Report of Experiment ExpE. k-Symmetry: Grammar Tuning and Language Tuning

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May 14, 2025

Abstract

Grammar tuning adapts the language. Language tuning adds new language elements. In this experiment we compare the best grammar of experiment B with a grammar with symmetric pairs and an additional function.

Contents I

Contents II

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 a grammar-based genetic programming algorithm.

Definition

Language tuning means adding additional language elements. This means changing the grammar **and** the syntax of the language elements and changing the implementation of the language so that the semantics of the language is implemented.

Example: Adding a new base function. E.g. NAND.

Description of Experiment

The purpose of this computational experiment is to show the improvement of performance by grammar **and** language 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 10 treatments, 2 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:
  - **T4**: With two rules for OR and two rules for variables replaced by symmetric pairs.
  - **T5**: With symmetric pairs and a new base function, the function sPair(x, y) which implements
    sPair <- function(x,y)
    {OR(AND(x,y),AND(NOT(x),NOT(y)))}

Common Parameters of Experiment ExpE

	Parameter Value
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
Codon.Precision	LCM

Table: Common Parameters of Experiment ExpE (Part 1)

Common Parameters of Experiment ExpE

	Parameter Value
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 ExpE (Part 2)

Parameters of Treatments of Experiment ExpE

	Experiment	Treatment	Problem Environment	Grammar	Worst
1	EB	BoolT4sgp2k	2-Symmetry Problem	AndOrNotTuned4.txt	
2	EB	BoolT4sgp3k	3-Symmetry Problem	AndOrNotTuned4.txt	
3	EB	BoolT4sgp4k	4-Symmetry Problem	AndOrNotTuned4.txt	
4	EB	BoolT4sgp5k	5-Symmetry Problem	AndOrNotTuned4.txt	
5	EB	BoolT4sgp6k	6-Symmetry Problem	AndOrNotTuned4.txt	
6	EE	BoolT5sgp2k	2-Symmetry Problem	AndOrNotTuned5.txt	
7	EE	BoolT5sgp3k	3-Symmetry Problem	AndOrNotTuned5.txt	
8	EE	BoolT5sgp4k	4-Symmetry Problem	AndOrNotTuned5.txt	
9	EE	BoolT5sgp5k	5-Symmetry Problem	AndOrNotTuned5.txt	
10	EE	BoolT5sgp6k	6-Symmetry Problem	AndOrNotTuned5.txt	

Table: Parameters of Treatments of Experiment ExpE

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

	T4	T5
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	0.00	0.00
5	3.33	0.00

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)

	T4	T5
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	0.00	0.00
5	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?

- For grammar T5: **Yes.** For grammar T4: **No.** (Not for the 6-symmetry problem with 500 generations.
- For the 6-symmetry problem, the grammar T4 has maximum of 6 errors.

