Report of Experiment ExpB. k-Symmetry: Grammar Tuning

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May 9, 2025

Abstract

Context-free grammars control the stochastic process for generating programs in grammar-based genetic programming algorithms. The stochastic process can be tuned by adding additional production rules. In this experiment we compare 4 manually tuned grammars for boolean functions with a standard grammar for boolean functions for learning k-symmetry problems. Grammar tuning (the grammar dimension) is a distinctive feature of grammar-based genetic programming.

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Definition

Grammar tuning means adding additional production rules to a context-free grammar with the goal of improving the learning performance of grammar-based genetic programming algorithms.
Example: Repeating production rules allows to change the distribution of programs (and their sizes) generated during the initialization of a grammar-based genetic programming algorithm.

Definition

Families of functions are parametrized functions whose difficulty can be controlled by one or more parameters.

Example: The family of k-symmetry functions. The k-symmetry problem requires finding a function which classifies a k-bit string as symmetric. The parameter k defines the length of the bit string. The problem is NP hard, because the number of test cases increases by 2^k.

Description of Experiment

The purpose of this computational experiment is to show the improvement of performance by grammar tuning.
The **problem environment** is the k-symmetry problem: Finding a boolean expression (with and, or, and not) which is TRUE for symmetric k-bit strings.
The **solution method** is grammar-based genetic programming (option `algorithm="sgp"` of `xegaRun`). The **solver** used is `xegaRun` from the R-package `xega`.
The experiment consists of 25 treatments, 5 grammars for 5 problem sizes $k \in 2, \ldots, 6$.

Description of Experiment

The two control variables in this experiment are

- The bit-length of the k-symmetry problem: 2, 3, 4, 5, and 6.
- The grammar for boolean expressions:
  - **T0**: A standard grammar for boolean expressions.
  - **T1**: A standard grammar for boolean expressions. With two rules for OR and a rule for a template which tests for the symmetry of two bits.
  - **T2**: With two rules for AND and one rule for variables replaced by symmetric pairs.
  - **T3**: With two rules for OR and one rule variables replaced by symmetric pairs.
  - **T4**: With two rules for OR and two rules for variables replaced by symmetric pairs.

Common Parameters of Experiment ExpB

	Parameter Value
Experiment	EB
Optimize	Minimize!
Trials	80
Algorithm	sgp
Max.Depth.of.DTs	7
Replay	0
Evaluation.Method	Deterministic
Execution.Model	MultiCore
Verbose	1
Semantics	byValue
Report.Eval.Errors	TRUE
Termination.Condition	AbsoluteError
Termination.Eps	-0.1
Gene.Map	Bin2Dec
Init.Gene	InitGene

Table: Common Parameters of Experiment ExpB (Part 1)

Common Parameters of Experiment ExpB

	Parameter Value
Codon.Precision	LCM
Population.Size	200
Max.Generations	500
Crossover.Rate	0.2
Mutation.Rate	0.4
IV.Crossover.Rate	Const
Crossover.Rate.2	0.4
IV.Mutation.Rate	Const
Mutation.Rate.2	0.8

Table: Common Parameters of Experiment ExpB (Part 2)

Parameters of Treatments of Experiment ExpB

	Treatment	Problem Environment	Grammar	Worst Fitness	Cod
1	BoolT0sgp2k	2-Symmetry Problem	AndOrNot.txt	-4	
2	BoolT0sgp3k	3-Symmetry Problem	AndOrNot.txt	-8	
3	BoolT0sgp4k	4-Symmetry Problem	AndOrNot.txt	-16	
4	BoolT0sgp5k	5-Symmetry Problem	AndOrNot.txt	-32	
5	BoolT0sgp6k	6-Symmetry Problem	AndOrNot.txt	-64	
6	BoolT1sgp2k	2-Symmetry Problem	AndOrNotTuned1.txt	-4	
7	BoolT1sgp3k	3-Symmetry Problem	AndOrNotTuned1.txt	-8	
8	BoolT1sgp4k	4-Symmetry Problem	AndOrNotTuned1.txt	-16	
9	BoolT1sgp5k	5-Symmetry Problem	AndOrNotTuned1.txt	-32	
10	BoolT1sgp6k	6-Symmetry Problem	AndOrNotTuned1.txt	-64	
11	BoolT2sgp2k	2-Symmetry Problem	AndOrNotTuned2.txt	-4	
12	BoolT2sgp3k	3-Symmetry Problem	AndOrNotTuned2.txt	-8	
13	BoolT2sgp4k	4-Symmetry Problem	AndOrNotTuned2.txt	-16	
14	BoolT2sgp5k	5-Symmetry Problem	AndOrNotTuned2.txt	-32	
15	BoolT2sgp6k	6-Symmetry Problem	AndOrNotTuned2.txt	-64	

Table: Parameters of Treatments of Experiment ExpB (Part 1)

Parameters of Treatments of Experiment ExpB

	Treatment	Problem Environment	Grammar	Worst Fitness	Cod
16	BoolT3sgp2k	2-Symmetry Problem	AndOrNotTuned3.txt	-4	
17	BoolT3sgp3k	3-Symmetry Problem	AndOrNotTuned3.txt	-8	
18	BoolT3sgp4k	4-Symmetry Problem	AndOrNotTuned3.txt	-16	
19	BoolT3sgp5k	5-Symmetry Problem	AndOrNotTuned3.txt	-32	
20	BoolT3sgp6k	6-Symmetry Problem	AndOrNotTuned3.txt	-64	
21	BoolT4sgp2k	2-Symmetry Problem	AndOrNotTuned4.txt	-4	
22	BoolT4sgp3k	3-Symmetry Problem	AndOrNotTuned4.txt	-8	
23	BoolT4sgp4k	4-Symmetry Problem	AndOrNotTuned4.txt	-16	
24	BoolT4sgp5k	5-Symmetry Problem	AndOrNotTuned4.txt	-32	
25	BoolT4sgp6k	6-Symmetry Problem	AndOrNotTuned4.txt	-64	

Table: Parameters of Treatments of Experiment ExpB (Part 2)

Matrix of Mean of Errors (Fitness). Rows: k=2, 3, 4, 5, 6)

	T0	T1	T2	T3	T4
1	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00
3	1.38	0.10	0.12	0.00	0.00
4	3.23	0.10	0.05	0.00	0.00
5	6.67	5.30	4.92	4.41	3.33

Table: Matrix of Mean of Errors (Fitness). Rows: k=2, 3, 4, 5, 6)

Matrix of Min of Errors (Fitness). Rows: k=2, 3, 4, 5, 6)

	T0	T1	T2	T3	T4
1	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00
5	4.00	0.00	0.00	0.00	0.00

Table: Matrix of Min of Errors (Fitness). Rows: k=2, 3, 4, 5, 6)

Do we always find the optimal program?

- **No.** The non-zero elements in the first table indicate the mean number of remaining errors given a limit of 500 generations.
- The standard boolean grammar (T0) has the highest error rate for the 4, 5, and 6-symmetry problems given a limit of 500 generations.
- The grammars T3 and T4 have only problems with the 6-symmetry problem given a limit of 500 generations.
- For the 6-symmetry problem, the grammar T0 has at least 4 errors.

Matrix of Mean of Seconds. Rows: k=2, 3, 4, 5, 6)

	T0	T1	T2	T3	T4
1	1.62	0.33	0.31	0.31	0.24
2	6.20	0.36	0.37	0.33	0.30
3	283.26	41.66	59.00	33.05	17.93
4	274.74	49.71	50.95	32.92	18.16
5	319.79	301.31	228.21	238.16	193.42

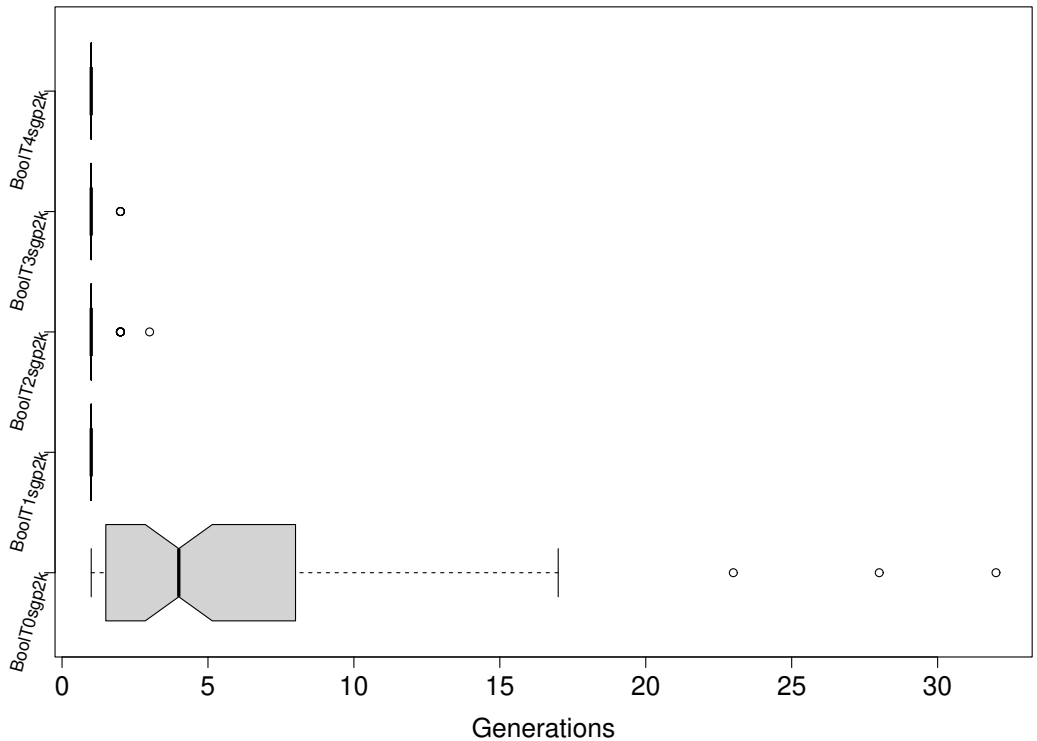
Table: Matrix of Mean of Seconds. Rows: k=2, 3, 4, 5, 6)

Matrix of Mean of Generations. Rows: k=2, 3, 4, 5, 6)

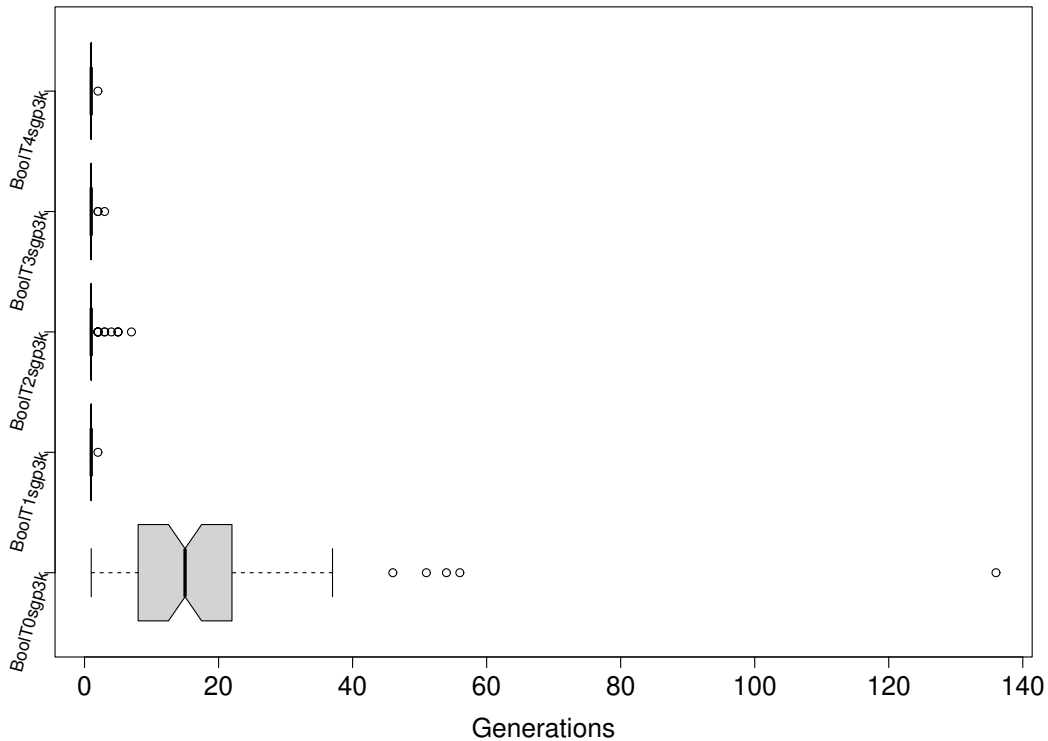
	T0	T1	T2	T3	T4
1	5.75	1.00	1.12	1.05	1.00
2	17.61	1.01	1.40	1.05	1.01
3	463.94	92.00	177.32	105.00	77.01
4	463.24	106.35	155.30	102.78	73.10
5	500.00	492.94	494.52	487.57	460.68

Table: Matrix of Mean of Generations. Rows: k=2, 3, 4, 5, 6)

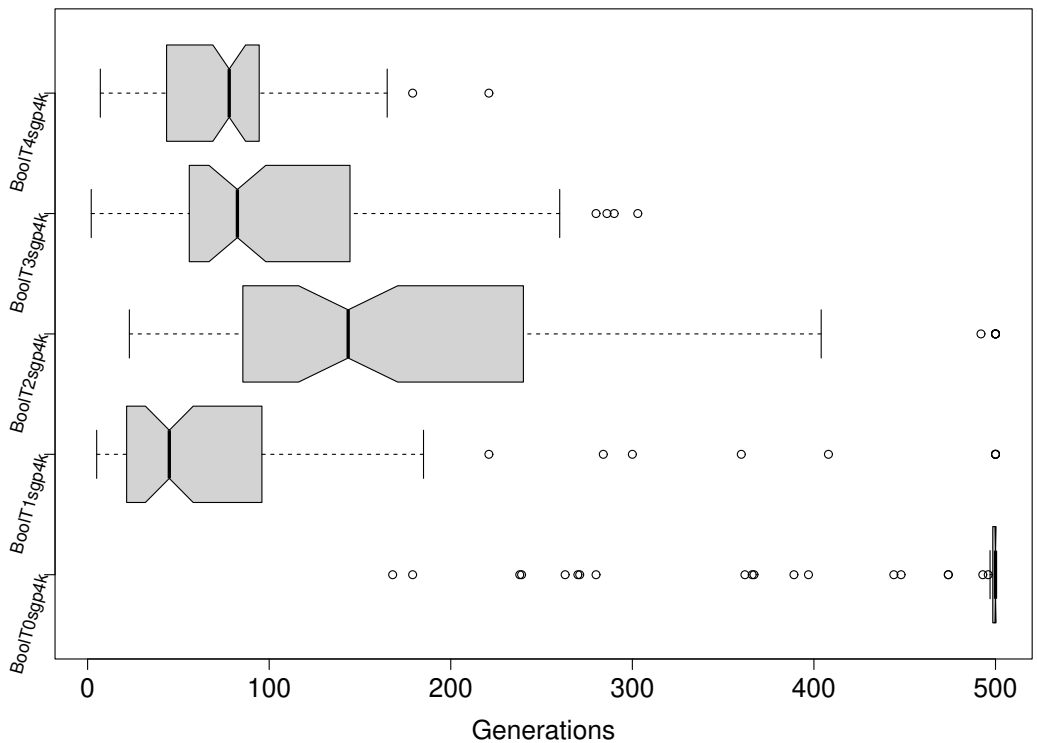
Distribution of Number of Generations for Grammars. 2k symmetry.



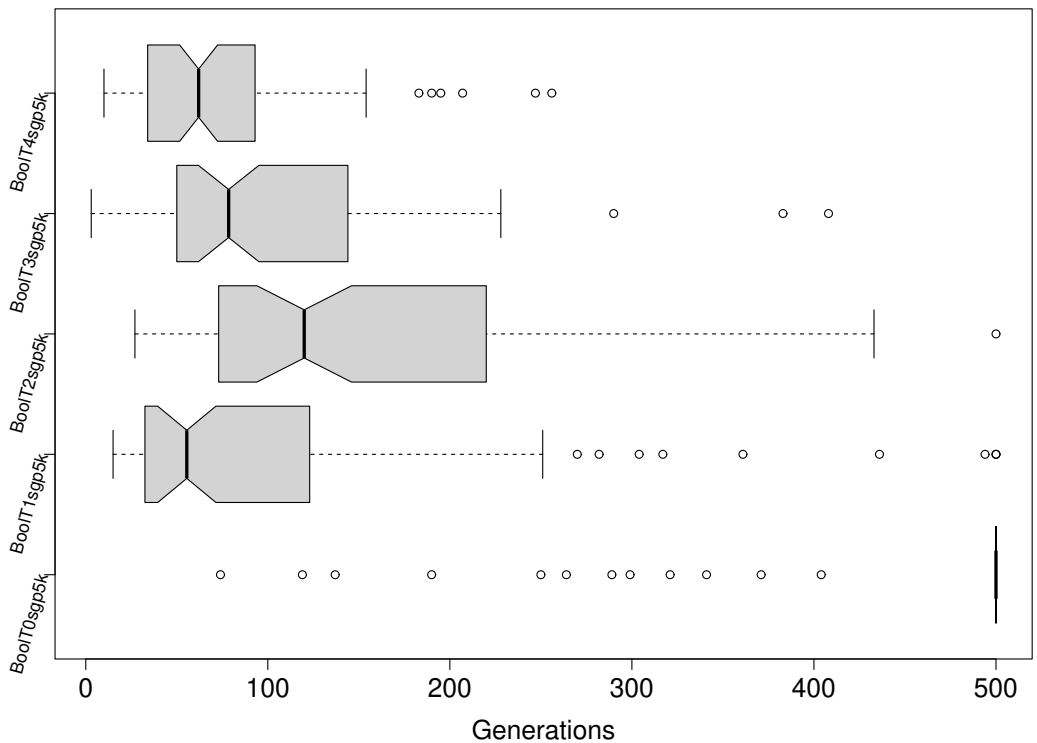
Distribution of Number of Generations for Grammars. 3k symmetry.



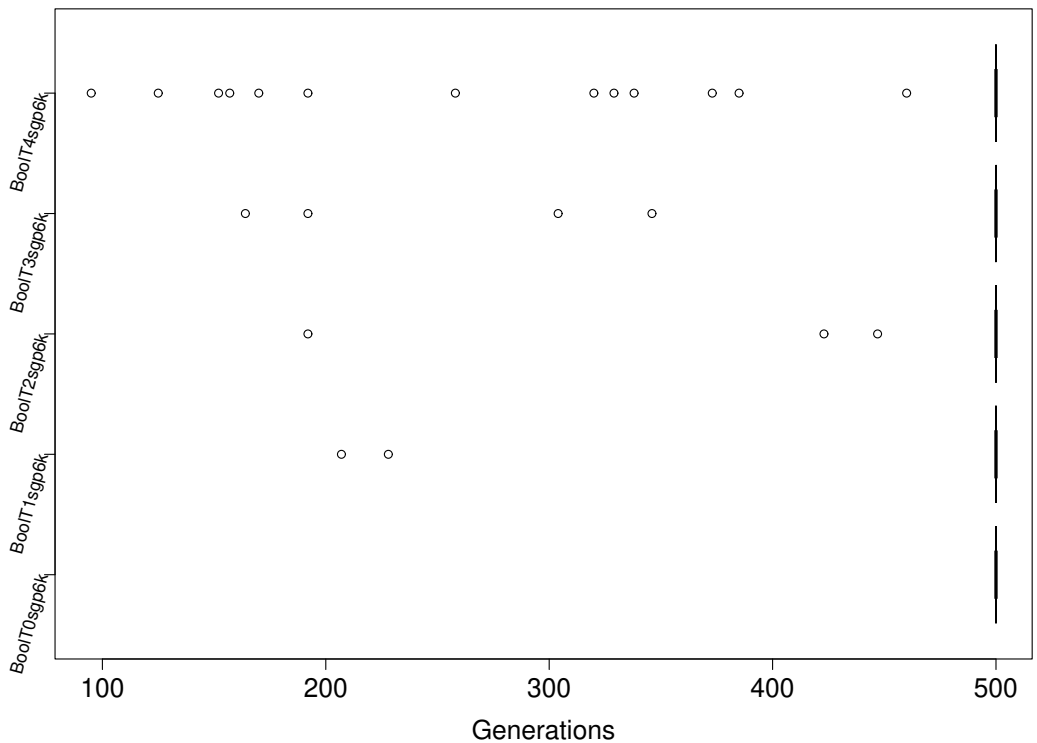
Distribution of Number of Generations for Grammars. 4k symmetry.



Distribution of Number of Generations for Grammars. 5k symmetry.



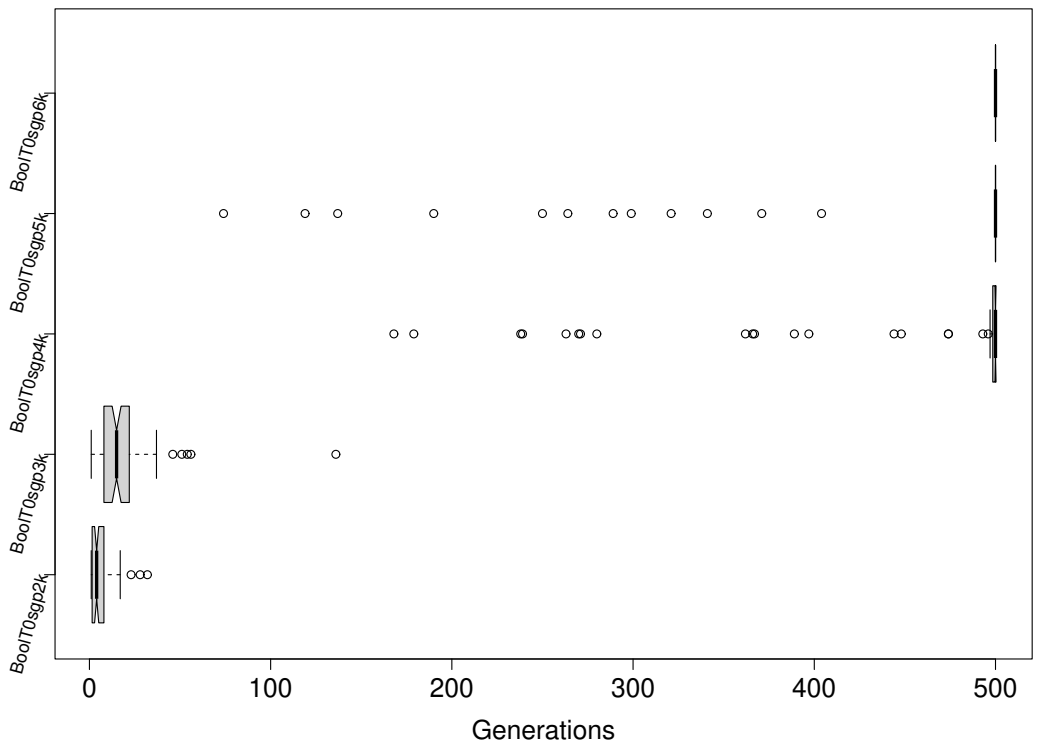
Distribution of Number of Generations for Grammars. 6k symmetry.



