	1	1	1	2	1	2	2	1	2	1	2	1	1						
Job 26	15	1	1	2	2	2	1	2	1	1	1	2	1	1	1	1					
Job 27	10	4	1	1	4	1	1	2	4	1	1										
Job 28	14	2	1	2	1	1	1	2	1	1	2	1	1	1	3						
Job 29	1	20																			
Job 30	5	7	6	3	3	1															

Table C.7
The structure of stages for instance size 40×15

Job numbers	Number of stages	Number of operations in the stage														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Job 01	14	2	1	1	1	1	1	1	1	1	1	1	1	1	1	
Job 02	14	1	1	1	1	2	1	1	1	1	1	1	1	1	1	
Job 03	7	3	3	2	1	1	3	2								
Job 04	6	2	1	4	1	1	6									
Job 05	9	1	1	2	1	1	1	1	1	6						
Job 06	10	1	2	1	2	1	2	1	1	2	2					
Job 07	4	1	5	2	7											
Job 08	13	1	1	1	1	2	1	1	1	1	2	1	1	1		
Job 09	3	10	1	4												
Job 10	6	2	1	2	2	3	5									
Job 11	7	1	2	1	4	3	1	3								
Job 12	15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Job 13	12	1	2	1	1	2	1	1	1	1	2	1	1			
Job 14	3	9	2	4												
Job 15	12	2	1	1	1	1	2	1	1	2	1	1	1			
Job 16	10	2	1	1	2	2	2	1	1	2	1					
Job 17	8	2	2	1	1	1	2	2	4							
Job 18	9	1	1	1	1	1	2	1	2	5						
Job 19	3	3	2	10												
Job 20	14	1	1	1	1	1	1	1	1	1	2	1	1	1	1	
Job 21	12	2	1	2	1	2	1	1	1	1	1	1	1			
Job 22	11	1	1	2	1	2	1	2	2	1	1	1				
Job 23	15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Job 24	10	2	2	1	2	1	2	1	1	1	2					
Job 25	8	1	2	1	2	1	2	1	5							
Job 26	8	2	2	2	1	2	1	1	4							
Job 27	5	3	3	6	2	1										
Job 28	2	1	14													
Job 29	14	1	1	1	1	1	2	1	1	1	1	1	1	1	1	
Job 30	8	2	1	1	1	1	1	1	7							
Job 31	14	1	1	1	1	1	1	1	1	1	2	1	1	1	1	
Job 32	12	2	1	2	1	2	1	1	1	1	1	1	1			
Job 33	11	1	1	2	1	2	1	2	2	1	1	1				
Job 34	15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Job 35	10	2	2	1	2	1	2	1	1	1	2					
Job 36	8	1	2	1	2	1	2	1	5							
Job 37	8	2	2	2	1	2	1	1	4							
Job 38	5	3	3	6	2	1										
Job 39	2	1	14													
Job 40	14	1	1	1	1	1	2	1	1	1	1	1	1	1	1	