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

	T4	T5
1	0.24	0.22
2	0.30	0.25
3	17.93	0.31
4	18.16	0.34
5	193.42	1.93

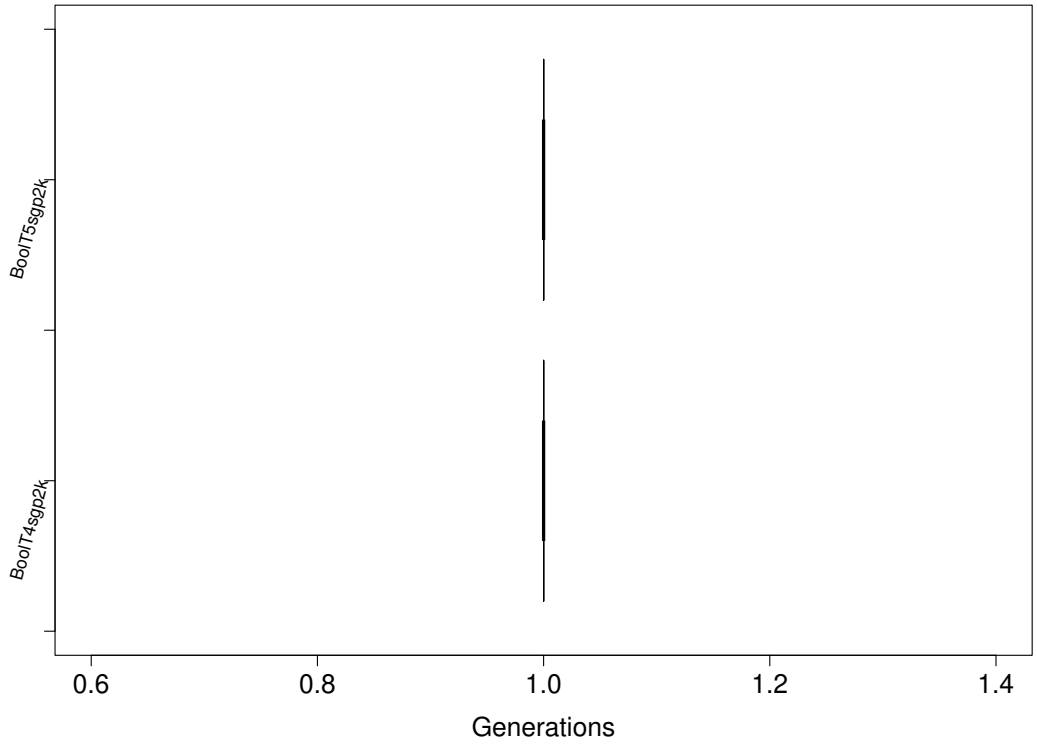
Table: Matrix of Mean of Seconds. Rows: k=2, 3, 4, 5, 6)

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

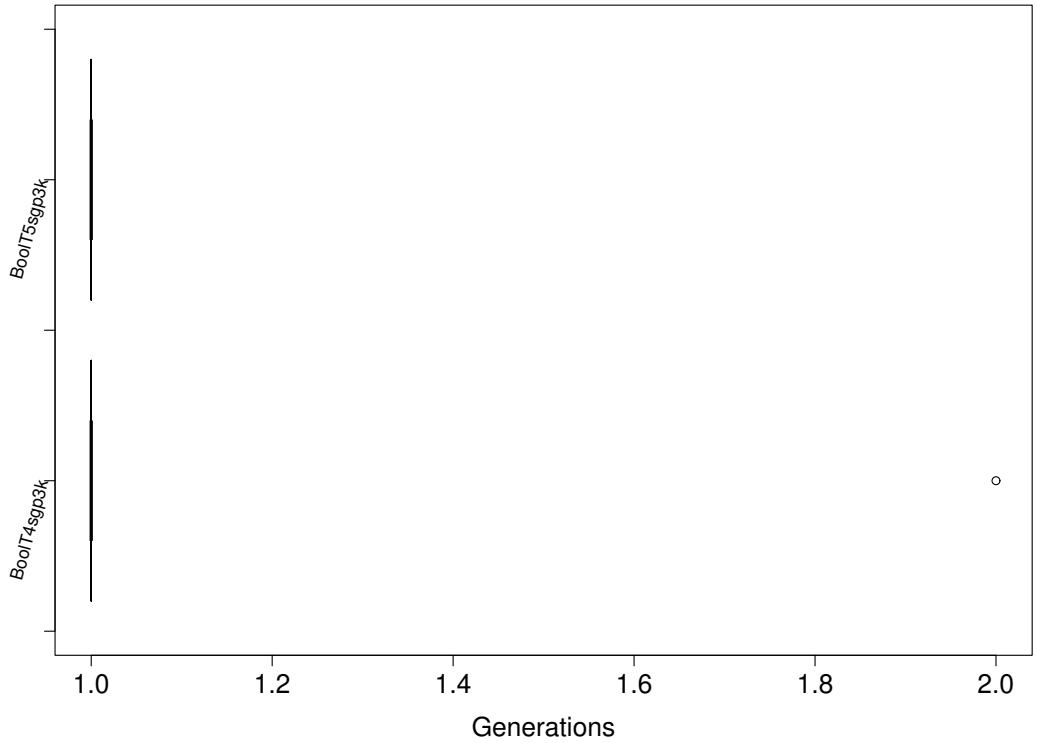
	T4	T5
1	1.00	1.00
2	1.01	1.00
3	77.01	1.23
4	73.10	1.20
5	460.68	7.22