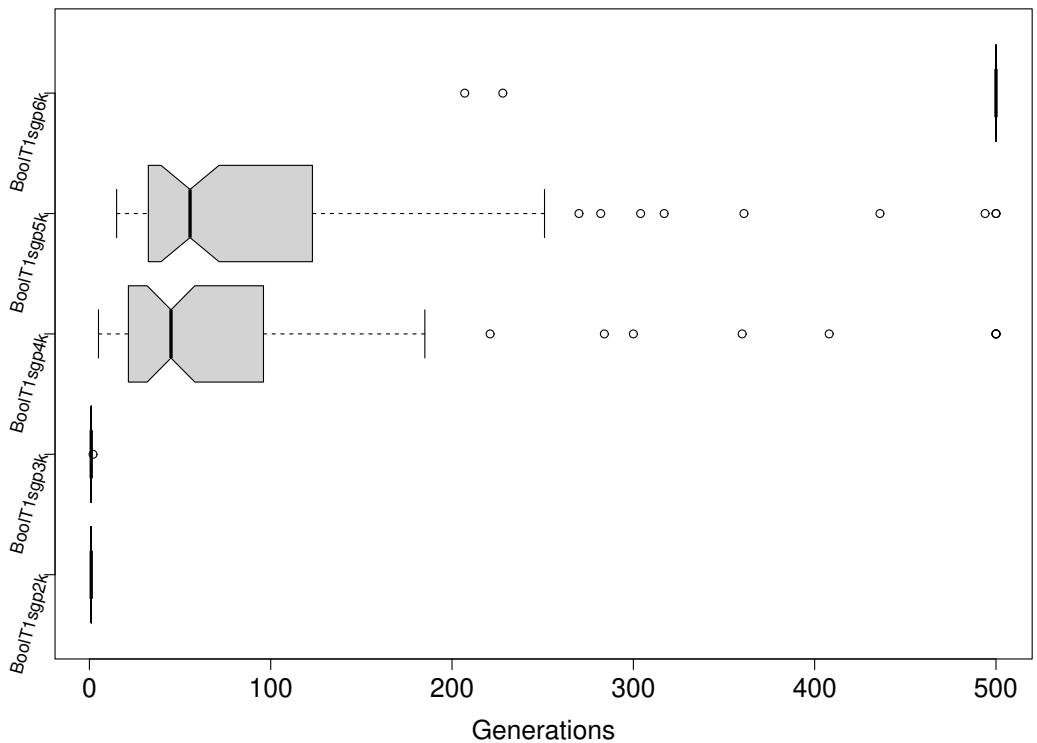
Which grammar performs best?

- Grammar T4 performs best (mean number of generations).
  But not always for the medians (e.g. Box-plot for 4-symmetry).
  Statistically significant? No - for medians. Not tested for means.
- Grammar T0 performs worst.
- Grammar tuning works: All modified grammars perform better than the grammar T0.

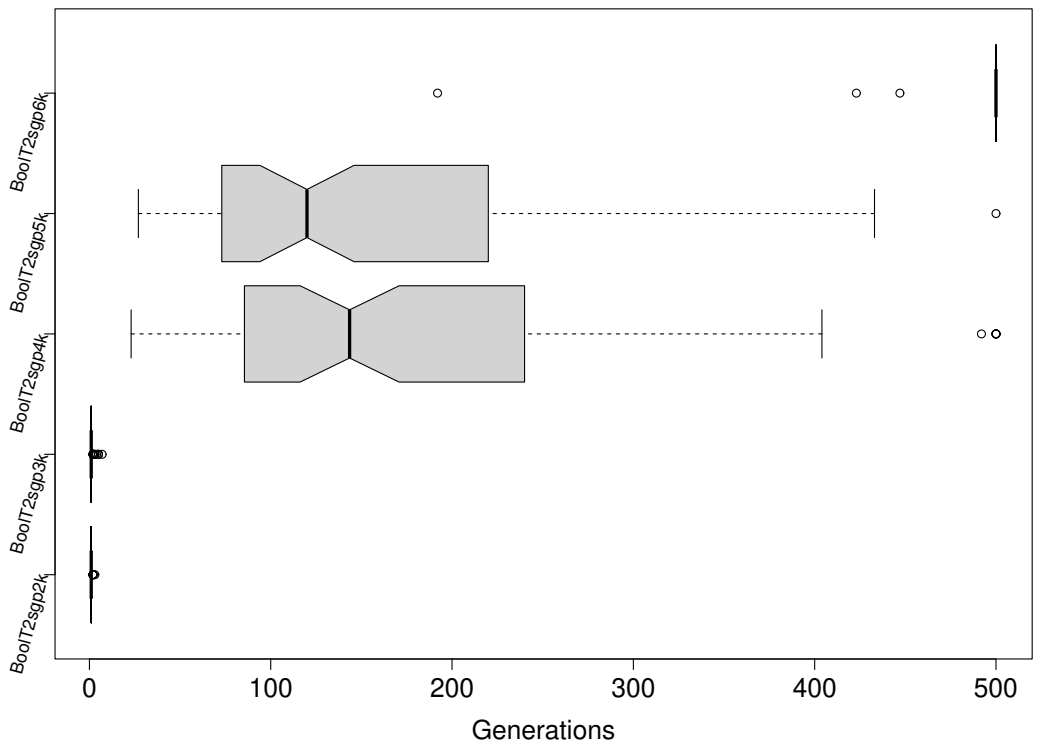
Distribution of Number of Generations for Grammar T0



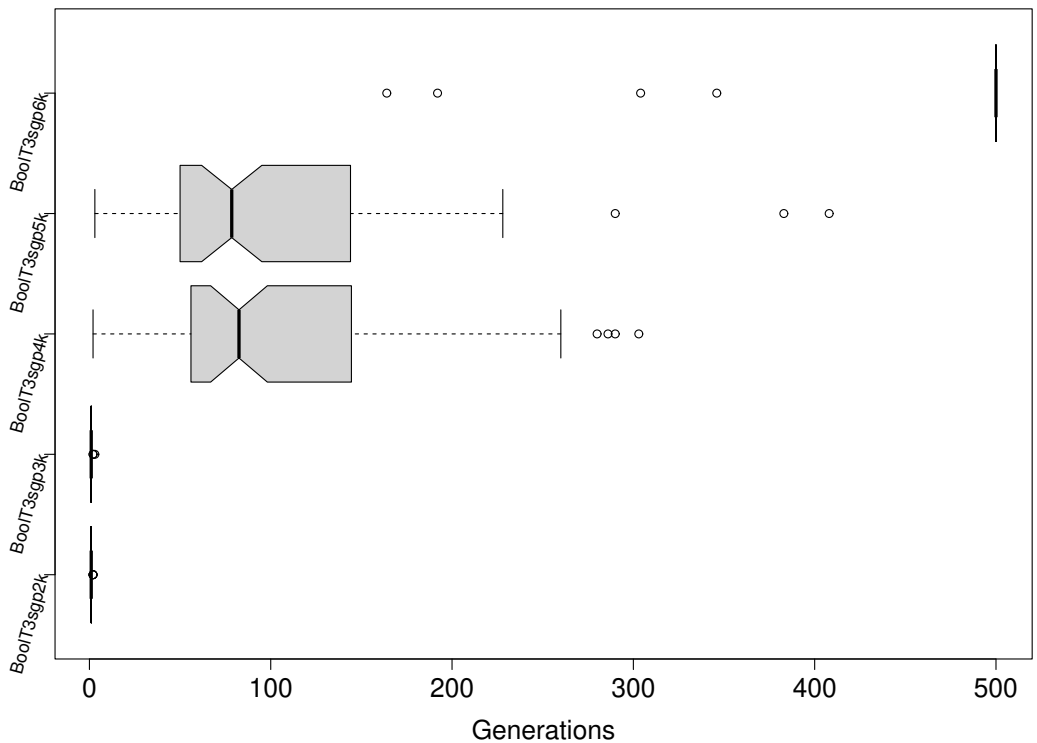
Distribution of Number of Generations for Grammar T1



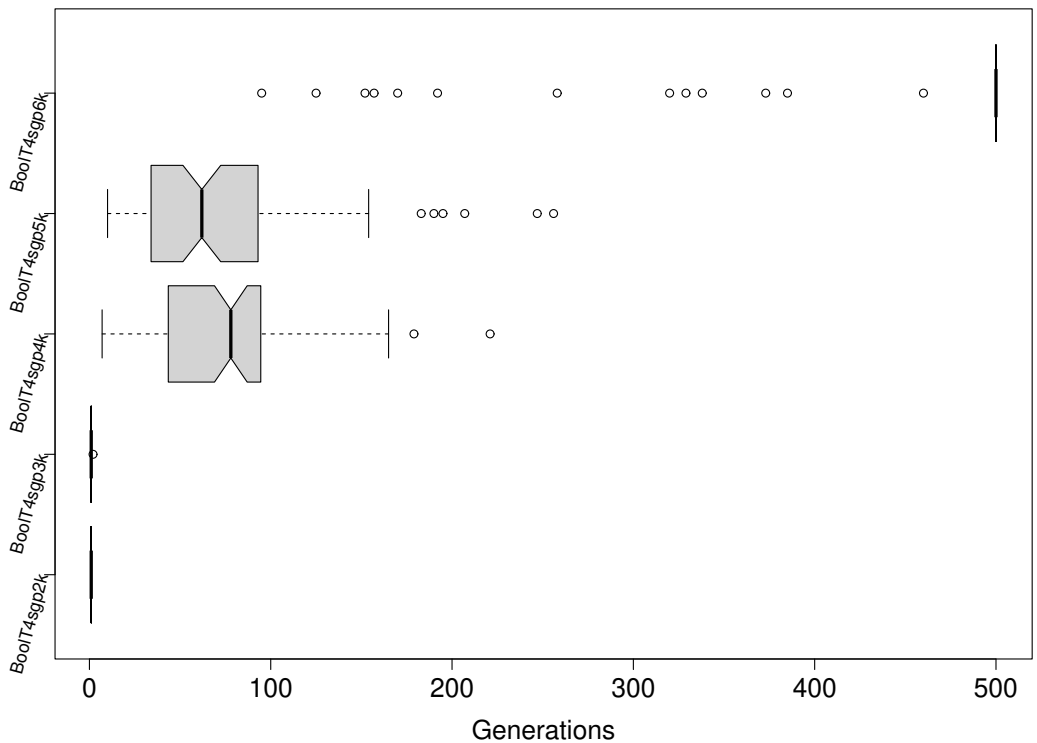
Distribution of Number of Generations for Grammar T2



Distribution of Number of Generations for Grammar T3



Distribution of Number of Generations for Grammar T4



Growth of Complexity?

- Complexity grows in steps of 2. E.g. the 2- and 3-symmetry problem need the same boolean expression, but with different variables: For the 2-symmetry problem, D1 and D2. For the 3-symmetry problem, D1 and D3. In the 3-symmetry problem, the middle variable is ignored.
- The search problem grows harder, because of the need to include all relevant variable pairs twice into the solution.

Summary of statistics of experiment ExpB.

	Treatment	Trials	Variable	min	mean	sd	m
4	BoolT0sgp2k	80	Evaluations	200.00	1150.00	1163.36	6400
8	BoolT0sgp3k	80	Evaluations	200.00	3522.50	3544.08	27200
12	BoolT0sgp4k	80	Evaluations	33600.00	92787.50	16547.36	100000
16	BoolT0sgp5k	80	Evaluations	14800.00	92647.50	19260.83	100000
20	BoolT0sgp6k	80	Evaluations	100000.00	100000.00	0.00	100000
24	BoolT1sgp2k	80	Evaluations	200.00	200.00	0.00	200
28	BoolT1sgp3k	80	Evaluations	200.00	202.50	22.36	400
32	BoolT1sgp4k	80	Evaluations	1000.00	18400.00	24270.06	100000
36	BoolT1sgp5k	80	Evaluations	3000.00	21270.00	23719.95	100000
40	BoolT1sgp6k	80	Evaluations	41400.00	98587.50	8883.00	100000
44	BoolT2sgp2k	80	Evaluations	200.00	225.00	73.78	600
48	BoolT2sgp3k	80	Evaluations	200.00	280.00	219.55	1400
52	BoolT2sgp4k	80	Evaluations	4600.00	35465.00	24750.50	100000
56	BoolT2sgp5k	80	Evaluations	5400.00	31060.00	20166.23	100000
60	BoolT2sgp6k	80	Evaluations	38400.00	98905.00	7158.39	100000

Table: Summary of statistics of experiment ExpB. (Part 1)

Summary of statistics of experiment ExpB.

	Treatment	Trials	Variable	min	mean	sd	ma
64	BoolT3sgp2k	80	Evaluations	200.00	210.00	43.86	400.0
68	BoolT3sgp3k	80	Evaluations	200.00	210.00	54.19	600.0
72	BoolT3sgp4k	80	Evaluations	400.00	21000.00	14616.48	60600.0
76	BoolT3sgp5k	80	Evaluations	600.00	20555.00	15290.93	81600.0
80	BoolT3sgp6k	80	Evaluations	32800.00	97515.00	11419.32	100000.0
84	BoolT4sgp2k	80	Evaluations	200.00	200.00	0.00	200.0
88	BoolT4sgp3k	80	Evaluations	200.00	202.50	22.36	400.0
92	BoolT4sgp4k	80	Evaluations	1400.00	15402.50	8377.03	44200.0
96	BoolT4sgp5k	80	Evaluations	2000.00	14620.00	10549.35	51200.0
100	BoolT4sgp6k	80	Evaluations	19000.00	92135.00	20136.92	100000.0
1	BoolT0sgp2k	80	Fitness	0.00	0.00	0.00	0.0
5	BoolT0sgp3k	80	Fitness	0.00	0.00	0.00	0.0
9	BoolT0sgp4k	80	Fitness	0.00	1.38	0.86	2.0
13	BoolT0sgp5k	80	Fitness	0.00	3.23	1.51	6.0
17	BoolT0sgp6k	80	Fitness	4.00	6.67	0.61	7.0

Table: Summary of statistics of experiment ExpB. (Part 2)

Summary of statistics of experiment ExpB.

	Treatment	Trials	Variable	min	mean	sd	max
21	BoolT1sgp2k	80	Fitness	0.00	0.00	0.00	0.00
25	BoolT1sgp3k	80	Fitness	0.00	0.00	0.00	0.00
29	BoolT1sgp4k	80	Fitness	0.00	0.10	0.44	2.00
33	BoolT1sgp5k	80	Fitness	0.00	0.10	0.63	4.00
37	BoolT1sgp6k	80	Fitness	0.00	5.30	1.50	7.00
41	BoolT2sgp2k	80	Fitness	0.00	0.00	0.00	0.00
45	BoolT2sgp3k	80	Fitness	0.00	0.00	0.00	0.00
49	BoolT2sgp4k	80	Fitness	0.00	0.12	0.49	2.00
53	BoolT2sgp5k	80	Fitness	0.00	0.05	0.45	4.00
57	BoolT2sgp6k	80	Fitness	0.00	4.92	1.37	6.00
61	BoolT3sgp2k	80	Fitness	0.00	0.00	0.00	0.00
65	BoolT3sgp3k	80	Fitness	0.00	0.00	0.00	0.00
69	BoolT3sgp4k	80	Fitness	0.00	0.00	0.00	0.00
73	BoolT3sgp5k	80	Fitness	0.00	0.00	0.00	0.00
77	BoolT3sgp6k	80	Fitness	0.00	4.41	1.38	6.00

Table: Summary of statistics of experiment ExpB. (Part 3)

Summary of statistics of experiment ExpB.

	Treatment	Trials	Variable	min	mean	sd	max
81	BoolT4sgp2k	80	Fitness	0.00	0.00	0.00	0.00
85	BoolT4sgp3k	80	Fitness	0.00	0.00	0.00	0.00
89	BoolT4sgp4k	80	Fitness	0.00	0.00	0.00	0.00
93	BoolT4sgp5k	80	Fitness	0.00	0.00	0.00	0.00
97	BoolT4sgp6k	80	Fitness	0.00	3.33	1.61	6.00
3	BoolT0sgp2k	80	Generations	1.00	5.75	5.82	32.00
7	BoolT0sgp3k	80	Generations	1.00	17.61	17.72	136.00
11	BoolT0sgp4k	80	Generations	168.00	463.94	82.74	500.00
15	BoolT0sgp5k	80	Generations	74.00	463.24	96.30	500.00
19	BoolT0sgp6k	80	Generations	500.00	500.00	0.00	500.00
23	BoolT1sgp2k	80	Generations	1.00	1.00	0.00	1.00
27	BoolT1sgp3k	80	Generations	1.00	1.01	0.11	2.00
31	BoolT1sgp4k	80	Generations	5.00	92.00	121.35	500.00
35	BoolT1sgp5k	80	Generations	15.00	106.35	118.60	500.00
39	BoolT1sgp6k	80	Generations	207.00	492.94	44.42	500.00

Table: Summary of statistics of experiment ExpB. (Part 4)

Summary of statistics of experiment ExpB.

	Treatment	Trials	Variable	min	mean	sd	max
43	BoolT2sgp2k	80	Generations	1.00	1.12	0.37	3.00
47	BoolT2sgp3k	80	Generations	1.00	1.40	1.10	7.00
51	BoolT2sgp4k	80	Generations	23.00	177.32	123.75	500.00
55	BoolT2sgp5k	80	Generations	27.00	155.30	100.83	500.00
59	BoolT2sgp6k	80	Generations	192.00	494.52	35.79	500.00
63	BoolT3sgp2k	80	Generations	1.00	1.05	0.22	2.00
67	BoolT3sgp3k	80	Generations	1.00	1.05	0.27	3.00
71	BoolT3sgp4k	80	Generations	2.00	105.00	73.08	303.00
75	BoolT3sgp5k	80	Generations	3.00	102.78	76.45	408.00
79	BoolT3sgp6k	80	Generations	164.00	487.57	57.10	500.00
83	BoolT4sgp2k	80	Generations	1.00	1.00	0.00	1.00
87	BoolT4sgp3k	80	Generations	1.00	1.01	0.11	2.00
91	BoolT4sgp4k	80	Generations	7.00	77.01	41.89	221.00
95	BoolT4sgp5k	80	Generations	10.00	73.10	52.75	256.00
99	BoolT4sgp6k	80	Generations	95.00	460.68	100.68	500.00

Table: Summary of statistics of experiment ExpB. (Part 5)

Summary of statistics of experiment ExpB.

	Treatment	Trials	Variable	min	mean	sd	max
2	BoolT0sgp2k	80	Seconds	0.27	1.62	1.68	10.51
6	BoolT0sgp3k	80	Seconds	0.39	6.20	8.48	68.15
10	BoolT0sgp4k	80	Seconds	90.53	283.26	73.32	500.88
14	BoolT0sgp5k	80	Seconds	33.18	274.74	74.21	450.85
18	BoolT0sgp6k	80	Seconds	253.33	319.79	35.37	374.52
22	BoolT1sgp2k	80	Seconds	0.22	0.33	0.10	0.93
26	BoolT1sgp3k	80	Seconds	0.24	0.36	0.05	0.56
30	BoolT1sgp4k	80	Seconds	1.46	41.66	67.31	289.48
34	BoolT1sgp5k	80	Seconds	4.28	49.71	68.50	401.34
38	BoolT1sgp6k	80	Seconds	106.36	301.31	48.60	398.28
42	BoolT2sgp2k	80	Seconds	0.20	0.31	0.08	0.76
46	BoolT2sgp3k	80	Seconds	0.20	0.37	0.18	1.15
50	BoolT2sgp4k	80	Seconds	5.15	59.00	49.04	227.58
54	BoolT2sgp5k	80	Seconds	6.25	50.95	37.51	196.01
58	BoolT2sgp6k	80	Seconds	70.74	228.21	31.10	289.58

Table: Summary of statistics of experiment ExpB. (Part 6)

Summary of statistics of experiment ExpB.

	Treatment	Trials	Variable	min	mean	sd	max
62	BoolT3sgp2k	80	Seconds	0.18	0.31	0.06	0.48
66	BoolT3sgp3k	80	Seconds	0.24	0.33	0.07	0.53
70	BoolT3sgp4k	80	Seconds	0.56	33.05	28.94	137.19
74	BoolT3sgp5k	80	Seconds	0.68	32.92	30.66	162.12
78	BoolT3sgp6k	80	Seconds	72.32	238.16	39.72	314.79
82	BoolT4sgp2k	80	Seconds	0.16	0.24	0.06	0.39
86	BoolT4sgp3k	80	Seconds	0.21	0.30	0.06	0.68
90	BoolT4sgp4k	80	Seconds	1.32	17.93	11.89	71.35
94	BoolT4sgp5k	80	Seconds	1.50	18.16	17.35	103.10
98	BoolT4sgp6k	80	Seconds	26.67	193.42	52.41	277.97

Table: Summary of statistics of experiment ExpB. (Part 7)

Parameters of treatment: BoolT0sgp2k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT0sgp2k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT0sgp2k

Parameters of treatment BoolT0sgp2k passed to xegaRun

	Parameter Values
penv	2-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNot.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-4
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT0sgp2k passed to xegaRun (Part 1)

Parameters of treatment BoolT0sgp2k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	80
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT0sgp2k passed to xegaRun (Part 2)

Parameters of treatment BoolT0sgp2k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT0sgp2k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT0sgp2k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f1>	NOT
7	<f2>	OR
8	<f2>	AND

Table: The Production Table of Treatment BoolT0sgp2k of Experiment ExpB

Treatment: BoolT0sgp2k

	Treatment	Trials	Variable	min	mean	sd	max
4	BoolT0sgp2k	80	Evaluations	200.00	1150.00	1163.36	6400.00
1	BoolT0sgp2k	80	Fitness	0.00	0.00	0.00	0.00
3	BoolT0sgp2k	80	Generations	1.00	5.75	5.82	32.00
2	BoolT0sgp2k	80	Seconds	0.27	1.62	1.68	10.51

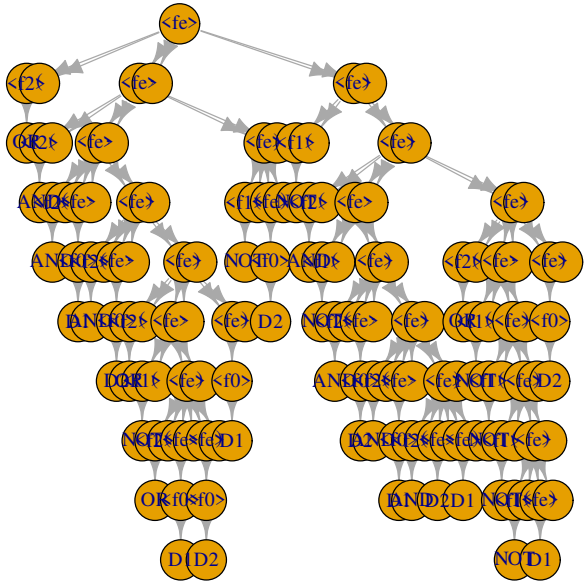
Table: Treatment: BoolT0sgp2k

The Solution Table of Treatment BoolT0sgp2k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 80.

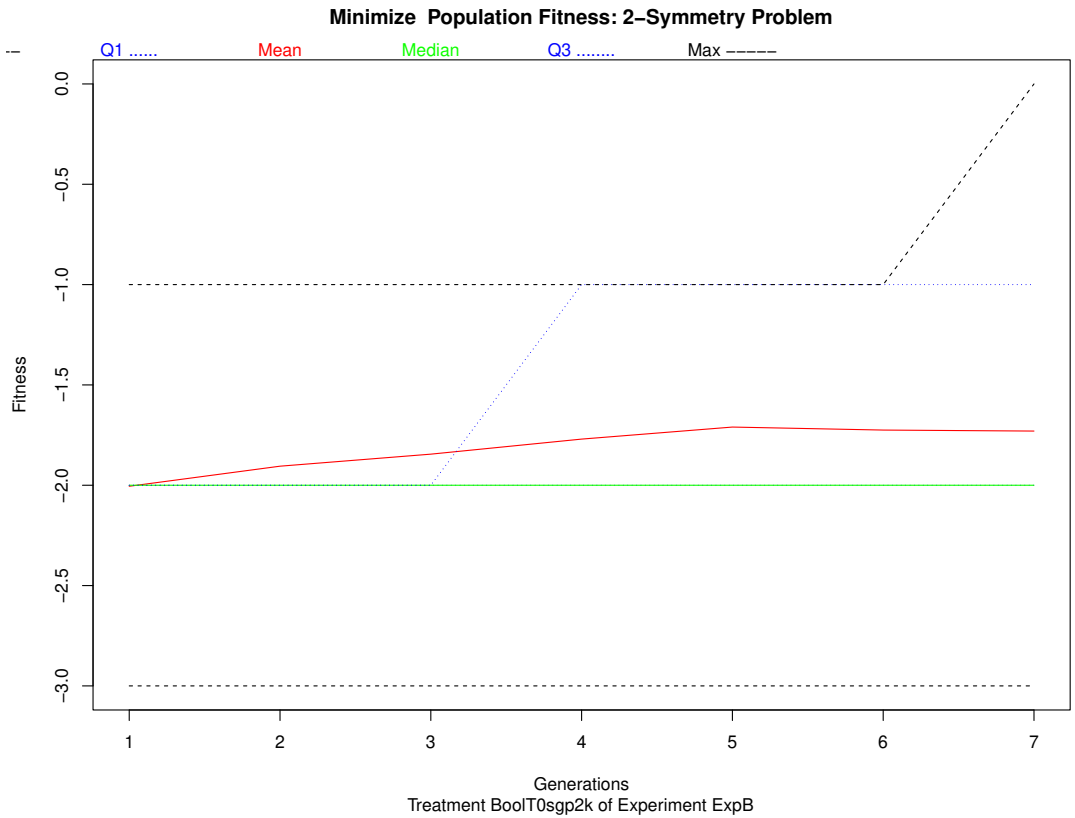
	Solution
1	NOT(AND(NOT(AND(D2, D1)), OR(D1, D2)))

Table: The Solution Table of Treatment BoolT0sgp2k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 80.