Table C.8
The structure of stages for instance size 40×20

Job numbers	Number of stages	Number of operations in the stage																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Job 01	13	1	1	2	2	2	1	2	1	1	2	1	2	2							
Job 02	14	2	2	1	1	1	2	2	2	2	1	1	1	1	1						
Job 03	13	2	1	1	1	2	1	2	2	2	2	1	2	1							
Job 04	13	1	2	1	2	2	1	2	1	1	1	1	2	3							
Job 05	11	2	2	2	2	1	2	1	1	1	2	4									
Job 06	14	1	1	1	1	2	1	2	1	2	2	2	2	1	1						
Job 07	11	2	2	2	2	1	2	1	1	1	2	4									
Job 08	8	2	2	1	1	4	1	3	6												
Job 09	8	2	2	4	1	4	1	4	2												
Job 10	5	2	6	4	1	7															
Job 11	4	2	7	7	4																
Job 12	6	6	6	4	2	1	1														
Job 13	3	6	1	13																	
Job 14	7	4	3	2	1	2	4	4													
Job 15	11	2	1	2	1	2	1	2	1	1	1	6									
Job 16	10	1	3	1	1	3	3	1	1	3	3										
Job 17	9	3	3	3	1	2	1	4	1	2											
Job 18	14	2	2	1	1	2	1	1	1	2	1	2	1	1	2						
Job 19	10	2	1	4	1	4	1	1	3	1	2										
Job 20	14	1	1	1	2	1	1	2	1	1	2	2	2	1	2						
Job 21	13	1	2	1	2	2	2	1	2	1	2	1	2	1							
Job 22	6	5	1	3	4	5	2														
Job 23	9	2	1	1	4	3	3	1	4	1											
Job 24	7	1	2	1	1	3	3	9													
Job 25	7	2	3	1	3	4	3	4													
Job 26	10	2	2	3	2	1	2	1	2	4	1										
Job 27	14	2	1	1	2	1	1	1	1	2	1	2	1	2	2						
Job 28	15	1	1	1	1	2	1	1	2	1	2	1	2	1	2	1					
Job 29	14	1	1	1	2	1	1	2	2	1	1	2	1	1	3						
Job 30	10	1	1	2	2	3	1	2	3	2	3										
Job 31	6	6	1	2	3	3	5														
Job 32	7	3	2	3	2	1	1	8													
Job 33	10	1	3	4	1	4	2	1	2	1	1										
Job 34	10	1	2	3	4	1	3	2	1	1	2										
Job 35	12	2	2	1	2	1	1	2	1	1	2	2	3								
Job 36	14	1	1	2	1	1	2	2	2	1	2	1	1	1	2						
Job 37	5	4	5	4	6	1															
Job 38	10	2	1	1	2	4	4	1	1	1	3										
Job 39	4	3	9	1	7																
Job 40	8	1	2	2	1	4	2	4	4												

Table C.9
The structure of stages for instance size 50×15

Job numbers	Number of stages	Number of operations in the stage														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Job 01	2	6	9													
Job 02	7	4	1	1	2	3	1	3								
Job 03	9	2	2	1	1	1	2	2	2	2						
Job 04	9	1	2	2	2	1	1	1	2	3						
Job 05	3	1	7	7												
Job 06	10	1	1	1	1	2	1	2	1	1	4					
Job 07	10	1	2	1	2	1	2	2	1	1	2					
Job 08	12	1	1	1	2	1	1	2	1	1	1	2	1			
Job 09	5	2	5	1	2	5										
Job 10	3	7	7	1												
Job 11	5	1	5	2	6	1										
Job 12	2	3	12													
Job 13	1	15														
Job 14	10	2	1	2	1	1	1	1	2	2	2					
Job 15	3	3	1	11												
Job 16	6	3	2	3	1	2	4									
Job 17	8	2	1	1	2	1	1	2	5							
Job 18	11	1	1	1	1	2	2	1	1	2	2	1				
Job 19	8	2	2	2	1	2	1	2	3							
Job 20	2	5	10													
Job 21	10	1	2	1	1	1	2	2	1	1	3					
Job 22	8	2	1	2	1	1	1	2	5							
Job 23	8	2	2	2	1	1	1	2	4							
Job 24	12	2	1	1	1	1	1	1	1	1	1	1	3			
Job 25	14	1	1	1	1	1	1	1	1	1	2	1	1	1	1	
Job 26	9	2	1	1	1	2	1	2	2	3						
Job 27	5	1	1	2	4	7										
Job 28	14	1	1	1	1	1	1	1	1	1	1	1	1	1	2	
Job 29	13	1	1	1	1	1	1	2	2	1	1	1	1	1		
Job 30	12	1	2	1	1	1	1	1	2	1	1	2	1			
Job 31	12	1	1	1	1	2	1	2	1	1	1	2	1			
Job 32	12	1	2	1	2	1	1	1	1	1	1	2	1			
Job 33	10	2	1	1	1	1	2	2	2	1	2					
Job 34	7	1	2	2	3	4	1	2								
Job 35	14	1	1	1	1	1	1	1	1	2	1	1	1	1	1	
Job 36	1	15														
Job 37	11	1	2	2	2	1	1	1	1	2	1	1				
Job 38	9	2	2	1	2	1	2	1	2	2						
Job 39	13	1	1	1	1	2	1	1	1	1	2	1	1	1		
Job 40	12	1	1	1	1	1	2	2	1	2	1	1	1			
Job 41	2	10	5													
Job 42	14	1	1	1	1	2	1	1	1	1	1	1	1	1	1	
Job 43	13	1	1	1	2	1	1	1	1	1	1	1	1	2		
Job 44	9	1	2	1	2	2	2	2	2	1						
Job 45	4	3	1	6	5											
Job 46	15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Job 47	6	1	1	4	4	4	1									
Job 48	7	2	1	1	1	2	2	6								
Job 49	11	1	1	2	1	2	2	2	1	1	1	1				
Job 50	3	4	2	9												