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

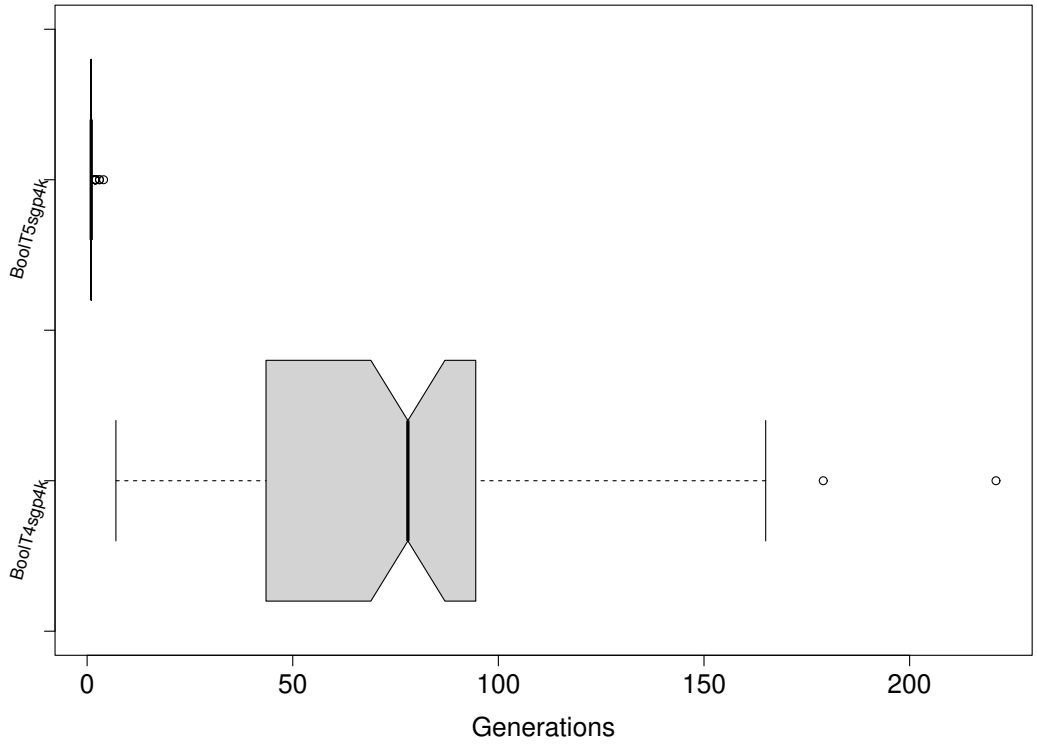
Distribution of Number of Generations for Grammars. 2k symmetry.



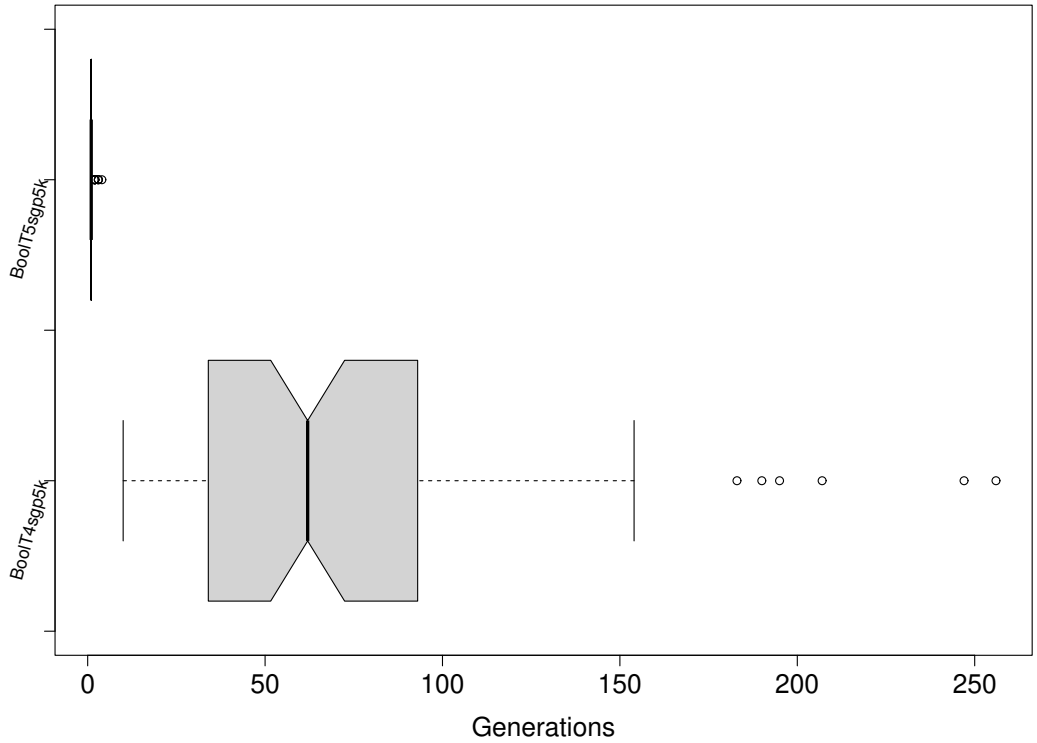
Distribution of Number of Generations for Grammars. 3k symmetry.