The Derivation Tree of a Solution of Treatment BoolT0sgp2k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT0sgp2k of Experiment ExpB



Parameters of treatment: BoolT0sgp3k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT0sgp3k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT0sgp3k

Parameters of treatment BoolT0sgp3k passed to xegaRun

	Parameter Values
penv	3-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNot.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-8
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT0sgp3k passed to xegaRun (Part 1)

Parameters of treatment BoolT0sgp3k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	120
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT0sgp3k passed to xegaRun (Part 2)

Parameters of treatment BoolT0sgp3k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT0sgp3k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT0sgp3k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f0>	D3
7	<f1>	NOT
8	<f2>	OR
9	<f2>	AND

Table: The Production Table of Treatment BoolT0sgp3k of Experiment ExpB

Treatment: BoolT0sgp3k

	Treatment	Trials	Variable	min	mean	sd	max
8	BoolT0sgp3k	80	Evaluations	200.00	3522.50	3544.08	27200.00
5	BoolT0sgp3k	80	Fitness	0.00	0.00	0.00	0.00
7	BoolT0sgp3k	80	Generations	1.00	17.61	17.72	136.00
6	BoolT0sgp3k	80	Seconds	0.39	6.20	8.48	68.15

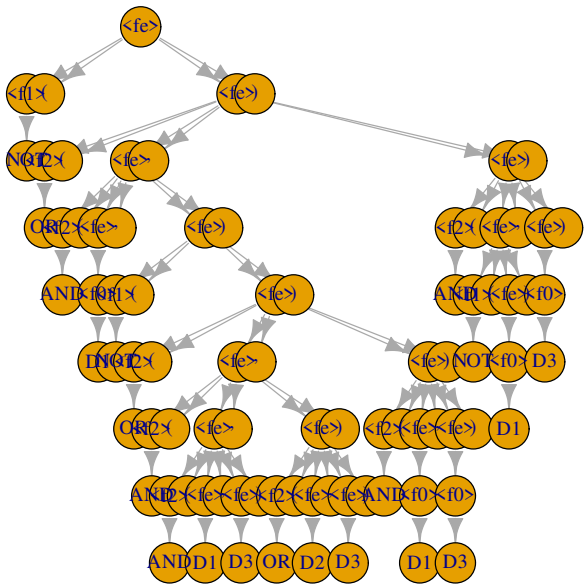
Table: Treatment: BoolT0sgp3k

The Solution Table of Treatment BoolT0sgp3k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 80.

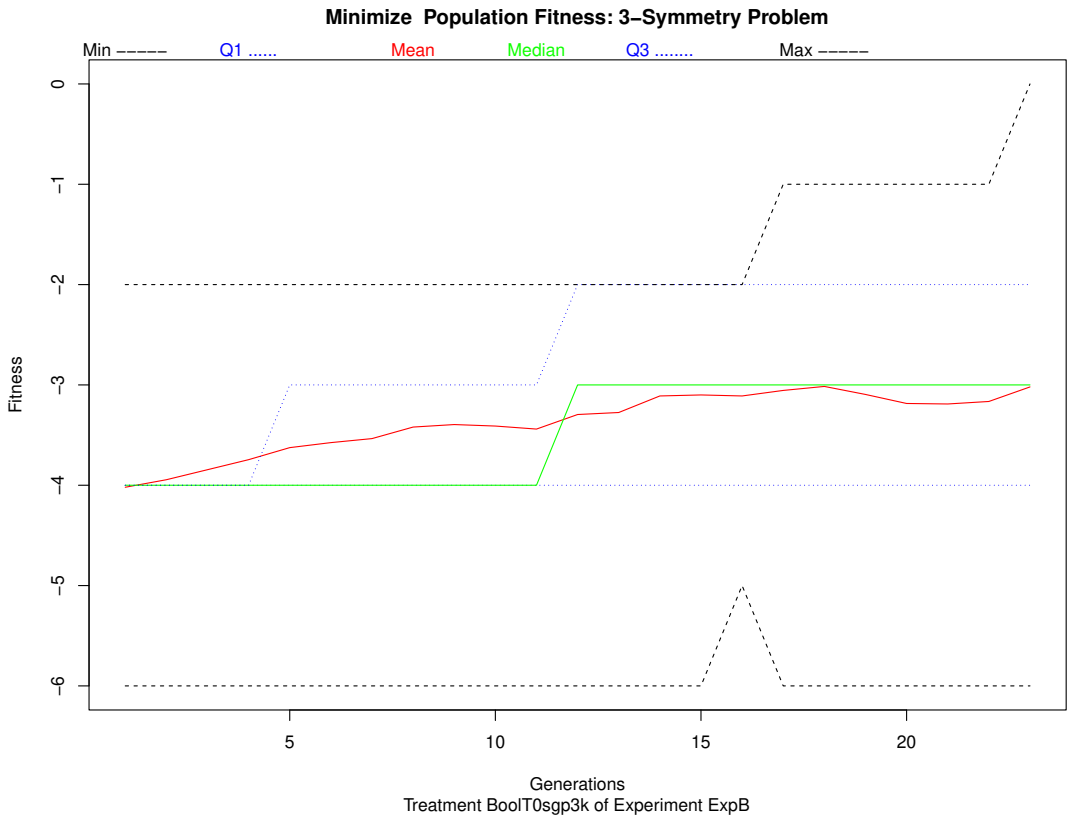
	Solution
1	OR(AND(D3, D1), NOT(OR(D1, D3)))

Table: The Solution Table of Treatment BoolT0sgp3k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 80.

The Derivation Tree of a Solution of Treatment BoolT0sgp3k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT0sgp3k of Experiment ExpB



Parameters of treatment: BoolT0sgp4k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT0sgp4k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT0sgp4k

Parameters of treatment BoolT0sgp4k passed to xegaRun

	Parameter Values
penv	4-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNot.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-16
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT0sgp4k passed to xegaRun (Part 1)

Parameters of treatment BoolT0sgp4k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	160
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT0sgp4k passed to xegaRun (Part 2)

Parameters of treatment BoolT0sgp4k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT0sgp4k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT0sgp4k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f0>	D3
7	<f0>	D4
8	<f1>	NOT
9	<f2>	OR
10	<f2>	AND

Table: The Production Table of Treatment BoolT0sgp4k of Experiment ExpB

Treatment: BoolT0sgp4k

	Treatment	Trials	Variable	min	mean	sd	max
12	BoolT0sgp4k	80	Evaluations	33600.00	92787.50	16547.36	100000.00
9	BoolT0sgp4k	80	Fitness	0.00	1.38	0.86	2.00
11	BoolT0sgp4k	80	Generations	168.00	463.94	82.74	500.00
10	BoolT0sgp4k	80	Seconds	90.53	283.26	73.32	500.88

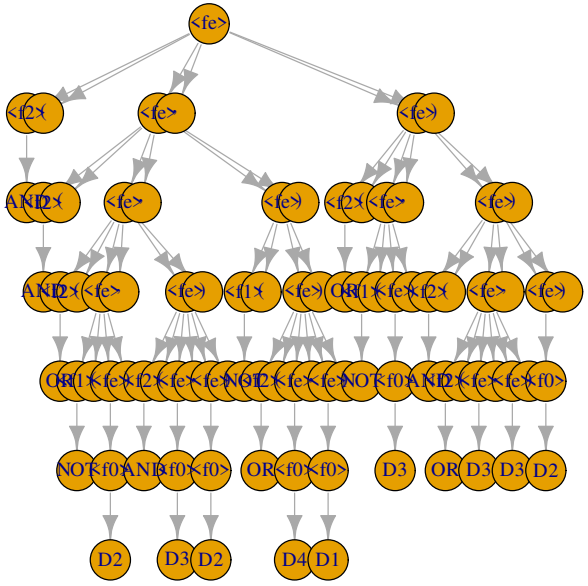
Table: Treatment: BoolT0sgp4k

The Solution Table of Treatment BoolT0sgp4k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 20.

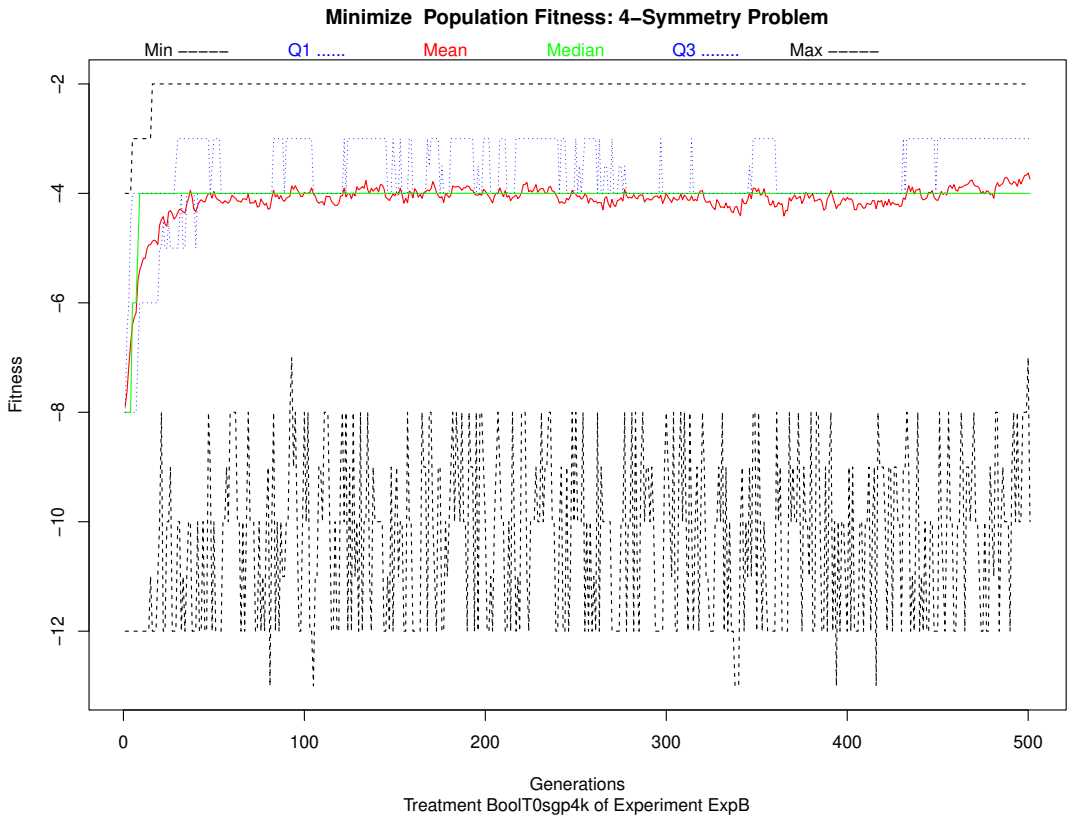
	Solution
1	AND(NOT(AND(NOT(AND(OR(AND(D2, D1), D4), D4)), NOT(AND(NOT(NOT(NOT(D1))), NOT(OR(D4, D1)))))), NOT(OR(NOT(OR(OR(AND(D3, D2), AND(D2, D3)), NOT(OR(D2, D3))))), AND(D4, NOT(D1)))))

Table: The Solution Table of Treatment BoolT0sgp4k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 20.

The Derivation Tree of a Solution of Treatment BoolT0sgp4k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT0sgp4k of Experiment ExpB



Parameters of treatment: BoolT0sgp5k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT0sgp5k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT0sgp5k

Parameters of treatment BoolT0sgp5k passed to xegaRun

	Parameter Values
penv	5-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNot.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-32
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT0sgp5k passed to xegaRun (Part 1)

Parameters of treatment BoolT0sgp5k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	200
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT0sgp5k passed to xegaRun (Part 2)

Parameters of treatment BoolT0sgp5k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT0sgp5k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT0sgp5k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f0>	D3
7	<f0>	D4
8	<f0>	D5
9	<f1>	NOT
10	<f2>	OR
11	<f2>	AND

Table: The Production Table of Treatment BoolT0sgp5k of Experiment ExpB

Treatment: BoolT0sgp5k

	Treatment	Trials	Variable	min	mean	sd	max
16	BoolT0sgp5k	80	Evaluations	14800.00	92647.50	19260.83	100000.00
13	BoolT0sgp5k	80	Fitness	0.00	3.23	1.51	6.00
15	BoolT0sgp5k	80	Generations	74.00	463.24	96.30	500.00
14	BoolT0sgp5k	80	Seconds	33.18	274.74	74.21	450.85

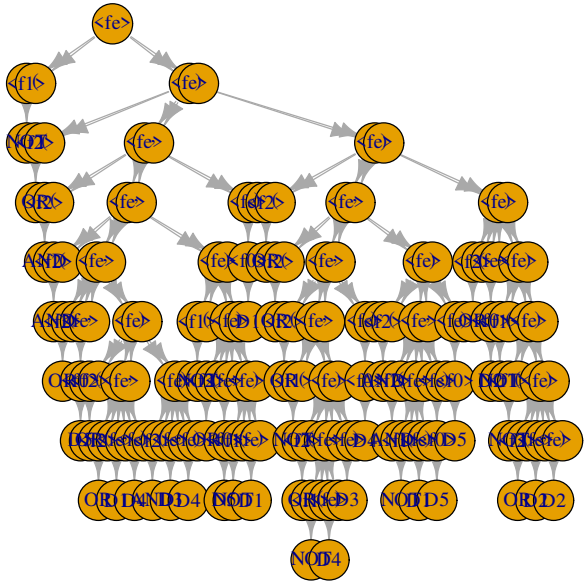
Table: Treatment: BoolT0sgp5k

The Solution Table of Treatment BoolT0sgp5k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 12.

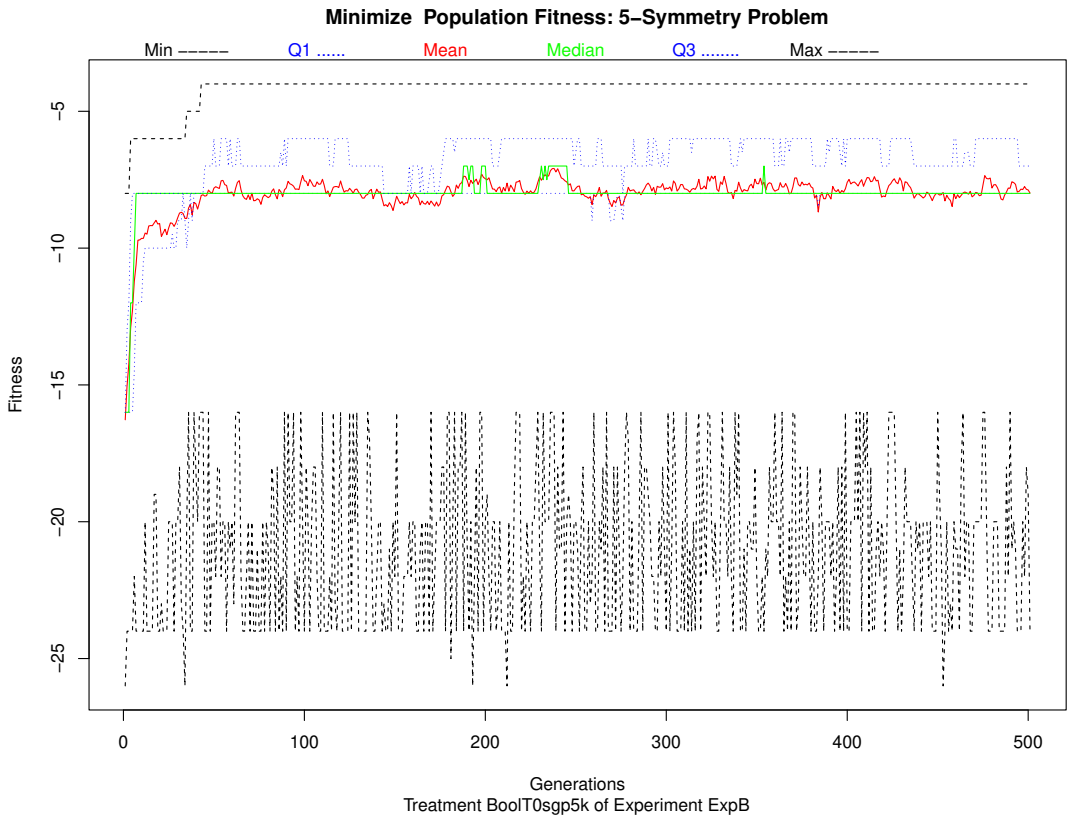
	Solution
1	AND(NOT(OR(AND(NOT(D4), OR(D4, D2)), AND(NOT(D5), D1))), AND(OR(D1, NOT(D5)), NOT(AND(NOT(D2), D4))))

Table: The Solution Table of Treatment BoolT0sgp5k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 12.

The Derivation Tree of a Solution of Treatment BoolT0sgp5k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT0sgp5k of Experiment ExpB



Parameters of treatment: BoolT0sgp6k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT0sgp6k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT0sgp6k

Parameters of treatment BoolT0sgp6k passed to xegaRun

	Parameter Values
penv	6-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNot.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-64
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT0sgp6k passed to xegaRun (Part 1)

Parameters of treatment BoolT0sgp6k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	240
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT0sgp6k passed to xegaRun (Part 2)

Parameters of treatment BoolT0sgp6k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT0sgp6k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT0sgp6k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f0>	D3
7	<f0>	D4
8	<f0>	D5
9	<f0>	D6
10	<f1>	NOT
11	<f2>	OR
12	<f2>	AND

Table: The Production Table of Treatment BoolT0sgp6k of Experiment ExpB

Treatment: BoolT0sgp6k

	Treatment	Trials	Variable	min	mean	sd	max
20	BoolT0sgp6k	80	Evaluations	100000.00	100000.00	0.00	100000.00
17	BoolT0sgp6k	80	Fitness	4.00	6.67	0.61	7.00
19	BoolT0sgp6k	80	Generations	500.00	500.00	0.00	500.00
18	BoolT0sgp6k	80	Seconds	253.33	319.79	35.37	374.52

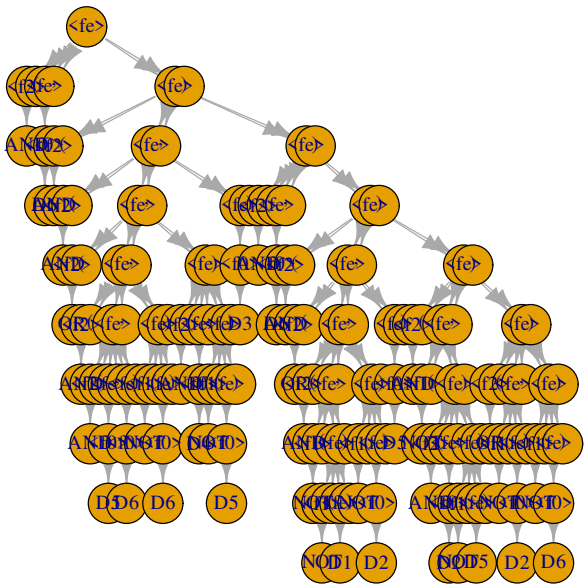
Table: Treatment: BoolT0sgp6k

The Solution Table of Treatment BoolT0sgp6k of Experiment ExpB. Fit: 4. Unique Shortest Solutions: 2.

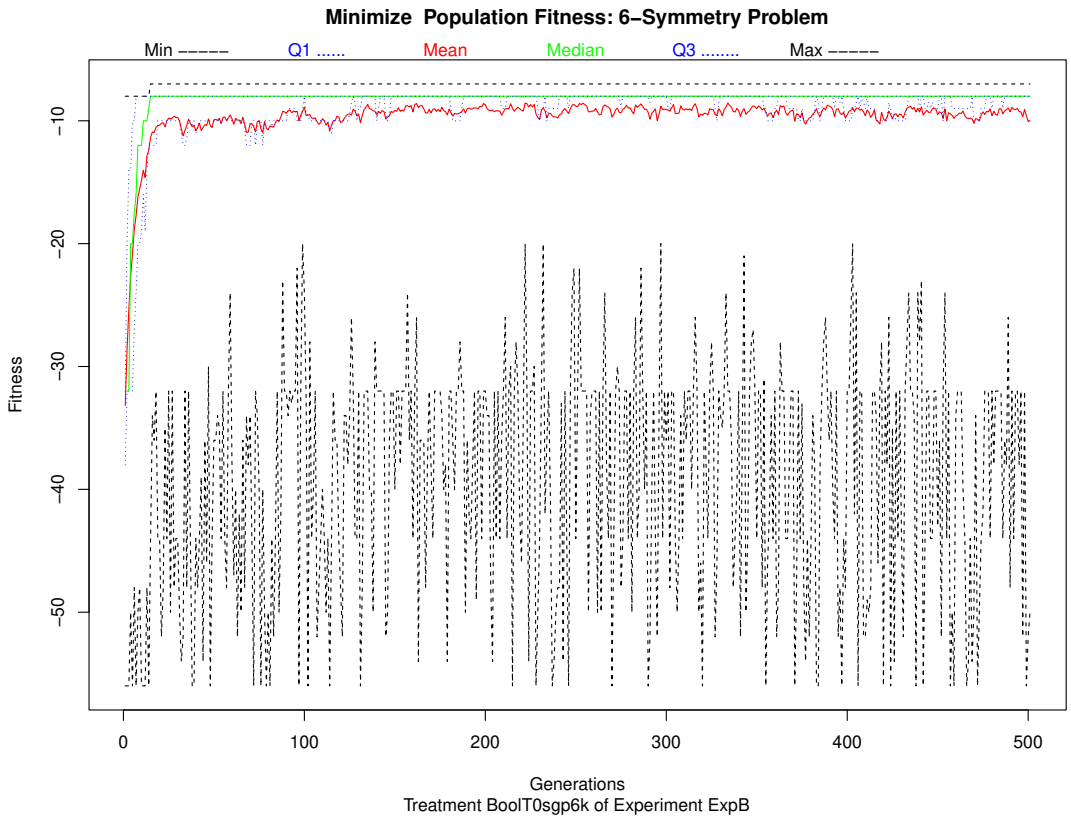
	Solution
1	AND(NOT(NOT(AND(D2, AND(OR(NOT(NOT(D4)), D2), OR(AND(D6, D1), NOT(OR(D1, D6))))))), AND(OR(NOT(NOT(AND(AND(D4, D2), D3))), NOT(OR(OR(D4, D3), AND(D6, D3))))), D5))

Table: The Solution Table of Treatment BoolT0sgp6k of Experiment ExpB. Fit: 4. Unique Shortest Solutions: 2.