Table C.10
The structure of stages for instance size 50×20

Job numbers	Number of stages	Number of operations in the stage																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Job 01	13	1	1	2	2	2	1	2	1	1	2	1	2	2							
Job 02	14	2	2	1	1	1	2	2	2	2	1	1	1	1	1						
Job 03	1	20																			
Job 04	13	2	1	1	1	2	1	2	2	2	2	1	2	1							
Job 05	13	1	2	1	2	2	1	2	1	1	1	1	2	3							
Job 06	11	2	2	2	2	1	2	1	1	1	2	4									
Job 07	14	1	1	1	1	2	1	2	1	2	2	2	2	1	1						
Job 08	11	2	2	2	2	1	2	1	1	1	2	4									
Job 09	8	2	2	1	1	4	1	3	6												
Job 10	8	2	2	4	1	4	1	4	2												
Job 11	5	2	6	4	1	7															
Job 12	4	2	7	7	4																
Job 13	6	6	6	4	2	1	1														
Job 14	3	6	1	13																	
Job 15	7	4	3	2	1	2	4	4													
Job 16	1	20																			
Job 17	11	2	1	2	1	2	1	2	1	1	1	6									
Job 18	10	1	3	1	1	3	3	1	1	3	3										
Job 19	9	3	3	3	1	2	1	4	1	2											
Job 20	14	2	2	1	1	2	1	1	1	2	1	2	1	1	2						
Job 21	10	2	1	4	1	4	1	1	3	1	2										
Job 22	14	1	1	1	2	1	1	2	1	1	2	2	2	1	2						
Job 23	13	1	2	1	2	2	2	1	2	1	2	1	2	1							
Job 24	6	5	1	3	4	5	2														
Job 25	3	10	3	7																	
Job 26	1	20																			
Job 27	9	2	1	1	4	3	3	1	4	1											
Job 28	7	1	2	1	1	3	3	9													
Job 29	5	1	4	2	2	11															
Job 30	7	2	3	1	3	4	3	4													
Job 31	10	2	2	3	2	1	2	1	2	4	1										
Job 32	14	2	1	1	2	1	1	1	1	2	1	2	1	2	2						
Job 33	15	1	1	1	1	2	1	1	2	1	2	1	2	1	2	1					
Job 34	14	1	1	1	2	1	1	2	2	1	1	2	1	1	3						
Job 35	10	1	1	2	2	3	1	2	3	2	3										
Job 36	6	6	1	2	3	3	5														
Job 37	7	3	2	3	2	1	1	8													
Job 38	1	20																			
Job 39	10	1	3	4	1	4	2	1	2	1	1										
Job 40	10	1	2	3	4	1	3	2	1	1	2										
Job 41	6	2	5	6	1	3	3														
Job 42	6	5	2	5	4	3	1														
Job 43	5	2	1	5	6	6															
Job 44	5	1	3	2	6	8															
Job 45	12	2	2	1	2	1	1	2	1	1	2	2	3								
Job 46	14	1	1	2	1	1	2	2	2	1	2	1	1	1	2						
Job 47	5	4	5	4	6	1															
Job 48	10	2	1	1	2	4	4	1	1	1	3										
Job 49	4	3	9	1	7																
Job 50	8	1	2	2	1	4	2	4	4												