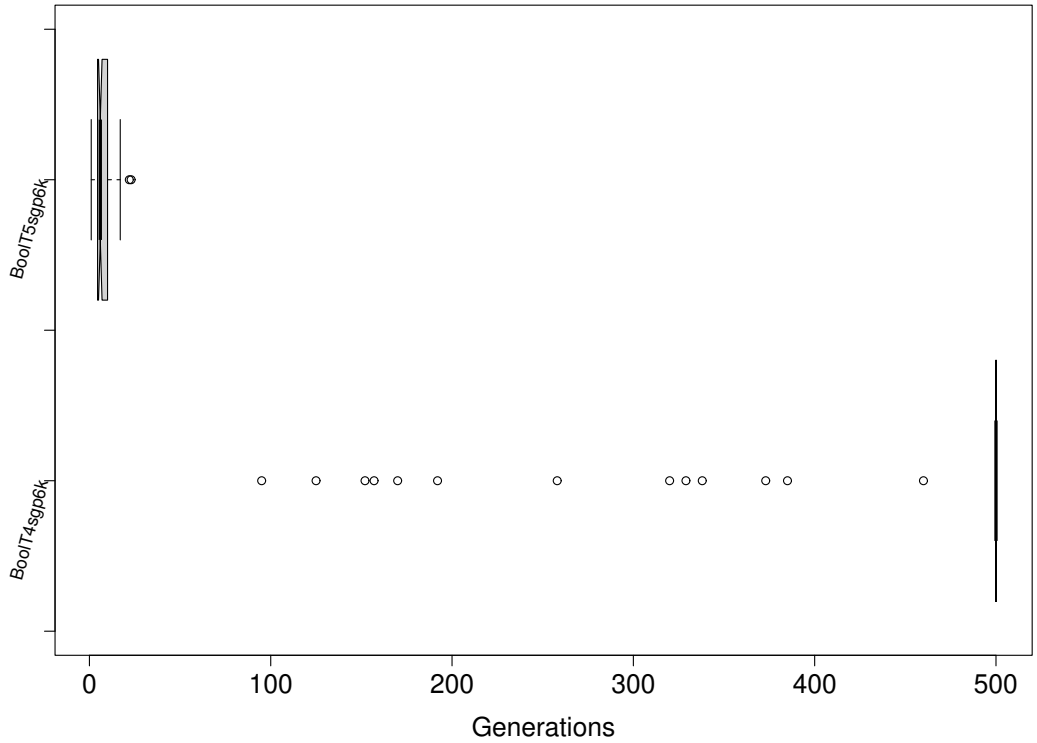
Distribution of Number of Generations for Grammars. 4k symmetry.