The Derivation Tree of a Solution of Treatment BoolT0sgp6k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT0sgp6k of Experiment ExpB



Parameters of treatment: BoolT1sgp2k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT1sgp2k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT1sgp2k

Parameters of treatment BoolT1sgp2k passed to xegaRun

	Parameter Values
penv	2-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned1.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-4
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT1sgp2k passed to xegaRun (Part 1)

Parameters of treatment BoolT1sgp2k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	80
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT1sgp2k passed to xegaRun (Part 2)

Parameters of treatment BoolT1sgp2k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT1sgp2k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT1sgp2k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<fe>	OR(AND(<f0>,<f0>),AND(NOT(<f0>),NOT(<f0>)))
5	<f2>	OR
6	<f2>	AND
7	<f2>	OR
8	<f1>	NOT
9	<f0>	D1
10	<f0>	D2

Table: The Production Table of Treatment BoolT1sgp2k of Experiment ExpB

Treatment: BoolT1sgp2k

	Treatment	Trials	Variable	min	mean	sd	max
24	BoolT1sgp2k	80	Evaluations	200.00	200.00	0.00	200.00
21	BoolT1sgp2k	80	Fitness	0.00	0.00	0.00	0.00
23	BoolT1sgp2k	80	Generations	1.00	1.00	0.00	1.00
22	BoolT1sgp2k	80	Seconds	0.22	0.33	0.10	0.93

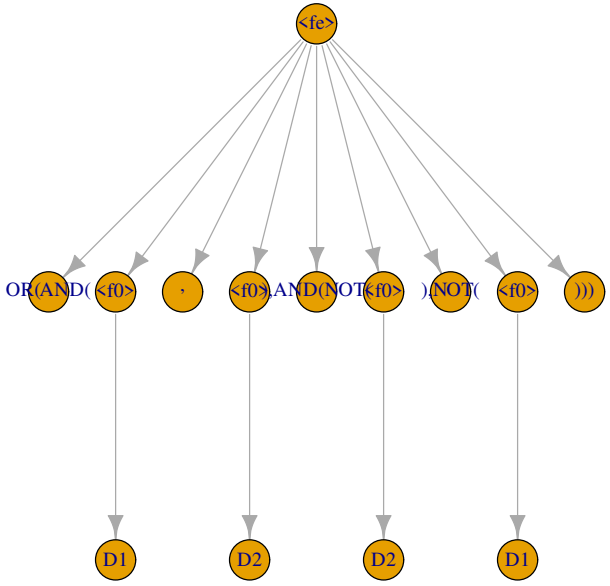
Table: Treatment: BoolT1sgp2k

The Solution Table of Treatment BoolT1sgp2k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 21.

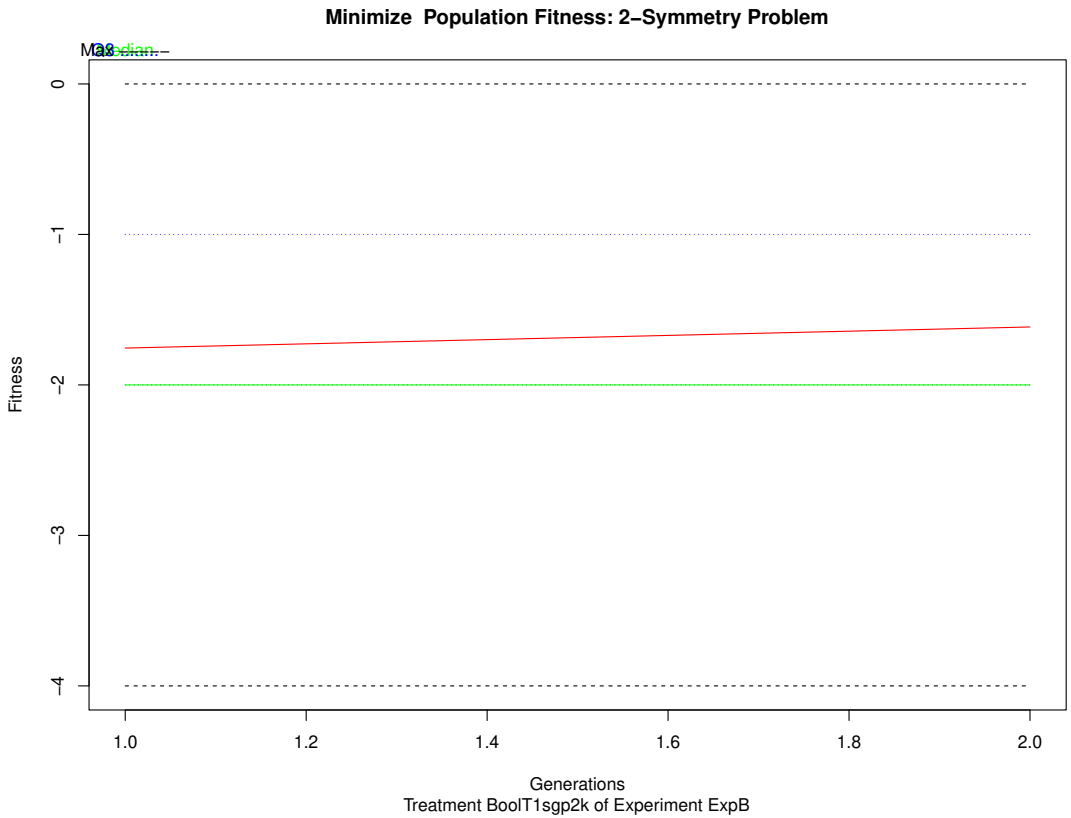
	Solution
1	OR(AND(D1, D2), AND(NOT(D1), NOT(D2)))

Table: The Solution Table of Treatment BoolT1sgp2k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 21.

The Derivation Tree of a Solution of Treatment BoolT1sgp2k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT1sgp2k of Experiment ExpB



Parameters of treatment: BoolT1sgp3k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT1sgp3k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT1sgp3k

Parameters of treatment BoolT1sgp3k passed to xegaRun

	Parameter Values
penv	3-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned1.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-8
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT1sgp3k passed to xegaRun (Part 1)

Parameters of treatment BoolT1sgp3k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	120
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT1sgp3k passed to xegaRun (Part 2)

Parameters of treatment BoolT1sgp3k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT1sgp3k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT1sgp3k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<fe>	OR(AND(<f0>,<f0>),AND(NOT(<f0>),NOT(<f0>)))
5	<f2>	OR
6	<f2>	AND
7	<f2>	OR
8	<f1>	NOT
9	<f0>	D1
10	<f0>	D2
11	<f0>	D3

Table: The Production Table of Treatment BoolT1sgp3k of Experiment ExpB

Treatment: BoolT1sgp3k

	Treatment	Trials	Variable	min	mean	sd	max
28	BoolT1sgp3k	80	Evaluations	200.00	202.50	22.36	400.00
25	BoolT1sgp3k	80	Fitness	0.00	0.00	0.00	0.00
27	BoolT1sgp3k	80	Generations	1.00	1.01	0.11	2.00
26	BoolT1sgp3k	80	Seconds	0.24	0.36	0.05	0.56

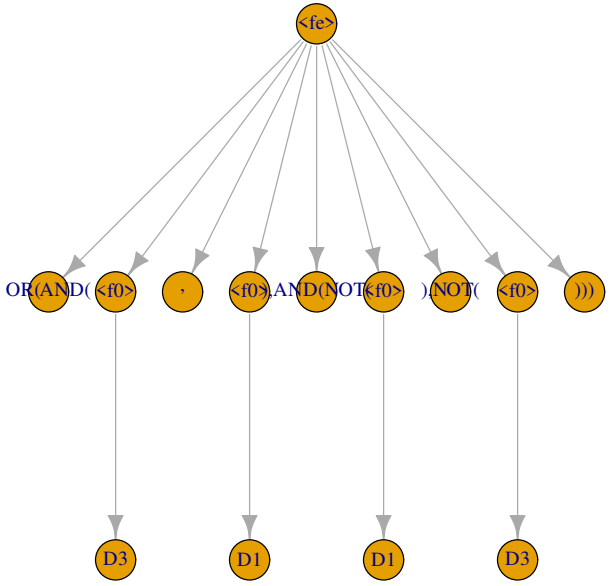
Table: Treatment: BoolT1sgp3k

The Solution Table of Treatment BoolT1sgp3k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 8.

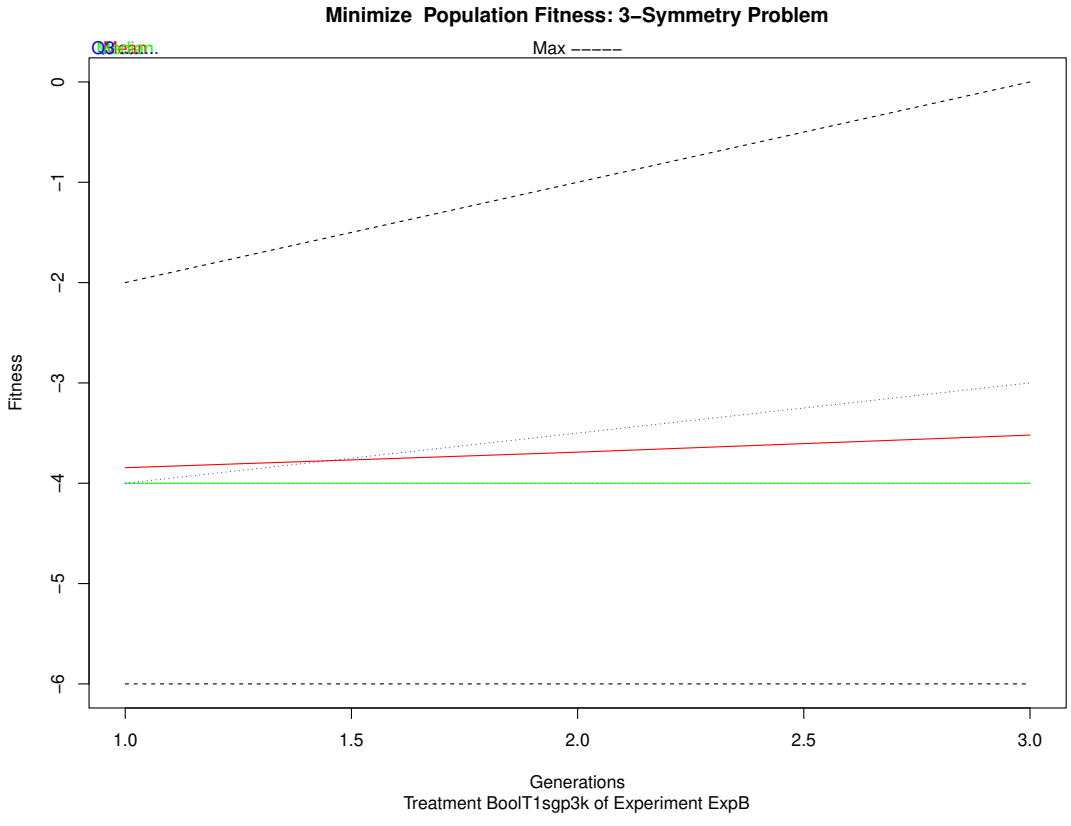
	Solution
1	OR(AND(D3, D1), AND(NOT(D3), NOT(D1)))

Table: The Solution Table of Treatment BoolT1sgp3k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 8.

The Derivation Tree of a Solution of Treatment BoolT1sgp3k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT1sgp3k of Experiment ExpB



Parameters of treatment: BoolT1sgp4k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT1sgp4k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT1sgp4k

Parameters of treatment BoolT1sgp4k passed to xegaRun

	Parameter Values
penv	4-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned1.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-16
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT1sgp4k passed to xegaRun (Part 1)

Parameters of treatment BoolT1sgp4k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	160
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT1sgp4k passed to xegaRun (Part 2)

Parameters of treatment BoolT1sgp4k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT1sgp4k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT1sgp4k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<fe>	OR(AND(<f0>,<f0>),AND(NOT(<f0>),NOT(<f0>)))
5	<f2>	OR
6	<f2>	AND
7	<f2>	OR
8	<f1>	NOT
9	<f0>	D1
10	<f0>	D2
11	<f0>	D3
12	<f0>	D4

Table: The Production Table of Treatment BoolT1sgp4k of Experiment ExpB

Treatment: BoolT1sgp4k

	Treatment	Trials	Variable	min	mean	sd	max
32	BoolT1sgp4k	80	Evaluations	1000.00	18400.00	24270.06	100000.00
29	BoolT1sgp4k	80	Fitness	0.00	0.10	0.44	2.00
31	BoolT1sgp4k	80	Generations	5.00	92.00	121.35	500.00
30	BoolT1sgp4k	80	Seconds	1.46	41.66	67.31	289.48

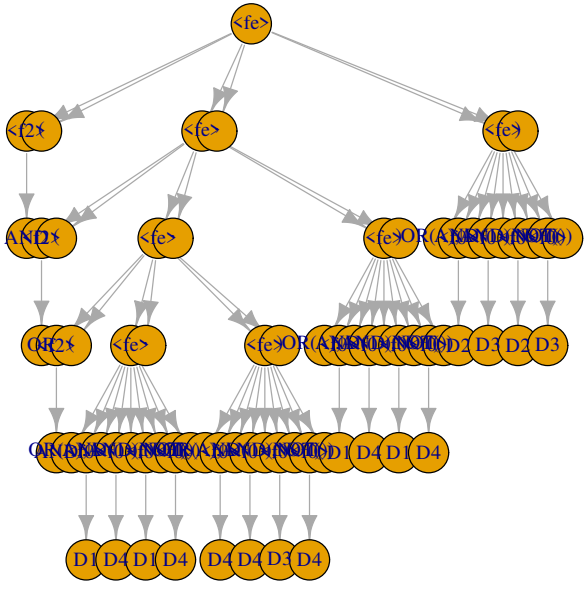
Table: Treatment: BoolT1sgp4k

The Solution Table of Treatment BoolT1sgp4k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 72.

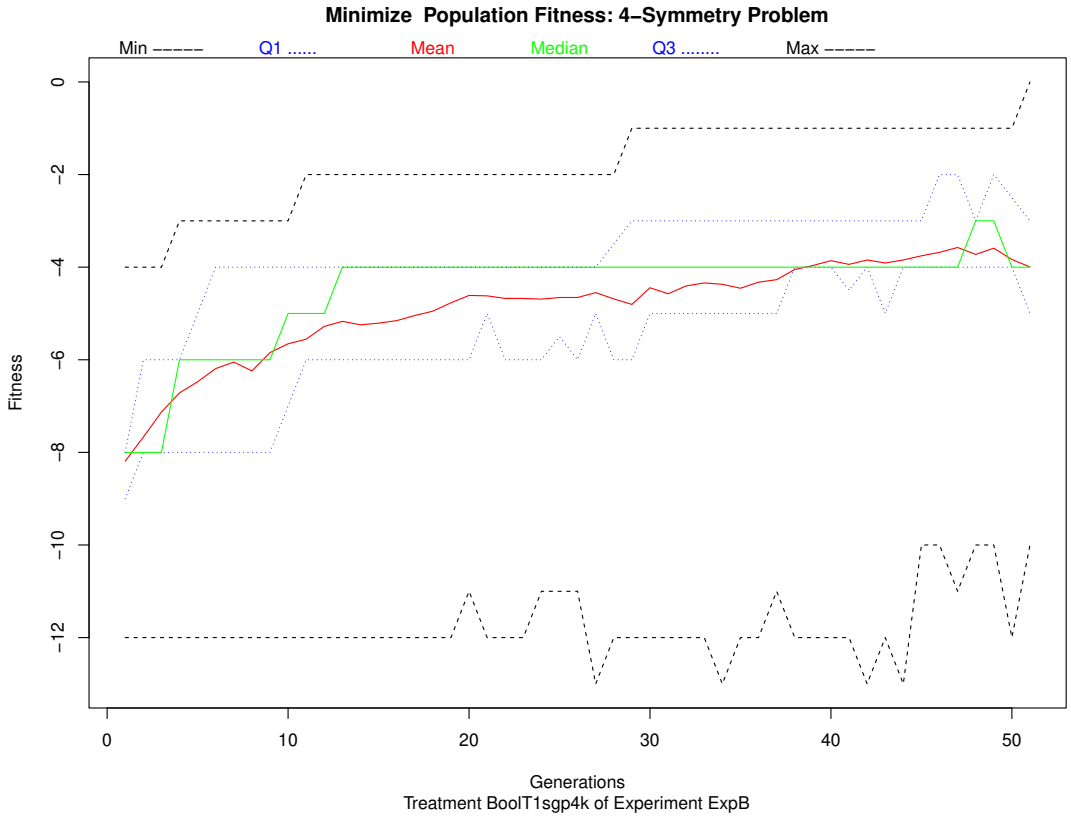
	Solution
1	AND(OR(AND(D1, D4), AND(NOT(D1), NOT(D4))), OR(AND(D2, D3), AND(NOT(D2), NOT(D3))))

Table: The Solution Table of Treatment BoolT1sgp4k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 72.

The Derivation Tree of a Solution of Treatment BoolT1sgp4k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT1sgp4k of Experiment ExpB



Parameters of treatment: BoolT1sgp5k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT1sgp5k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT1sgp5k

Parameters of treatment BoolT1sgp5k passed to xegaRun

	Parameter Values
penv	5-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned1.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-32
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT1sgp5k passed to xegaRun (Part 1)

Parameters of treatment BoolT1sgp5k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	200
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT1sgp5k passed to xegaRun (Part 2)

Parameters of treatment BoolT1sgp5k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT1sgp5k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT1sgp5k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<fe>	OR(AND(<f0>,<f0>),AND(NOT(<f0>),NOT(<f0>)))
5	<f2>	OR
6	<f2>	AND
7	<f2>	OR
8	<f1>	NOT
9	<f0>	D1
10	<f0>	D2
11	<f0>	D3
12	<f0>	D4
13	<f0>	D5

Table: The Production Table of Treatment BoolT1sgp5k of Experiment ExpB

Treatment: BoolT1sgp5k

	Treatment	Trials	Variable	min	mean	sd	max
36	BoolT1sgp5k	80	Evaluations	3000.00	21270.00	23719.95	100000.00
33	BoolT1sgp5k	80	Fitness	0.00	0.10	0.63	4.00
35	BoolT1sgp5k	80	Generations	15.00	106.35	118.60	500.00
34	BoolT1sgp5k	80	Seconds	4.28	49.71	68.50	401.34

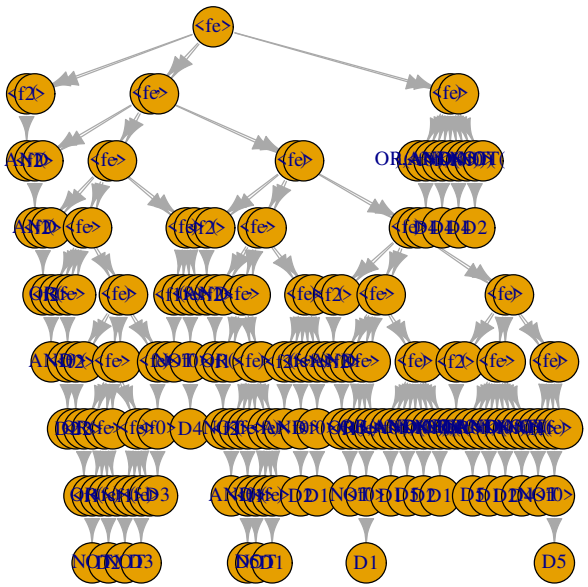
Table: Treatment: BoolT1sgp5k

The Solution Table of Treatment BoolT1sgp5k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 76.

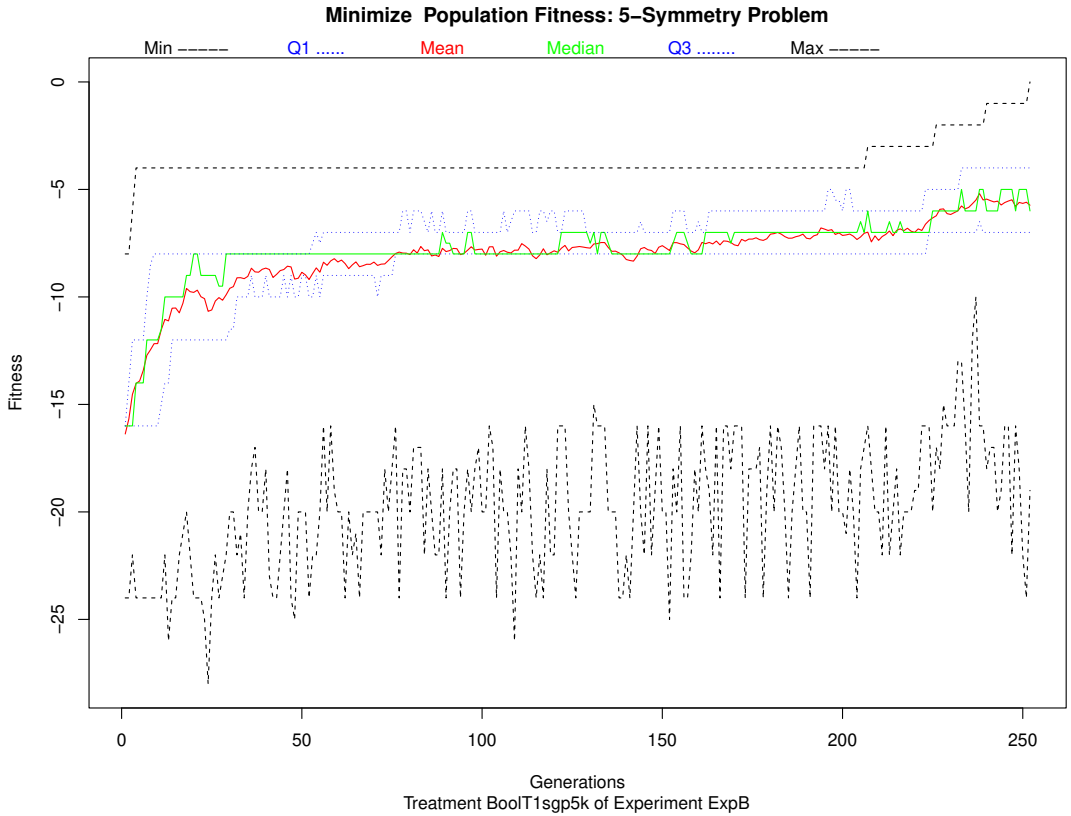
	Solution
1	AND(OR(AND(D5, D1), AND(NOT(D1), NOT(D5))), OR(AND(D2, D4), AND(NOT(D4), NOT(D2))))

Table: The Solution Table of Treatment BoolT1sgp5k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 76.

The Derivation Tree of a Solution of Treatment BoolT1sgp5k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT1sgp5k of Experiment ExpB



Parameters of treatment: BoolT1sgp6k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT1sgp6k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT1sgp6k

Parameters of treatment BoolT1sgp6k passed to xegaRun

	Parameter Values
penv	6-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned1.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-64
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT1sgp6k passed to xegaRun (Part 1)

Parameters of treatment BoolT1sgp6k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	240
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT1sgp6k passed to xegaRun (Part 2)

Parameters of treatment BoolT1sgp6k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT1sgp6k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT1sgp6k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<fe>	OR(AND(<f0>,<f0>),AND(NOT(<f0>),NOT(<f0>)))
5	<f2>	OR
6	<f2>	AND
7	<f2>	OR
8	<f1>	NOT
9	<f0>	D1
10	<f0>	D2
11	<f0>	D3
12	<f0>	D4
13	<f0>	D5
14	<f0>	D6

Table: The Production Table of Treatment BoolT1sgp6k of Experiment ExpB

Treatment: BoolT1sgp6k

	Treatment	Trials	Variable	min	mean	sd	max
40	BoolT1sgp6k	80	Evaluations	41400.00	98587.50	8883.00	100000.00
37	BoolT1sgp6k	80	Fitness	0.00	5.30	1.50	7.00
39	BoolT1sgp6k	80	Generations	207.00	492.94	44.42	500.00
38	BoolT1sgp6k	80	Seconds	106.36	301.31	48.60	398.28

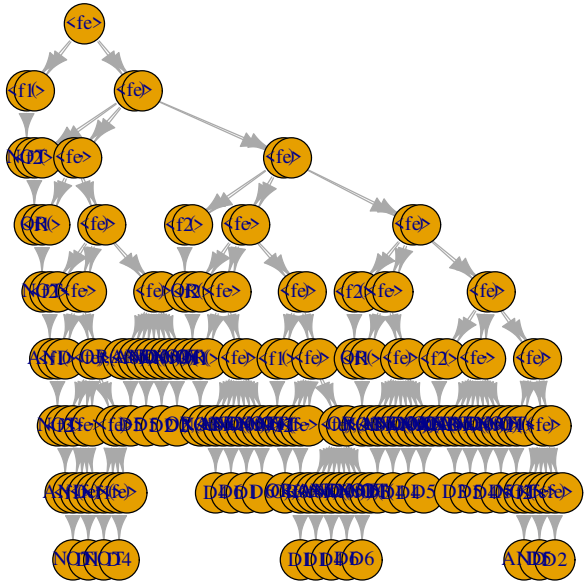
Table: Treatment: BoolT1sgp6k

The Solution Table of Treatment BoolT1sgp6k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 2.