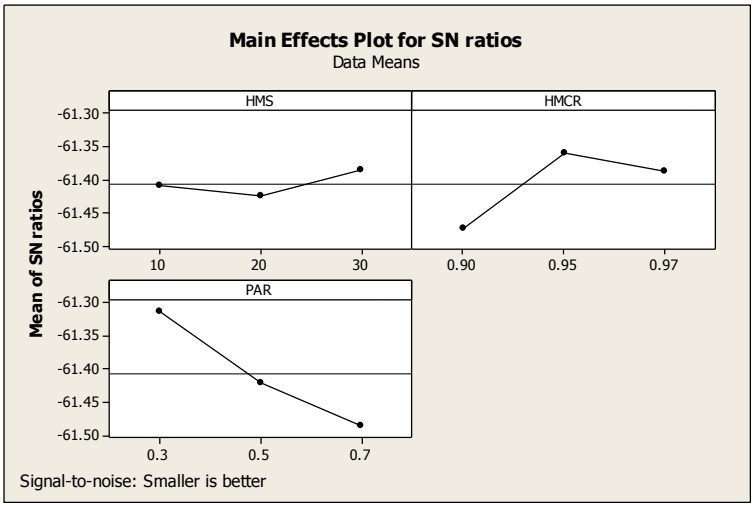

Fig. C.1. Analysis of Harmony search algorithm for the levels of HMS, HMCR and PAR.

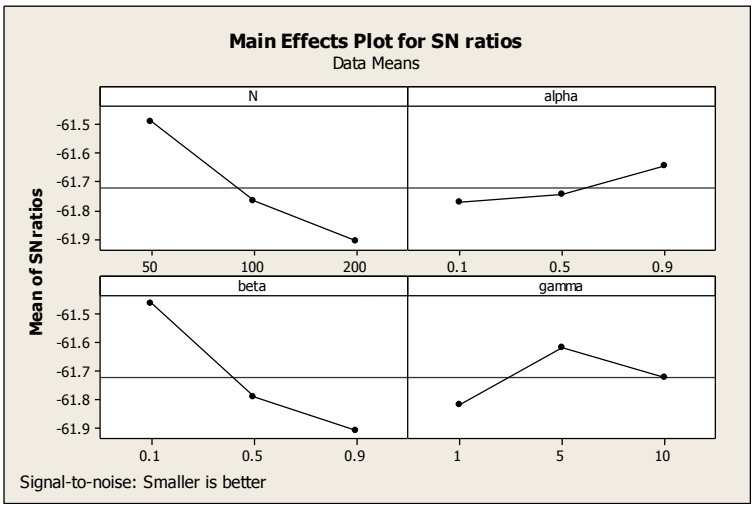

Fig. C.2. Analysis of Firefly algorithm for the levels of N-pop, α, β_o and γ.

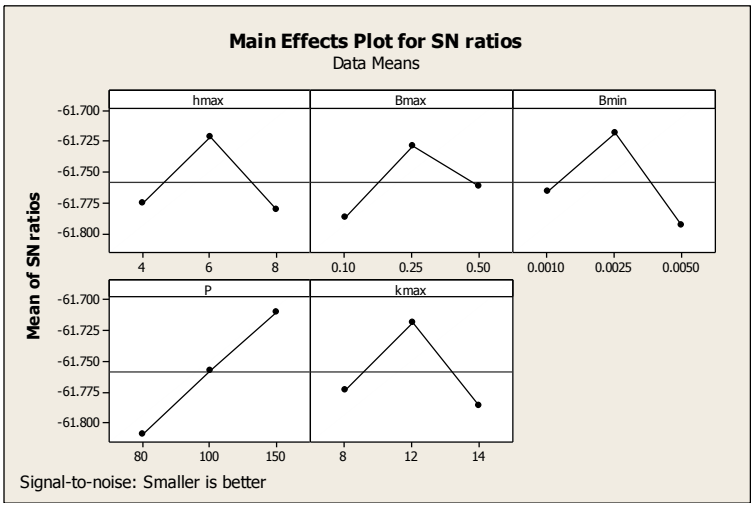

Fig. C.3. Analysis of WWO for the levels of n-Pop, α, k_{max}, h_{max}, β_{min} and β_{max}.

Table C.11
Kolmogorov–Smirnov normality test in the single-problem analysis.