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



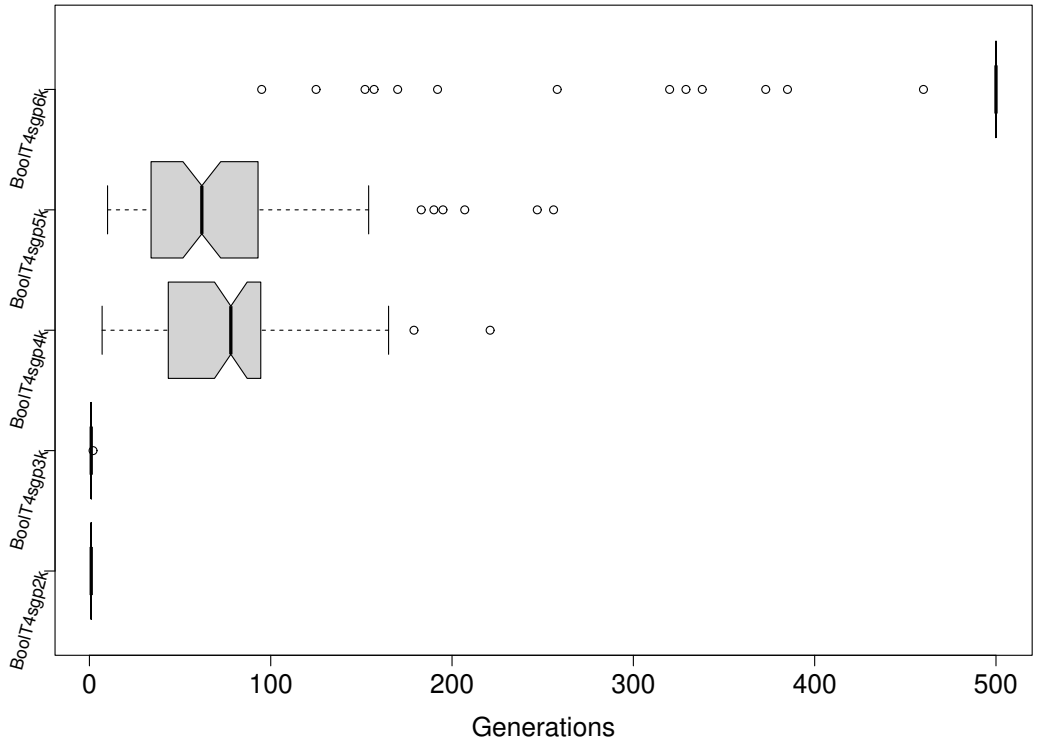
Distribution of Number of Generations for Grammars. 6k symmetry.



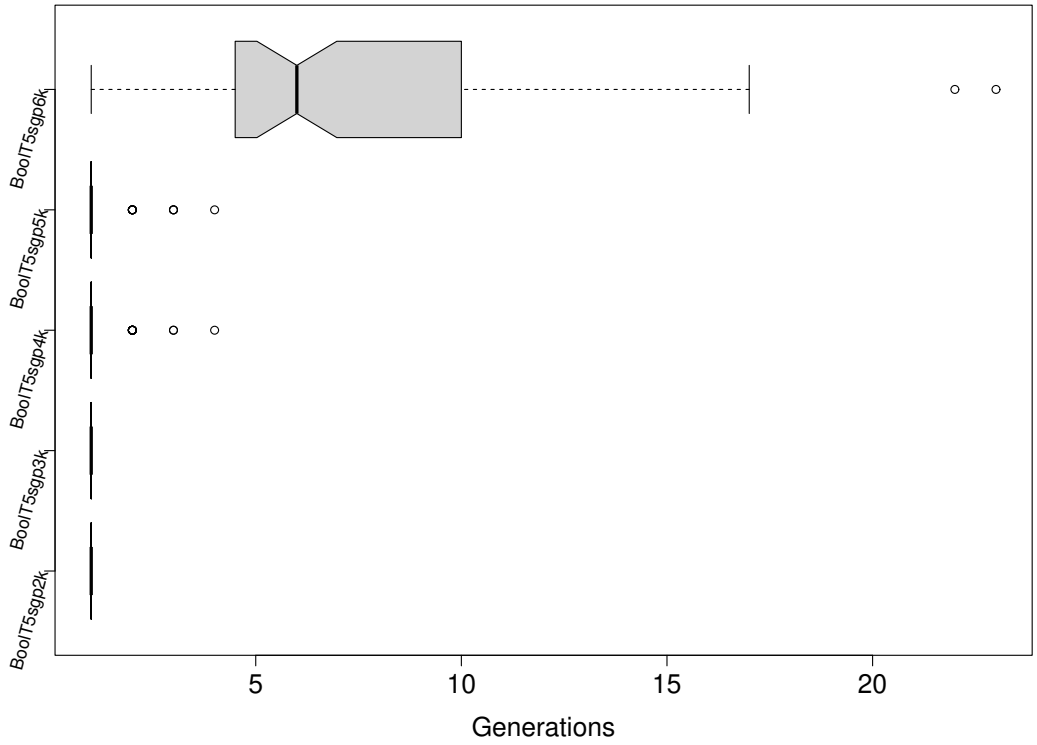
Which grammar performs best?