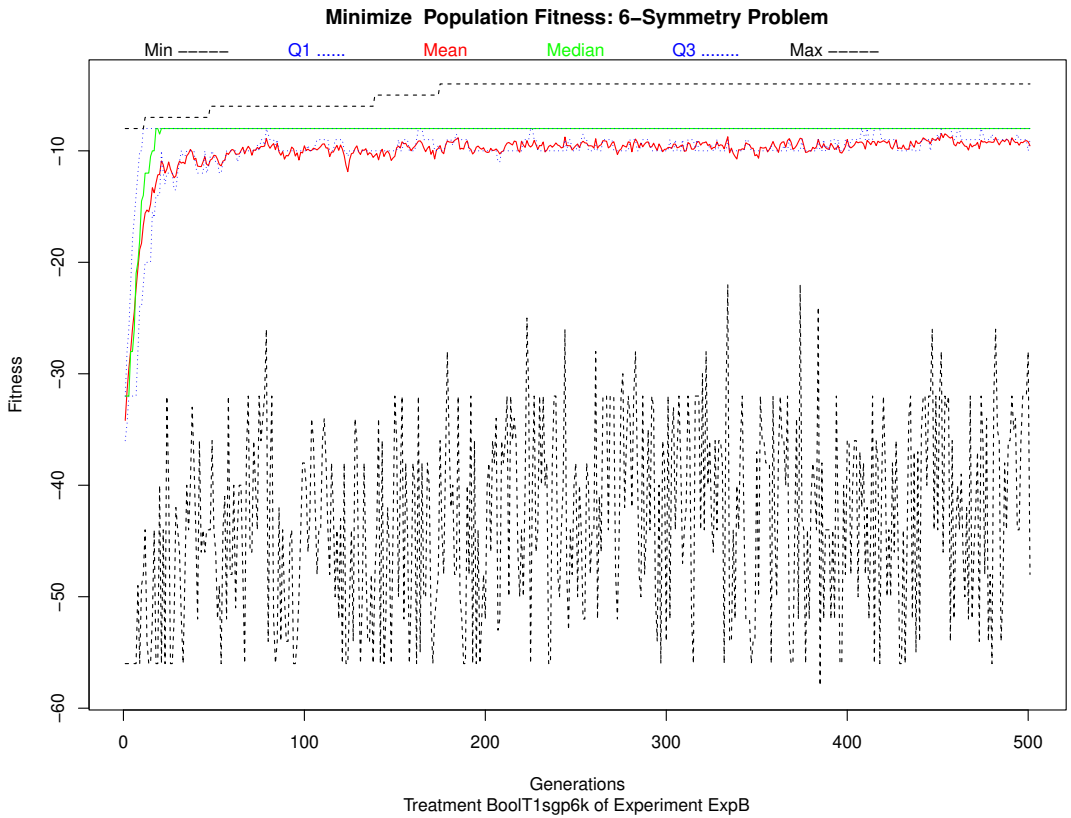
	Solution
1	NOT(OR(NOT(OR(AND(D1, D1), AND(NOT(D6), NOT(D6)))), OR(NOT(AND(OR(AND(D6, D6), AND(NOT(D1), NOT(D1))), OR(AND(D4, D3), AND(NOT(D3), NOT(D4))))), NOT(OR(AND(D2, D5), AND(NOT(D5), NOT(D2)))))))

Table: The Solution Table of Treatment BoolT1sgp6k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 2.

The Derivation Tree of a Solution of Treatment BoolT1sgp6k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT1sgp6k of Experiment ExpB



Parameters of treatment: BoolT2sgp2k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT2sgp2k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT2sgp2k

Parameters of treatment BoolT2sgp2k passed to xegaRun

	Parameter Values
penv	2-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned2.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-4
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT2sgp2k passed to xegaRun (Part 1)

Parameters of treatment BoolT2sgp2k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	80
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT2sgp2k passed to xegaRun (Part 2)

Parameters of treatment BoolT2sgp2k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT2sgp2k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT2sgp2k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<fe>	AND<sympairs>
7	<sympairs>	(D1,D2)
8	<sympairs>	(NOT(D1),NOT(D2))
9	<f1>	NOT
10	<f2>	OR
11	<f2>	AND
12	<f2>	AND

Table: The Production Table of Treatment BoolT2sgp2k of Experiment ExpB

Treatment: BoolT2sgp2k

	Treatment	Trials	Variable	min	mean	sd	max
44	BoolT2sgp2k	80	Evaluations	200.00	225.00	73.78	600.00
41	BoolT2sgp2k	80	Fitness	0.00	0.00	0.00	0.00
43	BoolT2sgp2k	80	Generations	1.00	1.12	0.37	3.00
42	BoolT2sgp2k	80	Seconds	0.20	0.31	0.08	0.76

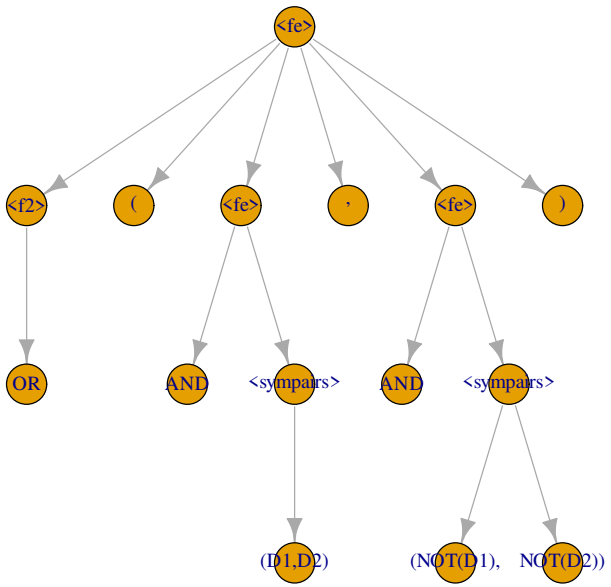
Table: Treatment: BoolT2sgp2k

The Solution Table of Treatment BoolT2sgp2k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 41.

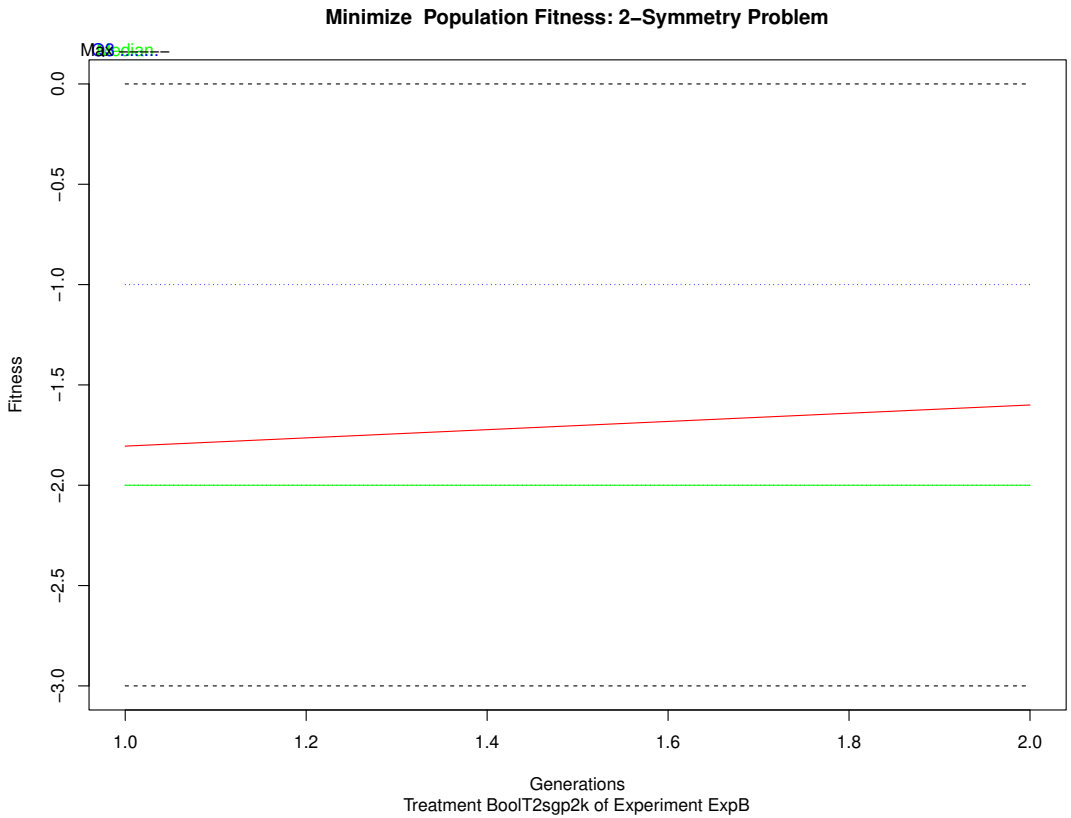
	Solution
1	OR(AND(D1, D2), NOT(OR(D1, D2)))

Table: The Solution Table of Treatment BoolT2sgp2k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 41.

The Derivation Tree of a Solution of Treatment BoolT2sgp2k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT2sgp2k of Experiment ExpB



Parameters of treatment: BoolT2sgp3k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT2sgp3k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT2sgp3k

Parameters of treatment BoolT2sgp3k passed to xegaRun

	Parameter Values
penv	3-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned2.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-8
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT2sgp3k passed to xegaRun (Part 1)

Parameters of treatment BoolT2sgp3k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	120
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT2sgp3k passed to xegaRun (Part 2)

Parameters of treatment BoolT2sgp3k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT2sgp3k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT2sgp3k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f0>	D3
7	<fe>	AND<sympairs>
8	<sympairs>	(D1,D3)
9	<sympairs>	(NOT(D1),NOT(D3))
10	<f1>	NOT
11	<f2>	OR
12	<f2>	AND
13	<f2>	AND

Table: The Production Table of Treatment BoolT2sgp3k of Experiment ExpB

Treatment: BoolT2sgp3k

	Treatment	Trials	Variable	min	mean	sd	max
48	BoolT2sgp3k	80	Evaluations	200.00	280.00	219.55	1400.00
45	BoolT2sgp3k	80	Fitness	0.00	0.00	0.00	0.00
47	BoolT2sgp3k	80	Generations	1.00	1.40	1.10	7.00
46	BoolT2sgp3k	80	Seconds	0.20	0.37	0.18	1.15

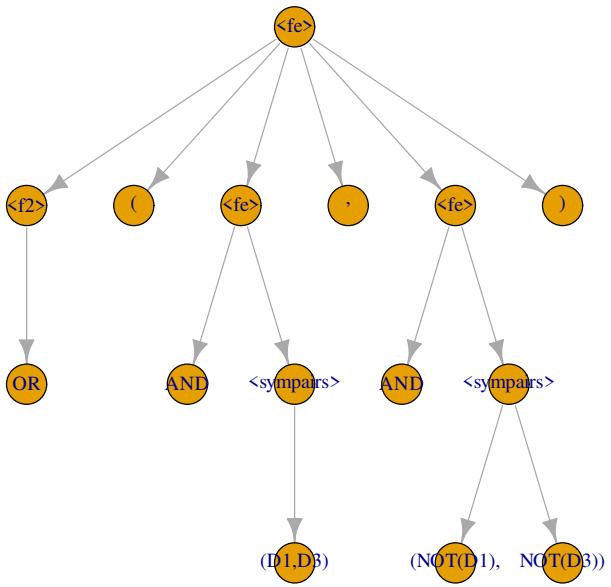
Table: Treatment: BoolT2sgp3k

The Solution Table of Treatment BoolT2sgp3k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 40.

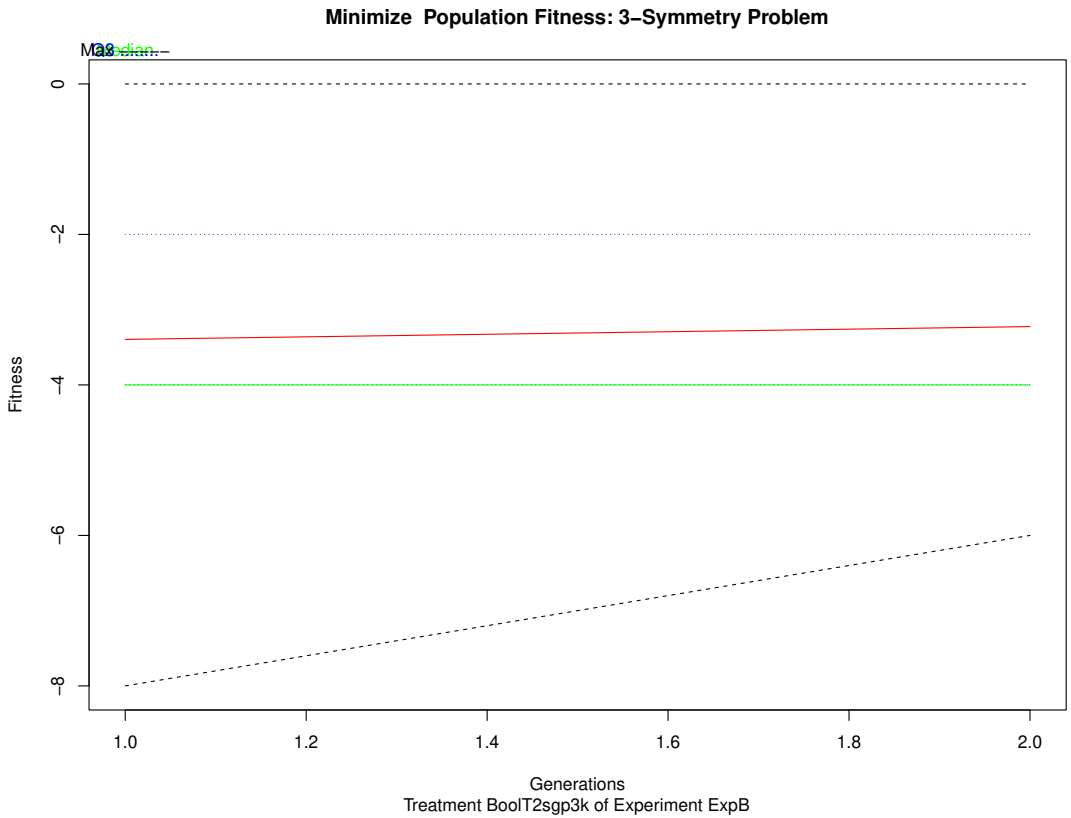
	Solution
1	OR(AND(NOT(D1), NOT(D3)), AND(D1, D3))

Table: The Solution Table of Treatment BoolT2sgp3k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 40.

The Derivation Tree of a Solution of Treatment BoolT2sgp3k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT2sgp3k of Experiment ExpB



Parameters of treatment: BoolT2sgp4k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT2sgp4k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT2sgp4k

Parameters of treatment BoolT2sgp4k passed to xegaRun

	Parameter Values
penv	4-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned2.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-16
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT2sgp4k passed to xegaRun (Part 1)

Parameters of treatment BoolT2sgp4k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	160
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT2sgp4k passed to xegaRun (Part 2)

Parameters of treatment BoolT2sgp4k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT2sgp4k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT2sgp4k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f0>	D3
7	<f0>	D4
8	<fe>	AND<sympairs>
9	<sympairs>	(D1,D4)
10	<sympairs>	(NOT(D1),NOT(D4))
11	<sympairs>	(D2,D3)
12	<sympairs>	(NOT(D2),NOT(D3))
13	<f1>	NOT
14	<f2>	OR
15	<f2>	AND

Table: The Production Table of Treatment BoolT2sgp4k of Experiment ExpB (Part 1)

The Production Table of Treatment BoolT2sgp4k of Experiment ExpB

	LHS	RHS
16	<f2>	AND

Table: The Production Table of Treatment BoolT2sgp4k of Experiment ExpB (Part 2)

Treatment: BoolT2sgp4k

	Treatment	Trials	Variable	min	mean	sd	max
52	BoolT2sgp4k	80	Evaluations	4600.00	35465.00	24750.50	100000.00
49	BoolT2sgp4k	80	Fitness	0.00	0.12	0.49	2.00
51	BoolT2sgp4k	80	Generations	23.00	177.32	123.75	500.00
50	BoolT2sgp4k	80	Seconds	5.15	59.00	49.04	227.58

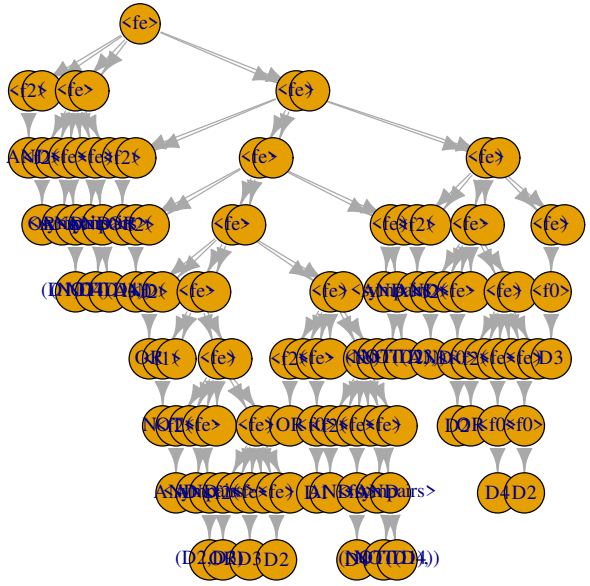
Table: Treatment: BoolT2sgp4k

The Solution Table of Treatment BoolT2sgp4k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 75.

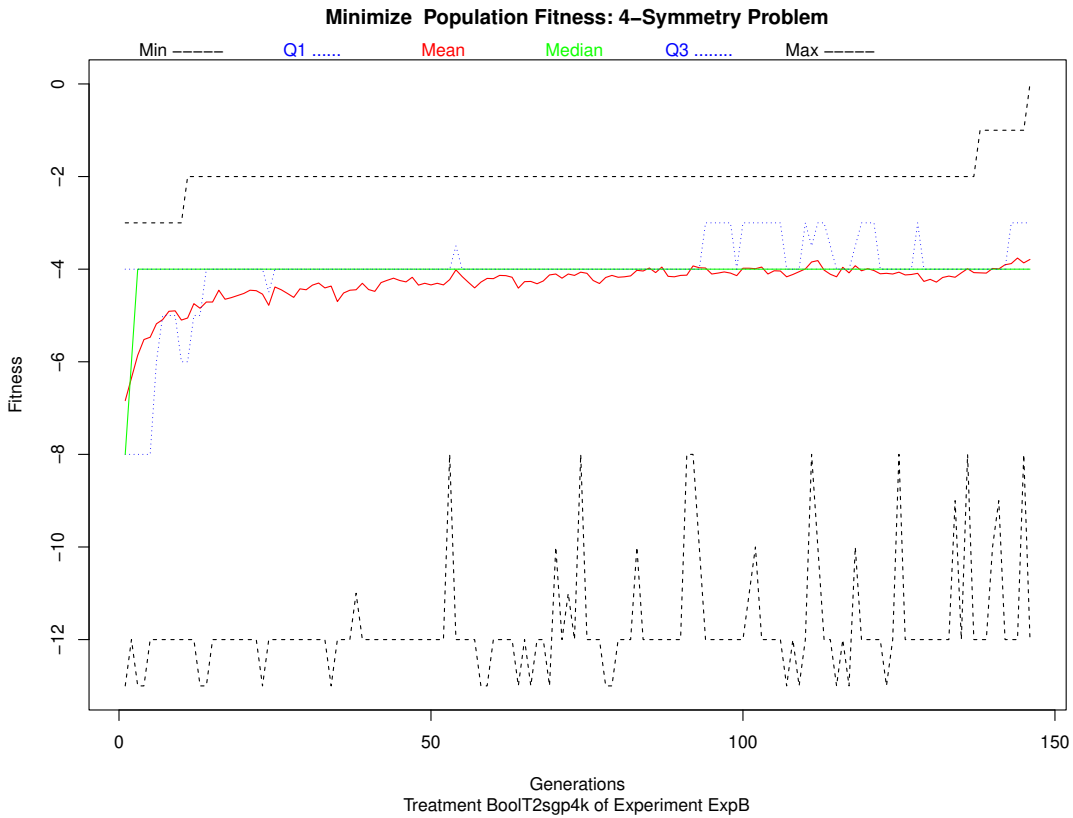
	Solution
1	AND(OR(AND(NOT(D1), NOT(D4)), AND(D1, D4)), OR(AND(NOT(D2), NOT(D3)), AND(D2, D3)))

Table: The Solution Table of Treatment BoolT2sgp4k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 75.

The Derivation Tree of a Solution of Treatment BoolT2sgp4k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT2sgp4k of Experiment ExpB



Parameters of treatment: BoolT2sgp5k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT2sgp5k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT2sgp5k

Parameters of treatment BoolT2sgp5k passed to xegaRun

	Parameter Values
penv	5-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned2.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-32
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT2sgp5k passed to xegaRun (Part 1)

Parameters of treatment BoolT2sgp5k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	200
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT2sgp5k passed to xegaRun (Part 2)

Parameters of treatment BoolT2sgp5k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT2sgp5k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT2sgp5k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f0>	D3
7	<f0>	D4
8	<f0>	D5
9	<fe>	AND<sympairs>
10	<sympairs>	(D1,D5)
11	<sympairs>	(NOT(D1),NOT(D5))
12	<sympairs>	(D2,D4)
13	<sympairs>	(NOT(D2),NOT(D4))
14	<f1>	NOT
15	<f2>	OR

Table: The Production Table of Treatment BoolT2sgp5k of Experiment ExpB (Part 1)

The Production Table of Treatment BoolT2sgp5k of Experiment ExpB

	LHS	RHS
16	<f2>	AND
17	<f2>	AND

Table: The Production Table of Treatment BoolT2sgp5k of Experiment ExpB (Part 2)

Treatment: BoolT2sgp5k

	Treatment	Trials	Variable	min	mean	sd	max
56	BoolT2sgp5k	80	Evaluations	5400.00	31060.00	20166.23	100000.00
53	BoolT2sgp5k	80	Fitness	0.00	0.05	0.45	4.00
55	BoolT2sgp5k	80	Generations	27.00	155.30	100.83	500.00
54	BoolT2sgp5k	80	Seconds	6.25	50.95	37.51	196.01

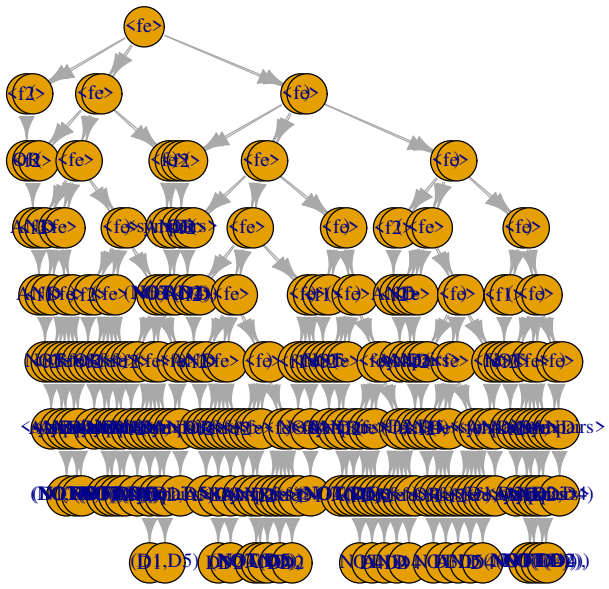
Table: Treatment: BoolT2sgp5k

The Solution Table of Treatment BoolT2sgp5k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 78.