Algorithms	ATA01	ATA02	ATA03	ATA04	ATA05	ATA06	ATA07	ATA08	ATA09	ATA10
HS	0.200	0.200	0.200	0.200	0.111	0.200	0.182	0.199	0.200	0.200
FF	0.157	0.200	0.200	0.143	0.200	0.200	0.200	0.200	0.099	0.200
WWO	0.146	0.200	0.024	0.200	0.011	0.200	0.200	0.200	0.200	0.200

Algorithms	ATA11	ATA12	ATA13	ATA14	ATA15	ATA16	ATA17	ATA18	ATA19	ATA20
HS	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200
FF	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.003	0.200
WWO	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.038

Algorithms	ATA21	ATA22	ATA23	ATA24	ATA25	ATA26	ATA27	ATA28	ATA29	ATA30
HS	0.200	0.200	0.000	0.200	0.200	0.141	0.200	0.200	0.200	0.200
FF	0.138	0.200	0.200	0.077	0.198	0.163	0.200	0.200	0.011	0.200
WWO	0.200	0.061	0.197	0.200	0.085	0.200	0.200	0.033	0.200	0.200

Algorithms	ATA31	ATA32	ATA33	ATA34	ATA35	ATA36	ATA37	ATA38	ATA39	ATA40
HS	0.164	0.066	0.071	0.200	0.200	0.200	0.016	0.200	0.065	0.200
FF	0.200	0.200	0.200	0.200	0.008	0.200	0.135	0.043	0.200	0.200
WWO	0.200	0.200	0.200	0.200	0.137	0.200	0.200	0.167	0.009	0.200

Algorithms	ATA41	ATA42	ATA43	ATA44	ATA45	ATA46	ATA47	ATA48	ATA49	ATA50
HS	0.200	0.200	0.200	0.121	0.200	0.200	0.020	0.056	0.200	0.200
FF	0.200	0.200	0.200	0.048	0.126	0.200	0.200	0.200	0.193	0.200
WWO	0.200	0.200	0.200	0.048	0.200	0.200	0.200	0.200	0.089	0.174

Table C.12

Levene heteroscedasticity test in the single-problem analysis (based on means).

Algorithms	ATA01	ATA02	ATA03	ATA04	ATA05	ATA06	ATA07	ATA08	ATA09	ATA10
HS Vs. FF	0.008	0.965	0.050	0.262	0.094	0.722	0.568	0.759	0.516	0.573
HS Vs. WWO	0.502	0.408	0.092	0.069	0.425	0.08	0.171	0.404	0.248	0.015
FF Vs. WWO	0.028	0.441	0.81	0.401	0.445	0.177	0.306	0.288	0.106	0.004

Algorithms	ATA11	ATA12	ATA13	ATA14	ATA15	ATA16	ATA17	ATA18	ATA19	ATA20
HS Vs. FF	0.321	0.008	0.263	0.007	0.363	0.091	0.958	0.022	0.090	0.001
HS Vs. WWO	0.01	0.000	0.000	0.003	0.119	0.018	0.003	0.013	0.011	0.326
FF Vs. WWO	0.053	0.071	0.004	0.643	0.482	0.437	0.002	0.664	0.556	0.019

Algorithms	ATA21	ATA22	ATA23	ATA24	ATA25	ATA26	ATA27	ATA28	ATA29	ATA30
HS Vs. FF	0.079	0.437	0.130	0.023	0.119	0.634	0.001	0.005	0.191	0.375
HS Vs. WWO	0.004	0.136	0.012	0.000	0.725	0.000	0.000	0.000	0.078	0.01
FF Vs. WWO	0.412	0.433	0.177	0.256	0.206	0.001	0.973	0.298	0.778	0.066

Algorithms	ATA31	ATA32	ATA33	ATA34	ATA35	ATA36	ATA37	ATA38	ATA39	ATA40
HS Vs. FF	0.001	0.908	0.005	0.718	0.201	0.622	0.296	0.018	0.383	0.010
HS Vs. WWO	0.000	0.029	0.000	0.000	0.024	0.000	0.000	0.000	0.002	0.006
FF Vs. WWO	0.012	0.038	0.641	0.000	0.286	0.001	0.002	0.004	0.011	0.392

Algorithms	ATA41	ATA42	ATA43	ATA44	ATA45	ATA46	ATA47	ATA48	ATA49	ATA50
HS Vs. FF	0.002	0.259	0.143	0.009	0.135	0.936	0.059	0.646	0.13	0.167
HS Vs. WWO	0.001	0.000	0.008	0.000	0.006	0.001	0.000	0.000	0.009	0.000
FF Vs. WWO	0.728	0.006	0.103	0.082	0.375	0.001	0.013	0.000	0.273	0.023