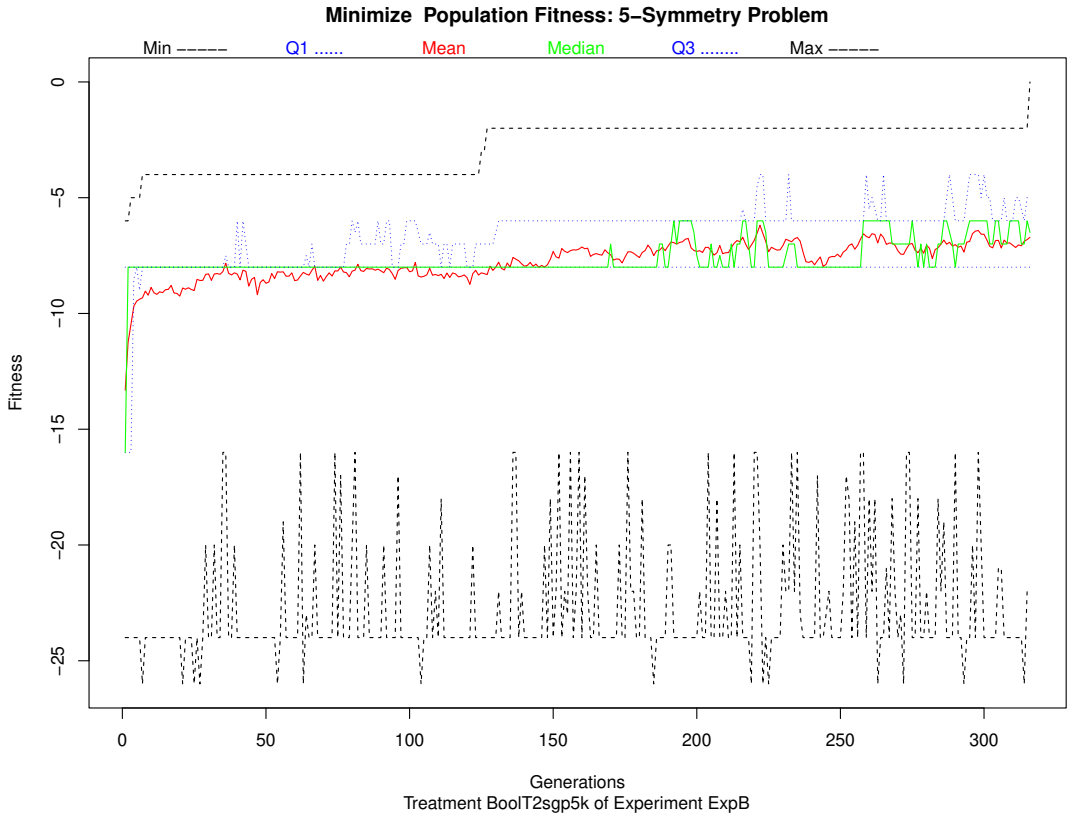
	Solution
1	AND(OR(AND(D2, D4), AND(NOT(D2), NOT(D4))), OR(AND(D1, D5), AND(NOT(D1), NOT(D5))))

Table: The Solution Table of Treatment BoolT2sgp5k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 78.

The Derivation Tree of a Solution of Treatment BoolT2sgp5k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT2sgp5k of Experiment ExpB



Parameters of treatment: BoolT2sgp6k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT2sgp6k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT2sgp6k

Parameters of treatment BoolT2sgp6k passed to xegaRun

	Parameter Values
penv	6-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned2.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-64
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT2sgp6k passed to xegaRun (Part 1)

Parameters of treatment BoolT2sgp6k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	240
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT2sgp6k passed to xegaRun (Part 2)

Parameters of treatment BoolT2sgp6k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT2sgp6k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT2sgp6k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f0>	D3
7	<f0>	D4
8	<f0>	D5
9	<f0>	D6
10	<fe>	AND<sympairs>
11	<sympairs>	(D1,D6)
12	<sympairs>	(NOT(D1),NOT(D6))
13	<sympairs>	(D2,D5)
14	<sympairs>	(NOT(D2),NOT(D5))
15	<sympairs>	(D3,D4)

Table: The Production Table of Treatment BoolT2sgp6k of Experiment ExpB (Part 1)

The Production Table of Treatment BoolT2sgp6k of Experiment ExpB

	LHS	RHS
16	<sympairs>	(NOT(D3),NOT(D4))
17	<f1>	NOT
18	<f2>	OR
19	<f2>	AND
20	<f2>	AND

Table: The Production Table of Treatment BoolT2sgp6k of Experiment ExpB (Part 2)

Treatment: BoolT2sgp6k

	Treatment	Trials	Variable	min	mean	sd	max
60	BoolT2sgp6k	80	Evaluations	38400.00	98905.00	7158.39	100000.00
57	BoolT2sgp6k	80	Fitness	0.00	4.92	1.37	6.00
59	BoolT2sgp6k	80	Generations	192.00	494.52	35.79	500.00
58	BoolT2sgp6k	80	Seconds	70.74	228.21	31.10	289.58

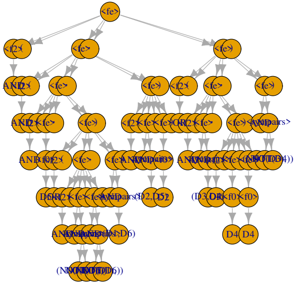
Table: Treatment: BoolT2sgp6k

The Solution Table of Treatment BoolT2sgp6k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 3.

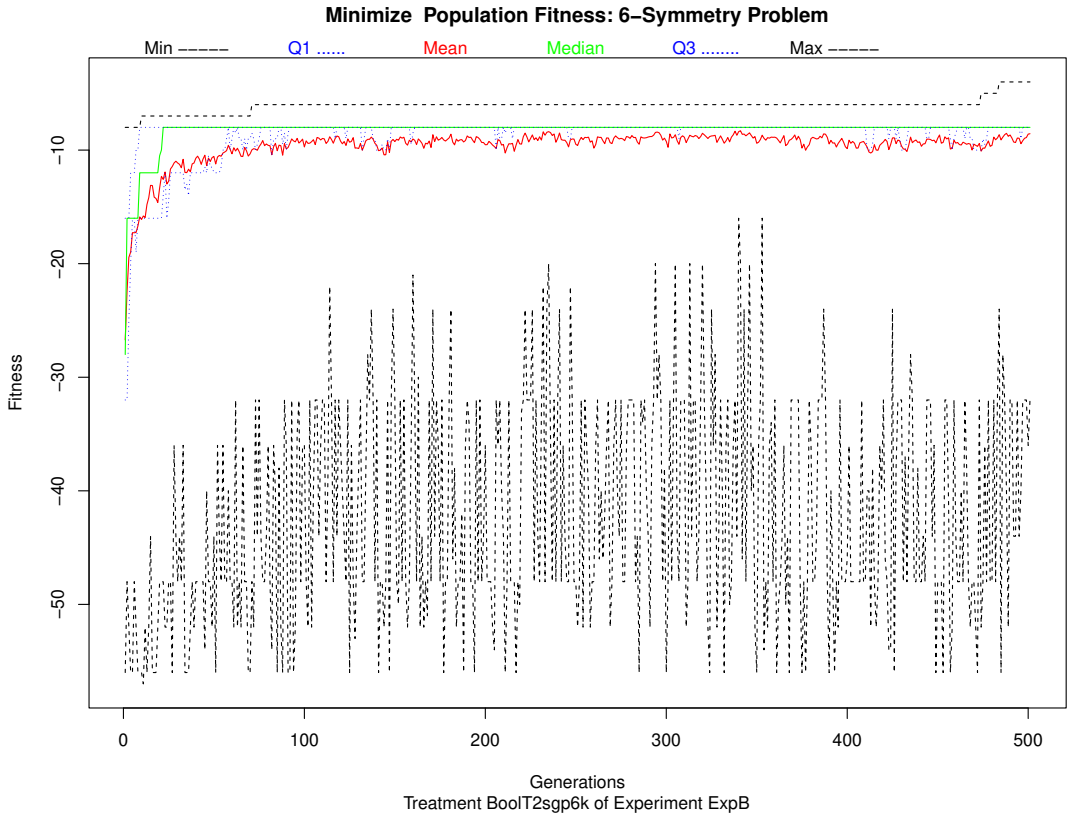
	Solution
1	AND(AND(NOT(NOT(OR(AND(D1, D6), AND(NOT(D1), NOT(D6))))), NOT(NOT(AND(OR(AND(D2, D5), AND(NOT(D2), NOT(D5))), OR(D1, NOT(D1)))))), OR(AND(D3, D4), AND(NOT(D3), NOT(D4))))

Table: The Solution Table of Treatment BoolT2sgp6k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 3.

The Derivation Tree of a Solution of Treatment BoolT2sgp6k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT2sgp6k of Experiment ExpB



Parameters of treatment: BoolT3sgp2k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT3sgp2k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT3sgp2k

Parameters of treatment BoolT3sgp2k passed to xegaRun

	Parameter Values
penv	2-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned3.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-4
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT3sgp2k passed to xegaRun (Part 1)

Parameters of treatment BoolT3sgp2k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	80
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT3sgp2k passed to xegaRun (Part 2)

Parameters of treatment BoolT3sgp2k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT3sgp2k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT3sgp2k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<fe>	AND<sympairs>
7	<sympairs>	(D1,D2)
8	<sympairs>	(NOT(D1),NOT(D2))
9	<f1>	NOT
10	<f2>	OR
11	<f2>	OR
12	<f2>	AND

Table: The Production Table of Treatment BoolT3sgp2k of Experiment ExpB

Treatment: BoolT3sgp2k

	Treatment	Trials	Variable	min	mean	sd	max
64	BoolT3sgp2k	80	Evaluations	200.00	210.00	43.86	400.00
61	BoolT3sgp2k	80	Fitness	0.00	0.00	0.00	0.00
63	BoolT3sgp2k	80	Generations	1.00	1.05	0.22	2.00
62	BoolT3sgp2k	80	Seconds	0.18	0.31	0.06	0.48

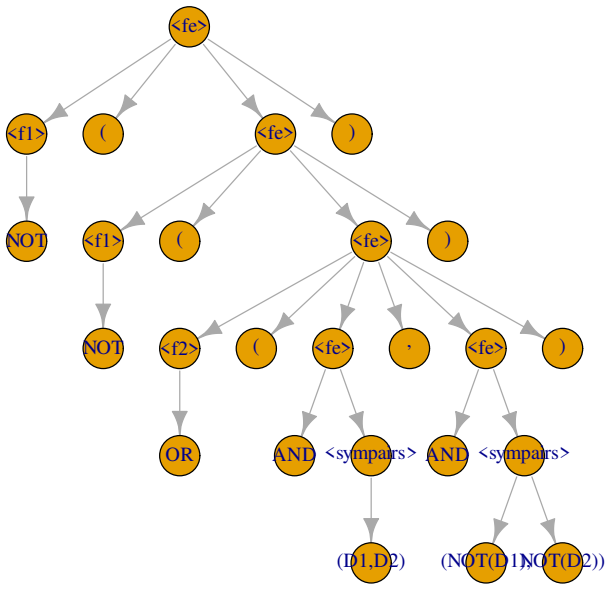
Table: Treatment: BoolT3sgp2k

The Solution Table of Treatment BoolT3sgp2k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 39.

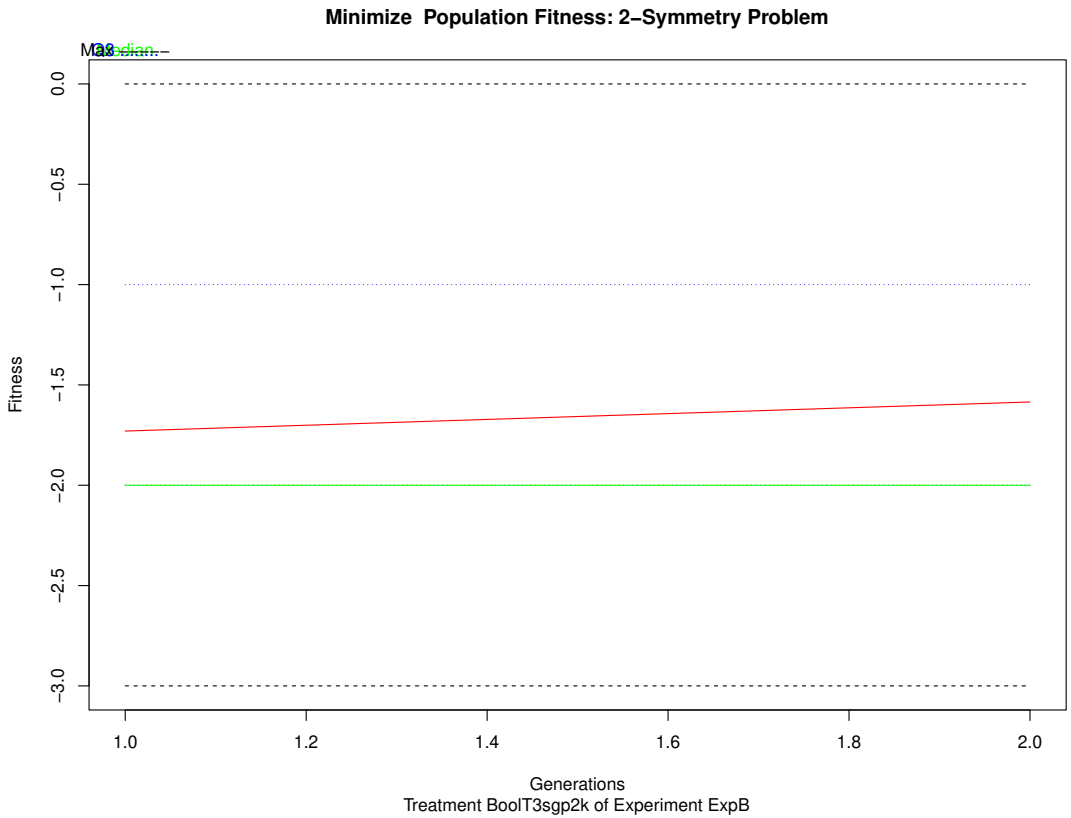
	Solution
1	OR(AND(NOT(D1), NOT(D2)), AND(D1, D2))

Table: The Solution Table of Treatment BoolT3sgp2k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 39.

The Derivation Tree of a Solution of Treatment BoolT3sgp2k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT3sgp2k of Experiment ExpB



Parameters of treatment: BoolT3sgp3k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT3sgp3k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT3sgp3k

Parameters of treatment BoolT3sgp3k passed to xegaRun

	Parameter Values
penv	3-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned3.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-8
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT3sgp3k passed to xegaRun (Part 1)

Parameters of treatment BoolT3sgp3k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	120
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT3sgp3k passed to xegaRun (Part 2)

Parameters of treatment BoolT3sgp3k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT3sgp3k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT3sgp3k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f0>	D3
7	<fe>	AND<sympairs>
8	<sympairs>	(D1,D3)
9	<sympairs>	(NOT(D1),NOT(D3))
10	<f1>	NOT
11	<f2>	OR
12	<f2>	OR
13	<f2>	AND

Table: The Production Table of Treatment BoolT3sgp3k of Experiment ExpB

Treatment: BoolT3sgp3k

	Treatment	Trials	Variable	min	mean	sd	max
68	BoolT3sgp3k	80	Evaluations	200.00	210.00	54.19	600.00
65	BoolT3sgp3k	80	Fitness	0.00	0.00	0.00	0.00
67	BoolT3sgp3k	80	Generations	1.00	1.05	0.27	3.00
66	BoolT3sgp3k	80	Seconds	0.24	0.33	0.07	0.53

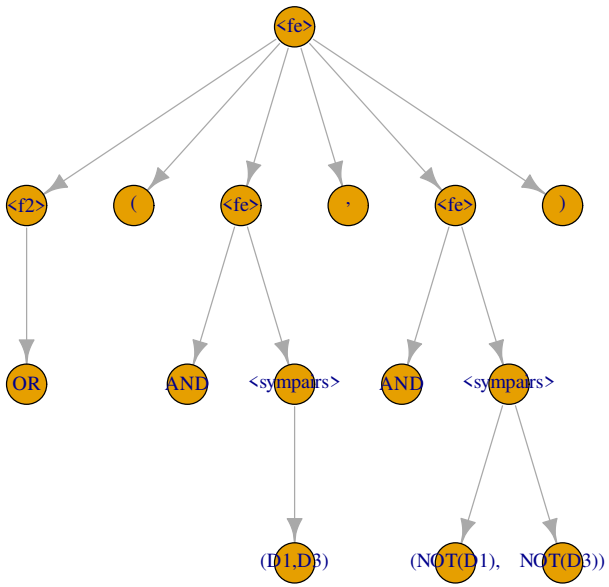
Table: Treatment: BoolT3sgp3k

The Solution Table of Treatment BoolT3sgp3k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 32.

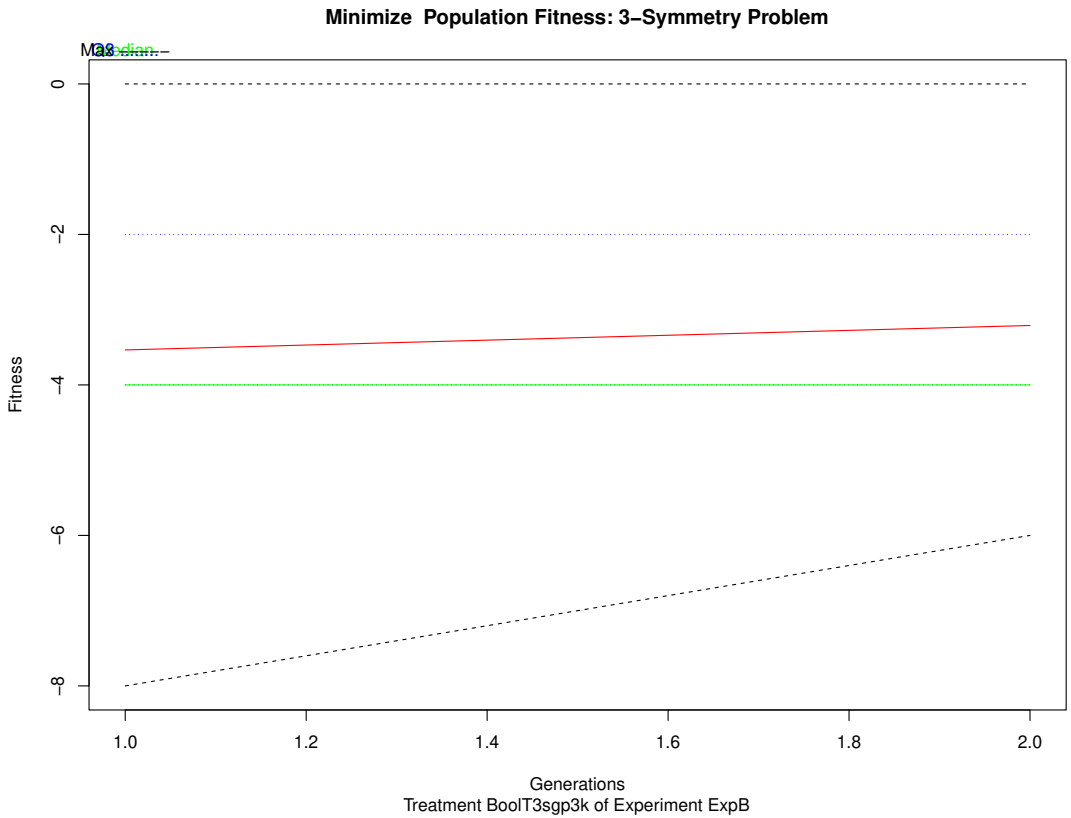
	Solution
1	OR(AND(NOT(D1), NOT(D3)), AND(D1, D3))

Table: The Solution Table of Treatment BoolT3sgp3k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 32.

The Derivation Tree of a Solution of Treatment BoolT3sgp3k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT3sgp3k of Experiment ExpB



Parameters of treatment: BoolT3sgp4k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT3sgp4k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT3sgp4k

Parameters of treatment BoolT3sgp4k passed to xegaRun

	Parameter Values
penv	4-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned3.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-16
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT3sgp4k passed to xegaRun (Part 1)

Parameters of treatment BoolT3sgp4k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	160
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT3sgp4k passed to xegaRun (Part 2)

Parameters of treatment BoolT3sgp4k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT3sgp4k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT3sgp4k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f0>	D3
7	<f0>	D4
8	<fe>	AND<sympairs>
9	<sympairs>	(D1,D4)
10	<sympairs>	(NOT(D1),NOT(D4))
11	<sympairs>	(D2,D3)
12	<sympairs>	(NOT(D2),NOT(D3))
13	<f1>	NOT
14	<f2>	OR
15	<f2>	OR

Table: The Production Table of Treatment BoolT3sgp4k of Experiment ExpB (Part 1)

The Production Table of Treatment BoolT3sgp4k of Experiment ExpB

	LHS	RHS
16	<f2>	AND

Table: The Production Table of Treatment BoolT3sgp4k of Experiment ExpB (Part 2)

Treatment: BoolT3sgp4k

	Treatment	Trials	Variable	min	mean	sd	max
72	BoolT3sgp4k	80	Evaluations	400.00	21000.00	14616.48	60600.00
69	BoolT3sgp4k	80	Fitness	0.00	0.00	0.00	0.00
71	BoolT3sgp4k	80	Generations	2.00	105.00	73.08	303.00
70	BoolT3sgp4k	80	Seconds	0.56	33.05	28.94	137.19

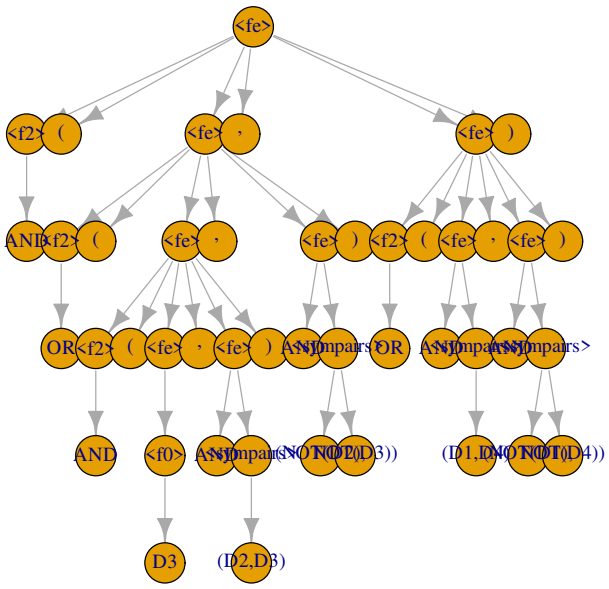
Table: Treatment: BoolT3sgp4k

The Solution Table of Treatment BoolT3sgp4k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 79.

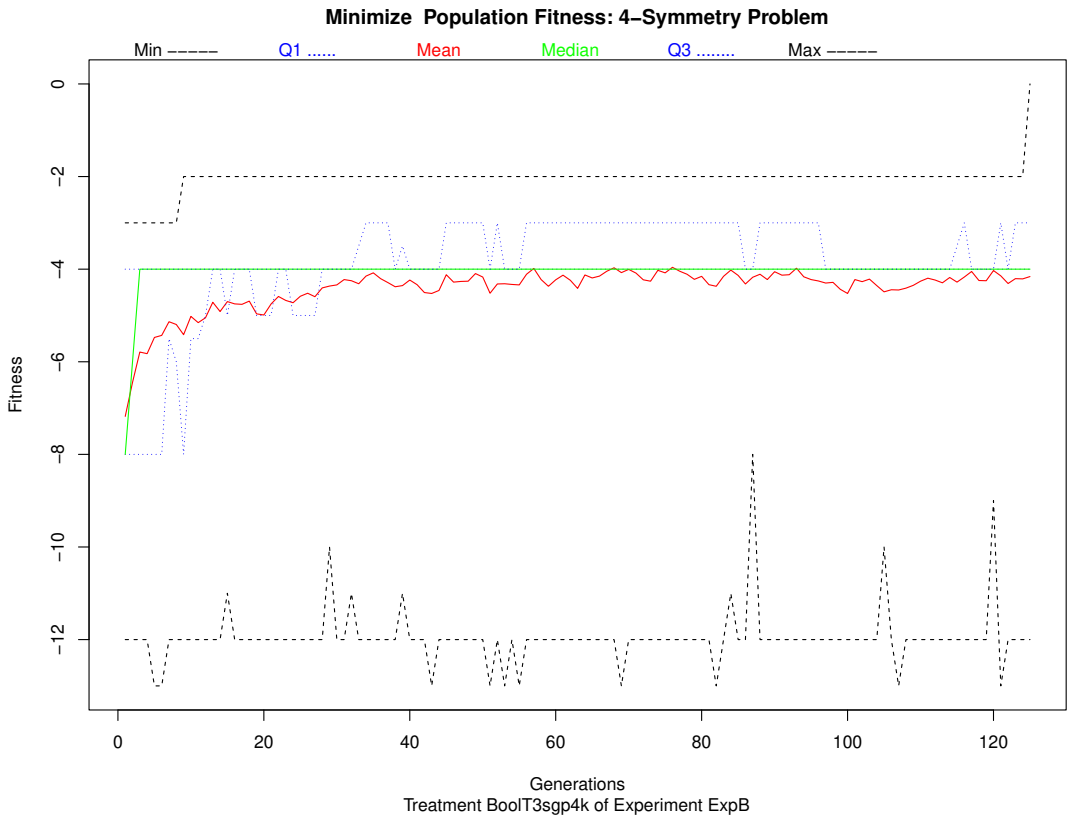
	Solution
1	AND(OR(AND(NOT(D1), NOT(D4)), AND(D1, D4)), OR(AND(D2, D3), AND(NOT(D2), NOT(D3))))

Table: The Solution Table of Treatment BoolT3sgp4k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 79.

The Derivation Tree of a Solution of Treatment BoolT3sgp4k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT3sgp4k of Experiment ExpB



Parameters of treatment: BoolT3sgp5k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT3sgp5k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT3sgp5k

Parameters of treatment BoolT3sgp5k passed to xegaRun

	Parameter Values
penv	5-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned3.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-32
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT3sgp5k passed to xegaRun (Part 1)

Parameters of treatment BoolT3sgp5k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	200
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT3sgp5k passed to xegaRun (Part 2)

Parameters of treatment BoolT3sgp5k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT3sgp5k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT3sgp5k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f0>	D3
7	<f0>	D4
8	<f0>	D5
9	<fe>	AND<sympairs>
10	<sympairs>	(D1,D5)
11	<sympairs>	(NOT(D1),NOT(D5))
12	<sympairs>	(D2,D4)
13	<sympairs>	(NOT(D2),NOT(D4))
14	<f1>	NOT
15	<f2>	OR

Table: The Production Table of Treatment BoolT3sgp5k of Experiment ExpB (Part 1)

The Production Table of Treatment BoolT3sgp5k of Experiment ExpB

	LHS	RHS
16	<f2>	OR
17	<f2>	AND

Table: The Production Table of Treatment BoolT3sgp5k of Experiment ExpB (Part 2)

Treatment: BoolT3sgp5k

	Treatment	Trials	Variable	min	mean	sd	max
76	BoolT3sgp5k	80	Evaluations	600.00	20555.00	15290.93	81600.00
73	BoolT3sgp5k	80	Fitness	0.00	0.00	0.00	0.00
75	BoolT3sgp5k	80	Generations	3.00	102.78	76.45	408.00
74	BoolT3sgp5k	80	Seconds	0.68	32.92	30.66	162.12

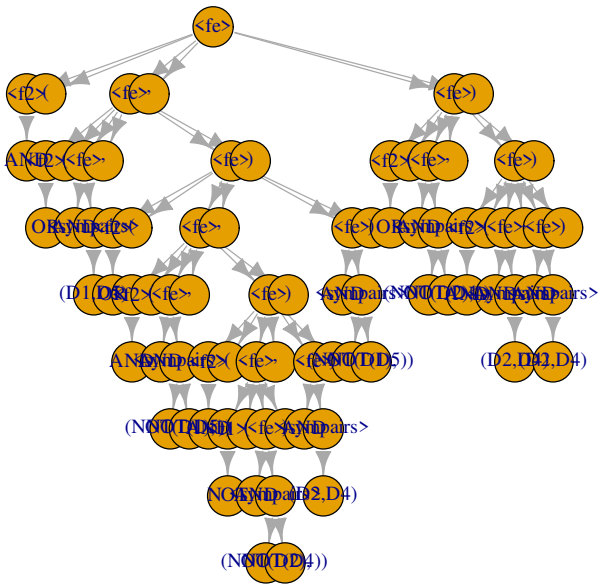
Table: Treatment: BoolT3sgp5k

The Solution Table of Treatment BoolT3sgp5k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 79.

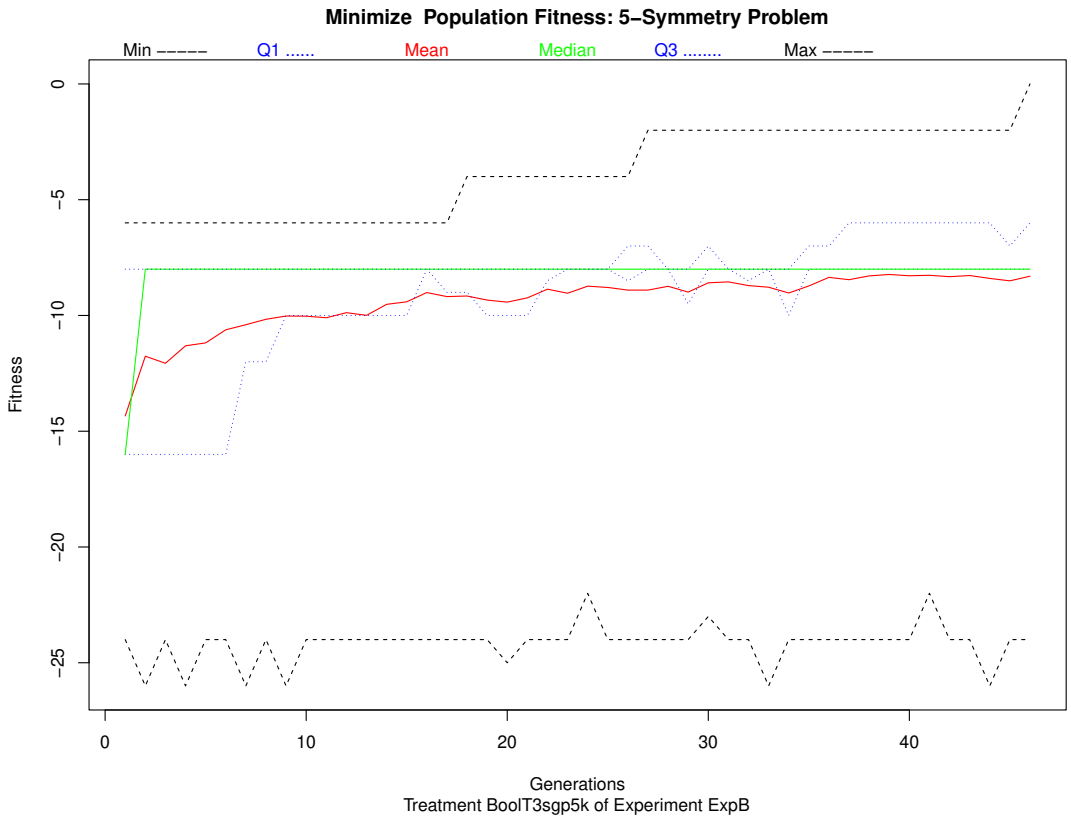
	Solution
1	AND(OR(AND(NOT(D1), NOT(D5)), AND(D1, D5)), OR(AND(D2, D4), AND(NOT(D2), NOT(D4))))

Table: The Solution Table of Treatment BoolT3sgp5k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 79.

The Derivation Tree of a Solution of Treatment BoolT3sgp5k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT3sgp5k of Experiment ExpB



Parameters of treatment: BoolT3sgp6k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT3sgp6k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT3sgp6k

Parameters of treatment BoolT3sgp6k passed to xegaRun

	Parameter Values
penv	6-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned3.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-64
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT3sgp6k passed to xegaRun (Part 1)

Parameters of treatment BoolT3sgp6k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	240
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT3sgp6k passed to xegaRun (Part 2)

Parameters of treatment BoolT3sgp6k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT3sgp6k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT3sgp6k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f0>	D3
7	<f0>	D4
8	<f0>	D5
9	<f0>	D6
10	<fe>	AND<sympairs>
11	<sympairs>	(D1,D6)
12	<sympairs>	(NOT(D1),NOT(D6))
13	<sympairs>	(D2,D5)
14	<sympairs>	(NOT(D2),NOT(D5))
15	<sympairs>	(D3,D4)

Table: The Production Table of Treatment BoolT3sgp6k of Experiment ExpB (Part 1)

The Production Table of Treatment BoolT3sgp6k of Experiment ExpB

	LHS	RHS
16	<sympairs>	(NOT(D3),NOT(D4))
17	<f1>	NOT
18	<f2>	OR
19	<f2>	OR
20	<f2>	AND

Table: The Production Table of Treatment BoolT3sgp6k of Experiment ExpB (Part 2)

Treatment: BoolT3sgp6k

	Treatment	Trials	Variable	min	mean	sd	max
80	BoolT3sgp6k	80	Evaluations	32800.00	97515.00	11419.32	100000.00
77	BoolT3sgp6k	80	Fitness	0.00	4.41	1.38	6.00
79	BoolT3sgp6k	80	Generations	164.00	487.57	57.10	500.00
78	BoolT3sgp6k	80	Seconds	72.32	238.16	39.72	314.79

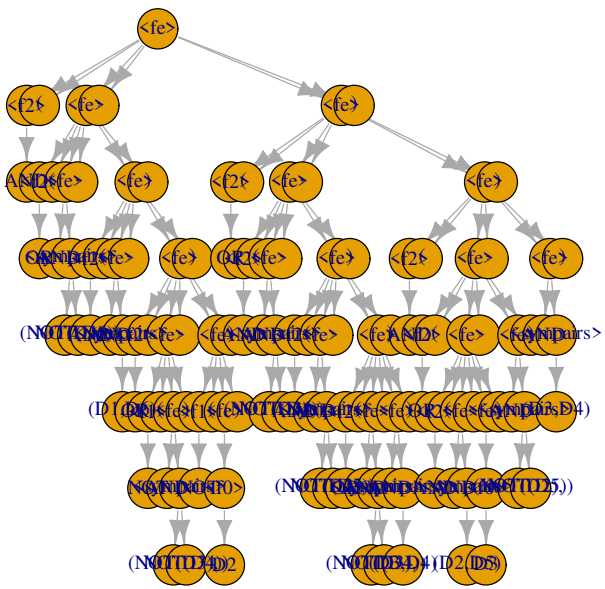
Table: Treatment: BoolT3sgp6k

The Solution Table of Treatment BoolT3sgp6k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 4.

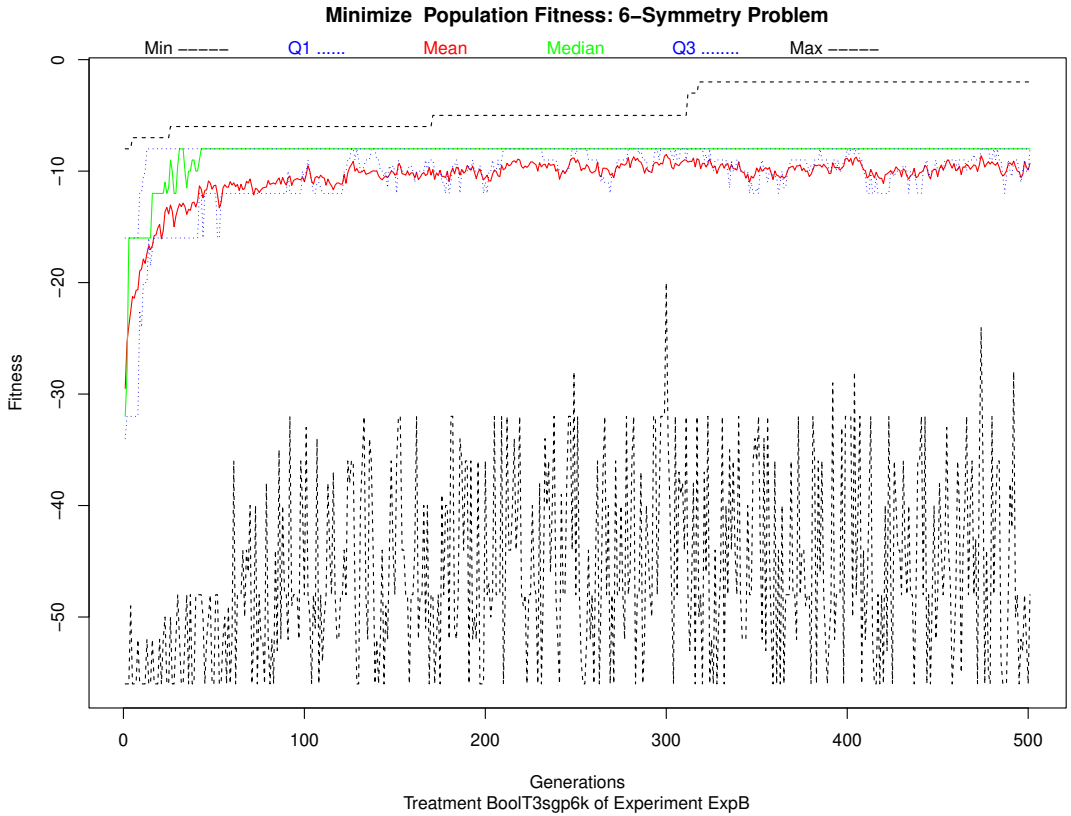
	Solution
1	AND(AND(OR(AND(NOT(D1), NOT(D6)), AND(D1, D6)), OR(AND(NOT(D2), NOT(D5)), AND(D2, D5))), OR(AND(D3, D4), AND(NOT(D3), NOT(D4))))

Table: The Solution Table of Treatment BoolT3sgp6k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 4.

The Derivation Tree of a Solution of Treatment BoolT3sgp6k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT3sgp6k of Experiment ExpB



Parameters of treatment: BoolT4sgp2k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT4sgp2k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT4sgp2k

Parameters of treatment BoolT4sgp2k passed to xegaRun

	Parameter Values
penv	2-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned4.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-4
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT4sgp2k passed to xegaRun (Part 1)

Parameters of treatment BoolT4sgp2k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	80
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT4sgp2k passed to xegaRun (Part 2)

Parameters of treatment BoolT4sgp2k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT4sgp2k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT4sgp2k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<fe>	AND<sympairs>
7	<fe>	AND<sympairs>
8	<sympairs>	(D1,D2)
9	<sympairs>	(NOT(D1),NOT(D2))
10	<f1>	NOT
11	<f2>	OR
12	<f2>	OR
13	<f2>	AND

Table: The Production Table of Treatment BoolT4sgp2k of Experiment ExpB

Treatment: BoolT4sgp2k

	Treatment	Trials	Variable	min	mean	sd	max
84	BoolT4sgp2k	80	Evaluations	200.00	200.00	0.00	200.00
81	BoolT4sgp2k	80	Fitness	0.00	0.00	0.00	0.00
83	BoolT4sgp2k	80	Generations	1.00	1.00	0.00	1.00
82	BoolT4sgp2k	80	Seconds	0.16	0.24	0.06	0.39

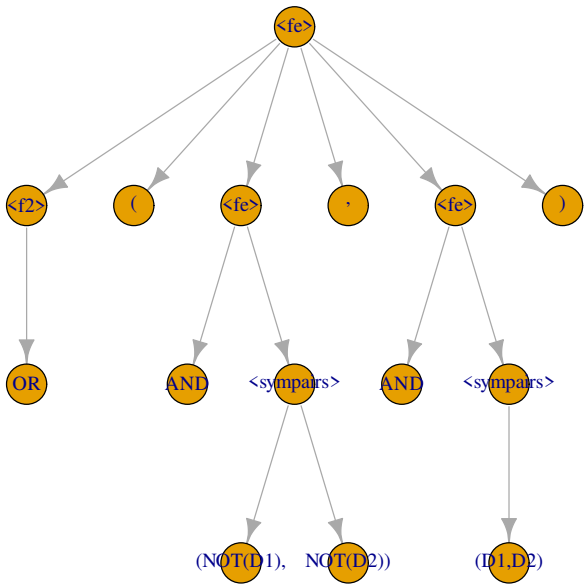
Table: Treatment: BoolT4sgp2k

The Solution Table of Treatment BoolT4sgp2k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 31.

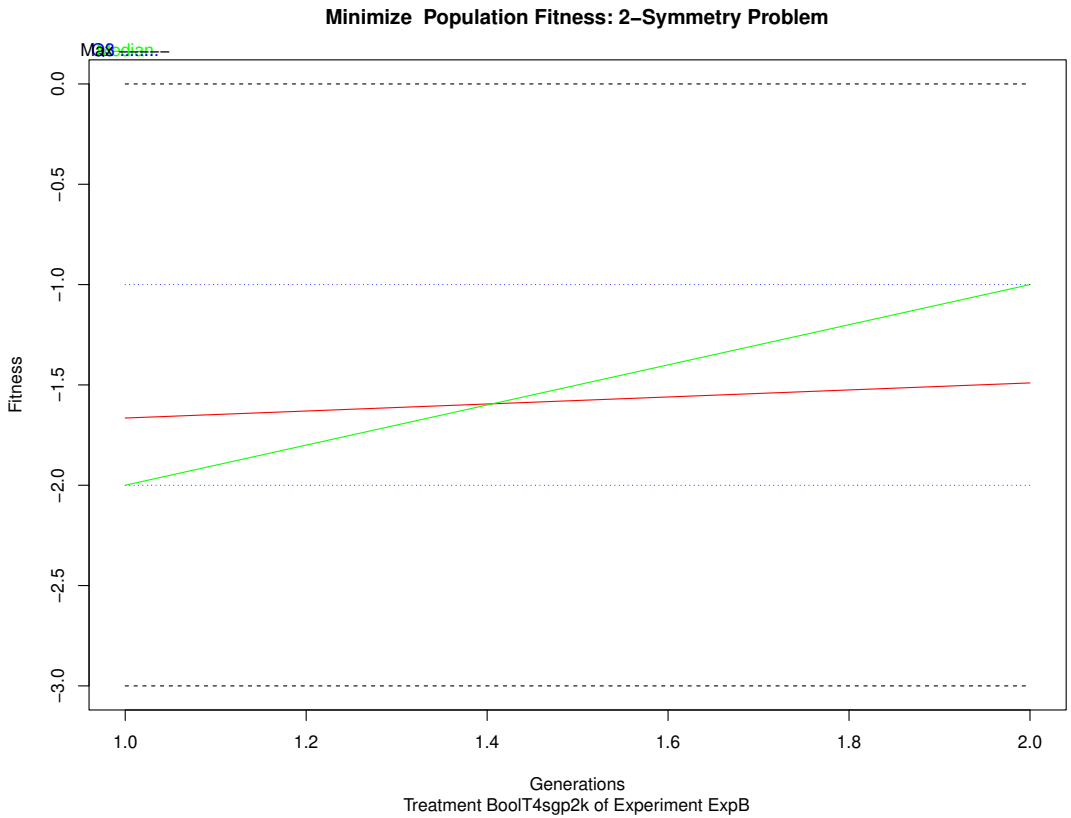
	Solution
1	OR(AND(NOT(D1), NOT(D2)), AND(D2, D1))

Table: The Solution Table of Treatment BoolT4sgp2k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 31.

The Derivation Tree of a Solution of Treatment BoolT4sgp2k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT4sgp2k of Experiment ExpB



Parameters of treatment: BoolT4sgp3k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT4sgp3k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT4sgp3k

Parameters of treatment BoolT4sgp3k passed to xegaRun

	Parameter Values
penv	3-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned4.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-8
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT4sgp3k passed to xegaRun (Part 1)

Parameters of treatment BoolT4sgp3k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	120
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT4sgp3k passed to xegaRun (Part 2)

Parameters of treatment BoolT4sgp3k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT4sgp3k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT4sgp3k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f0>	D3
7	<fe>	AND<sympairs>
8	<fe>	AND<sympairs>
9	<sympairs>	(D1,D3)
10	<sympairs>	(NOT(D1),NOT(D3))
11	<f1>	NOT
12	<f2>	OR
13	<f2>	OR
14	<f2>	AND

Table: The Production Table of Treatment BoolT4sgp3k of Experiment ExpB

Treatment: BoolT4sgp3k

	Treatment	Trials	Variable	min	mean	sd	max
88	BoolT4sgp3k	80	Evaluations	200.00	202.50	22.36	400.00
85	BoolT4sgp3k	80	Fitness	0.00	0.00	0.00	0.00
87	BoolT4sgp3k	80	Generations	1.00	1.01	0.11	2.00
86	BoolT4sgp3k	80	Seconds	0.21	0.30	0.06	0.68

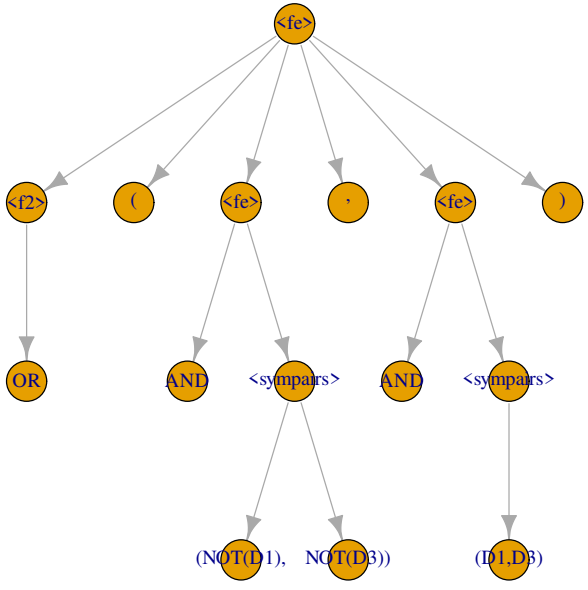
Table: Treatment: BoolT4sgp3k

The Solution Table of Treatment BoolT4sgp3k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 28.

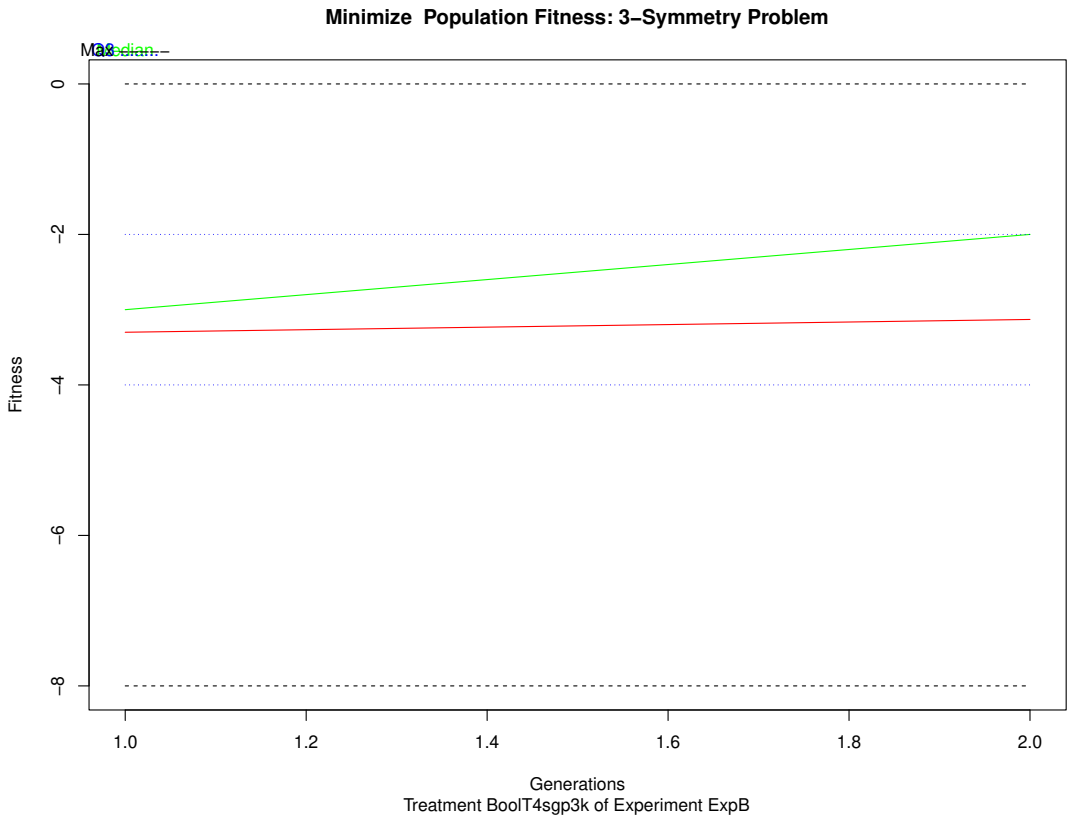
	Solution
1	OR(AND(NOT(D1), NOT(D3)), AND(D1, D3))

Table: The Solution Table of Treatment BoolT4sgp3k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 28.

The Derivation Tree of a Solution of Treatment BoolT4sgp3k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT4sgp3k of Experiment ExpB



Parameters of treatment: BoolT4sgp4k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT4sgp4k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT4sgp4k

Parameters of treatment BoolT4sgp4k passed to xegaRun

	Parameter Values
penv	4-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned4.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-16
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT4sgp4k passed to xegaRun (Part 1)

Parameters of treatment BoolT4sgp4k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	160
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT4sgp4k passed to xegaRun (Part 2)

Parameters of treatment BoolT4sgp4k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT4sgp4k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT4sgp4k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f0>	D3
7	<f0>	D4
8	<fe>	AND<sympairs>
9	<fe>	AND<sympairs>
10	<sympairs>	(D1,D4)
11	<sympairs>	(NOT(D1),NOT(D4))
12	<sympairs>	(D2,D3)
13	<sympairs>	(NOT(D2),NOT(D3))
14	<f1>	NOT
15	<f2>	OR

Table: The Production Table of Treatment BoolT4sgp4k of Experiment ExpB (Part 1)

The Production Table of Treatment BoolT4sgp4k of Experiment ExpB

	LHS	RHS
16	<f2>	OR
17	<f2>	AND

Table: The Production Table of Treatment BoolT4sgp4k of Experiment ExpB (Part 2)

Treatment: BoolT4sgp4k

	Treatment	Trials	Variable	min	mean	sd	max
92	BoolT4sgp4k	80	Evaluations	1400.00	15402.50	8377.03	44200.00
89	BoolT4sgp4k	80	Fitness	0.00	0.00	0.00	0.00
91	BoolT4sgp4k	80	Generations	7.00	77.01	41.89	221.00
90	BoolT4sgp4k	80	Seconds	1.32	17.93	11.89	71.35

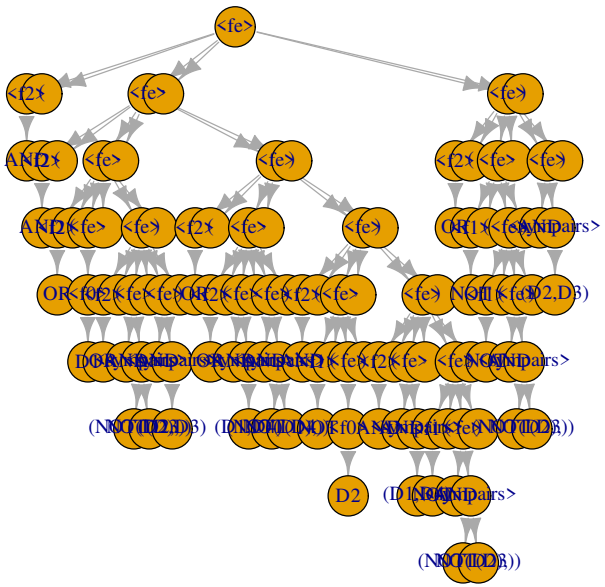
Table: Treatment: BoolT4sgp4k

The Solution Table of Treatment BoolT4sgp4k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 68.

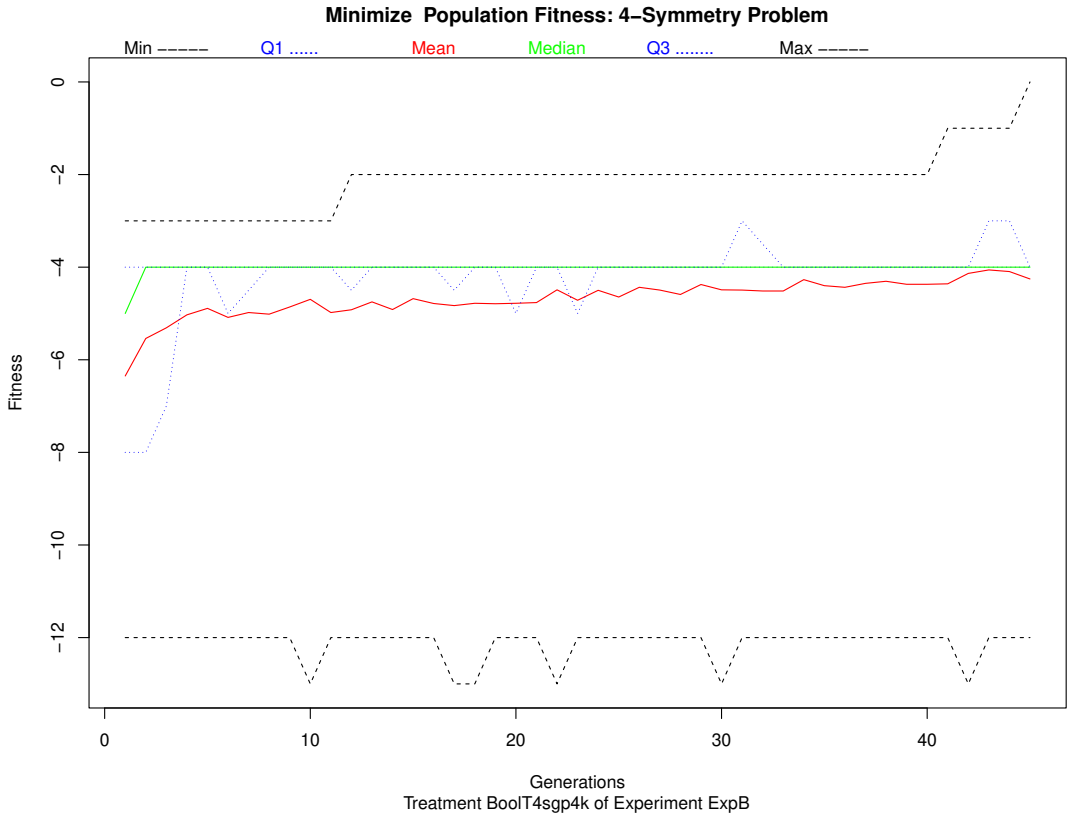
	Solution
1	AND(OR(AND(NOT(D2), NOT(D3)), AND(D2, D3)), OR(AND(D1, D4), AND(NOT(D1), NOT(D4))))

Table: The Solution Table of Treatment BoolT4sgp4k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 68.

The Derivation Tree of a Solution of Treatment BoolT4sgp4k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT4sgp4k of Experiment ExpB



Parameters of treatment: BoolT4sgp5k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT4sgp5k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT4sgp5k

Parameters of treatment BoolT4sgp5k passed to xegaRun

	Parameter Values
penv	5-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned4.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-32
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT4sgp5k passed to xegaRun (Part 1)

Parameters of treatment BoolT4sgp5k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	200
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT4sgp5k passed to xegaRun (Part 2)

Parameters of treatment BoolT4sgp5k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT4sgp5k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT4sgp5k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f0>	D3
7	<f0>	D4
8	<f0>	D5
9	<fe>	AND<sympairs>
10	<fe>	AND<sympairs>
11	<sympairs>	(D1,D5)
12	<sympairs>	(NOT(D1),NOT(D5))
13	<sympairs>	(D2,D4)
14	<sympairs>	(NOT(D2),NOT(D4))
15	<f1>	NOT

Table: The Production Table of Treatment BoolT4sgp5k of Experiment ExpB (Part 1)

The Production Table of Treatment BoolT4sgp5k of Experiment ExpB

	LHS	RHS
16	<f2>	OR
17	<f2>	OR
18	<f2>	AND

Table: The Production Table of Treatment BoolT4sgp5k of Experiment ExpB (Part 2)

Treatment: BoolT4sgp5k

	Treatment	Trials	Variable	min	mean	sd	max
96	BoolT4sgp5k	80	Evaluations	2000.00	14620.00	10549.35	51200.00
93	BoolT4sgp5k	80	Fitness	0.00	0.00	0.00	0.00
95	BoolT4sgp5k	80	Generations	10.00	73.10	52.75	256.00
94	BoolT4sgp5k	80	Seconds	1.50	18.16	17.35	103.10

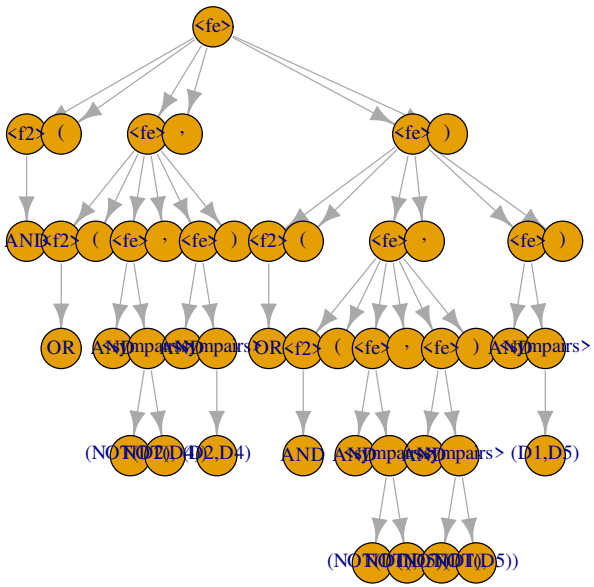
Table: Treatment: BoolT4sgp5k

The Solution Table of Treatment BoolT4sgp5k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 71.

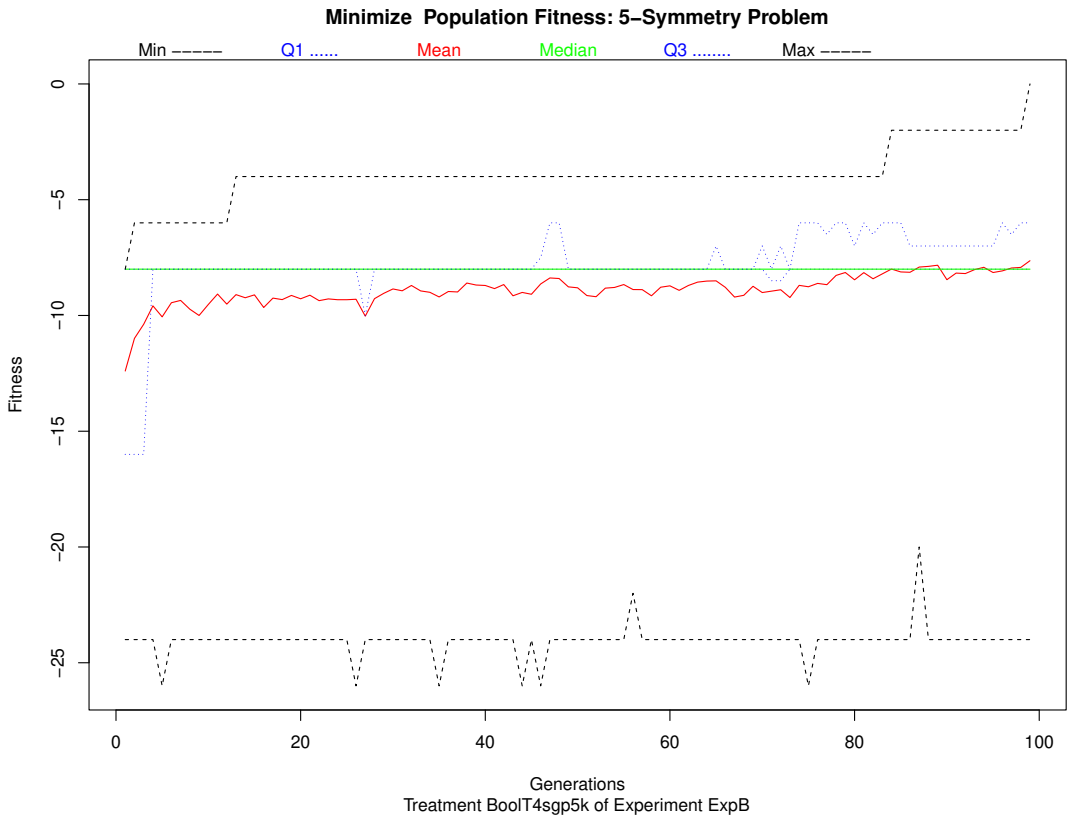
	Solution
1	AND(OR(AND(NOT(D2), NOT(D4)), AND(D2, D4)), OR(AND(NOT(D1), NOT(D5)), AND(D1, D5)))

Table: The Solution Table of Treatment BoolT4sgp5k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 71.

The Derivation Tree of a Solution of Treatment BoolT4sgp5k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT4sgp5k of Experiment ExpB



Parameters of treatment: BoolT4sgp6k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EB
treatmentName	BoolT4sgp6k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT4sgp6k

Parameters of treatment BoolT4sgp6k passed to xegaRun

	Parameter Values
penv	6-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned4.txt
replay	0
algorithm	sgp
maxdepth	7
max	FALSE
worstFitness	-64
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
ivmutrate	Const
mutrate2	0.8
ivcrossrate	Const
crossrate2	0.4

Table: Parameters of treatment BoolT4sgp6k passed to xegaRun (Part 1)

Parameters of treatment BoolT4sgp6k passed to xegaRun

	Parameter Values
scalefactor	Uniform
genemap	Bin2Dec
initgene	InitGene
selection	SUS
mateselection	SUS
replication	Kid2
crossover	Cross2Gene
mutation	MutateGene
accept	All
reportEvalErrors	TRUE
codons	240
codonPrecision	LCM
terminationEps	-0.1
terminationCondition	AbsoluteError
evalmethod	Deterministic

Table: Parameters of treatment BoolT4sgp6k passed to xegaRun (Part 2)

Parameters of treatment BoolT4sgp6k passed to xegaRun

	Parameter Values
executionModel	MultiCore
verbose	1
batch	FALSE
semantics	byValue
path	.

Table: Parameters of treatment BoolT4sgp6k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT4sgp6k of Experiment ExpB

	LHS	RHS
1	<fe>	<f0>
2	<fe>	<f1>(<fe>)
3	<fe>	<f2>(<fe>,<fe>)
4	<f0>	D1
5	<f0>	D2
6	<f0>	D3
7	<f0>	D4
8	<f0>	D5
9	<f0>	D6
10	<fe>	AND<sympairs>
11	<fe>	AND<sympairs>
12	<sympairs>	(D1,D6)
13	<sympairs>	(NOT(D1),NOT(D6))
14	<sympairs>	(D2,D5)
15	<sympairs>	(NOT(D2),NOT(D5))

Table: The Production Table of Treatment BoolT4sgp6k of Experiment ExpB (Part 1)

The Production Table of Treatment BoolT4sgp6k of Experiment ExpB

	LHS	RHS
16	<sympairs>	(D3,D4)
17	<sympairs>	(NOT(D3),NOT(D4))
18	<f1>	NOT
19	<f2>	OR
20	<f2>	OR
21	<f2>	AND

Table: The Production Table of Treatment BoolT4sgp6k of Experiment ExpB (Part 2)

Treatment: BoolT4sgp6k

	Treatment	Trials	Variable	min	mean	sd	m
100	BoolT4sgp6k	80	Evaluations	19000.00	92135.00	20136.92	100000.0
97	BoolT4sgp6k	80	Fitness	0.00	3.33	1.61	6.0
99	BoolT4sgp6k	80	Generations	95.00	460.68	100.68	500.0
98	BoolT4sgp6k	80	Seconds	26.67	193.42	52.41	277.9

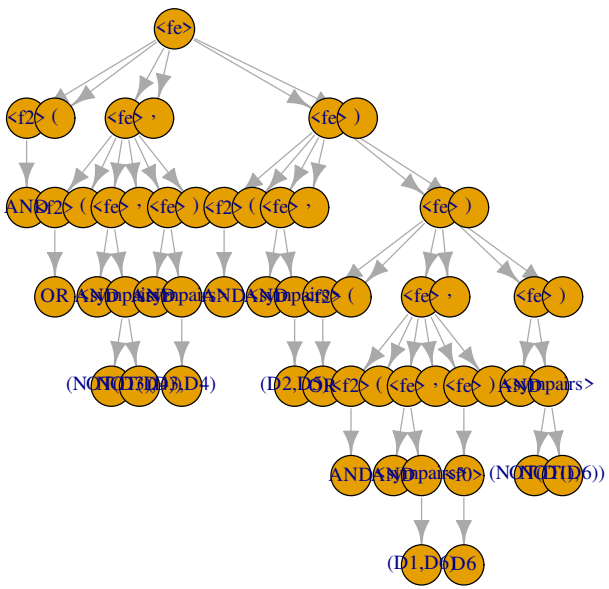
Table: Treatment: BoolT4sgp6k

The Solution Table of Treatment BoolT4sgp6k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 13.

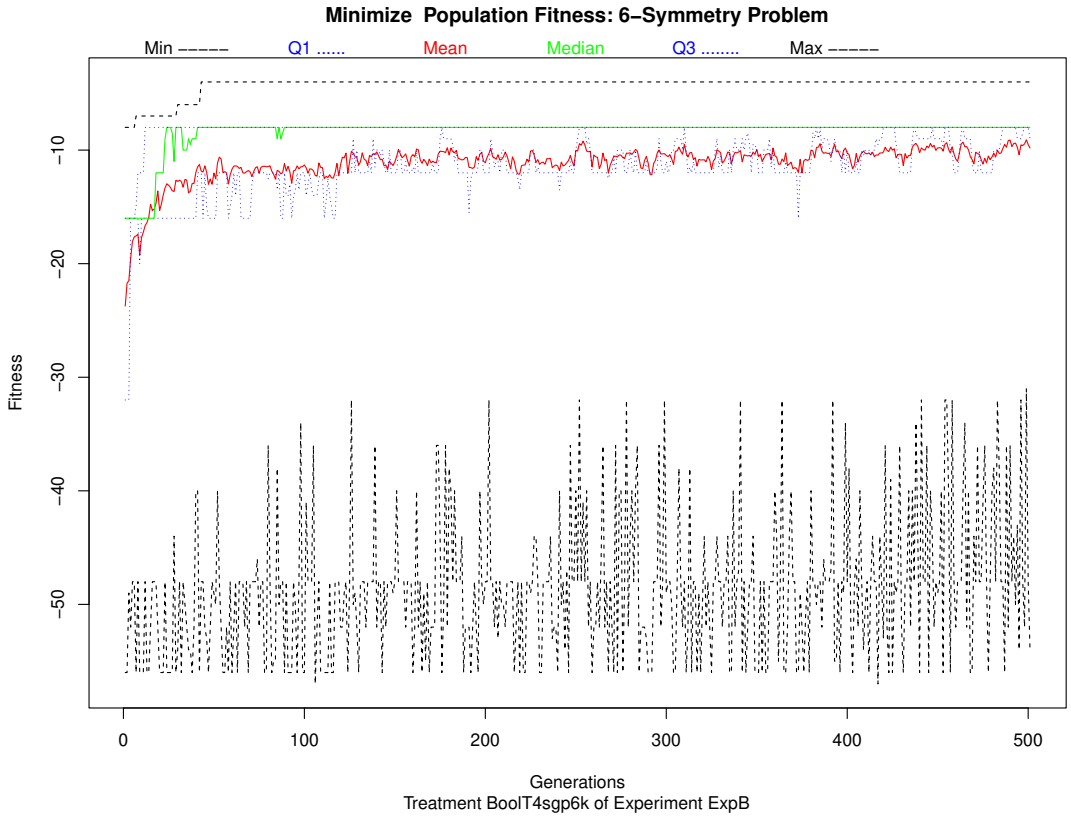
	Solution
1	AND(AND(OR(AND(NOT(D1), NOT(D6)), AND(D1, D6)), OR(AND(NOT(D3), NOT(D4)), AND(D3, D4))), OR(AND(D2, D5), AND(NOT(D2), NOT(D5))))

Table: The Solution Table of Treatment BoolT4sgp6k of Experiment ExpB. Fit: 0. Unique Shortest Solutions: 13.

The Derivation Tree of a Solution of Treatment BoolT4sgp6k of Experiment ExpB



Plot of last xegaRun for Treatment BoolT4sgp6k of Experiment ExpB



All parameters of xegaRun of treatment BoolT0sgp2k

	Parameter Values
penv	2-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNot.txt
max	FALSE
algorithm	sgp
popsize	200
generations	500
crossrate	0.2
mutrate	0.4
elitist	TRUE
replay	0
maxdepth	7
maxtrials	5
codons	80
codonBits	0
codonPrecision	LCM

Table: All parameters of xegaRun of treatment BoolT0sgp2k (Part 1)

All parameters of xegaRun of treatment BoolT0sgp2k

	Parameter Values
maxPBias	0.01
evalmethod	Deterministic
evalrep	1
reportEvalErrors	TRUE
genemap	Bin2Dec
decoder	DecodeGene
crossrate2	0.4
ivcrossrate	Const
crossover	Cross2Gene
uCrossSwap	0.2
mincrossdepth	1
maxcrossdepth	7
ivmutrate	Const
mutrate2	0.8
bitmutrate	0.005

Table: All parameters of xegaRun of treatment BoolT0sgp2k (Part 2)

All parameters of xegaRun of treatment BoolT0sgp2k

	Parameter Values
bitmutrate2	0.01
maxmutdepth	3
minmutinsertiondepth	1
maxmutinsertiondepth	7
lambda	0.05
max2opt	100
scalefactor1	0.9
scalefactor2	0.3
scalefactor	Uniform
cutoffFit	0.5
mutation	MutateGene
replication	Kid2
initgene	InitGene
offset	1
eps	0.01

Table: All parameters of xegaRun of treatment BoolT0sgp2k (Part 3)

All parameters of xegaRun of treatment BoolT0sgp2k

	Parameter Values
tournamentSize	2
selectionBias	1.5
maxTSR	1.5
selection	SUS
mateselection	SUS
selectionContinuation	TRUE
scaling	NoScaling
scalingThreshold	0
scalingExp	1
scalingExp2	1
rdmWeight	1
drMax	2
drMin	0.5
dispersionMeasure	var
scalingDelay	1

Table: All parameters of xegaRun of treatment BoolT0sgp2k (Part 4)

All parameters of xegaRun of treatment BoolT0sgp2k

	Parameter Values
accept	All
alpha	0.99
beta	2
cooling	ExponentialMultiplicative
coolingPower	1
temp0	40
tempN	0.01
verbose	1
logevals	FALSE
allsolutions	FALSE
early	FALSE
terminationCondition	AbsoluteError
terminationEps	-0.1
terminationThreshold	0
worstFitness	-4

Table: All parameters of xegaRun of treatment BoolT0sgp2k (Part 5)

All parameters of xegaRun of treatment BoolT0sgp2k

	Parameter Values
PACdelta	0.01
fSpace	Hilbert
cores	16
executionModel	MultiCore
uParApply	NULL
Cluster	NULL
profile	FALSE
batch	FALSE
path	.
semantics	byValue

Table: All parameters of xegaRun of treatment BoolT0sgp2k (Part 6)