- **Grammar T5** performs **best** (by two orders of magnitude).
  For the 6-symmetry problem:
  Grammar T4: 460.68 mean(Generations) 100.68 std(Generations).
  Grammar T5: 7.22 mean(Generations) 4.27 std(Generations).
  $\max(\text{Generations}_{T5}) = 23.00$.
  $\min(\text{Generations}_{T4}) = 95.00$.
  Statistically significant? Not tested. Expect highly significant.

Distribution of Number of Generations for Grammar T4



Distribution of Number of Generations for Grammar T5



Growth of Complexity?

- Complexity grows in steps of 2 of k. 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, D2 is ignored.
- Grammar T5 scales well with problem size growth.
  Reason: The combination of **grammar** and **language** tuning. The generation of pairs of symbols (grammar tuning) and the new function sPair. It takes a symbol pair as its arguments eliminates the need to expand a a non-terminal twice with the same symbol pair (language tuning).

Further Research.

Integrate grammar and language tuning into grammar-based genetic programming algorithms.

Mechanisms: Automatic function definitions e.g. from from best solutions for small k.

Grammar evolution from frontiers of derivation trees.

Summary of statistics of experiment ExpE.

	Treatment	Trials	Variable	min	mean	sd	max
4	BoolT4sgp2k	80	Evaluations	200.00	200.00	0.00	200.00
8	BoolT4sgp3k	80	Evaluations	200.00	202.50	22.36	400.00
12	BoolT4sgp4k	80	Evaluations	1400.00	15402.50	8377.03	44200.00
16	BoolT4sgp5k	80	Evaluations	2000.00	14620.00	10549.35	51200.00
20	BoolT4sgp6k	80	Evaluations	19000.00	92135.00	20136.92	100000.00
24	BoolT5sgp2k	80	Evaluations	200.00	200.00	0.00	200.00
28	BoolT5sgp3k	80	Evaluations	200.00	200.00	0.00	200.00
32	BoolT5sgp4k	80	Evaluations	200.00	245.00	110.12	800.00
36	BoolT5sgp5k	80	Evaluations	200.00	240.00	112.06	800.00
40	BoolT5sgp6k	80	Evaluations	200.00	1445.00	853.27	4600.00
1	BoolT4sgp2k	80	Fitness	0.00	0.00	0.00	0.00
5	BoolT4sgp3k	80	Fitness	0.00	0.00	0.00	0.00
9	BoolT4sgp4k	80	Fitness	0.00	0.00	0.00	0.00
13	BoolT4sgp5k	80	Fitness	0.00	0.00	0.00	0.00
17	BoolT4sgp6k	80	Fitness	0.00	3.33	1.61	6.00

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

Summary of statistics of experiment ExpE.

	Treatment	Trials	Variable	min	mean	sd	max
21	BoolT5sgp2k	80	Fitness	0.00	0.00	0.00	0.00
25	BoolT5sgp3k	80	Fitness	0.00	0.00	0.00	0.00
29	BoolT5sgp4k	80	Fitness	0.00	0.00	0.00	0.00
33	BoolT5sgp5k	80	Fitness	0.00	0.00	0.00	0.00
37	BoolT5sgp6k	80	Fitness	0.00	0.00	0.00	0.00
3	BoolT4sgp2k	80	Generations	1.00	1.00	0.00	1.00
7	BoolT4sgp3k	80	Generations	1.00	1.01	0.11	2.00
11	BoolT4sgp4k	80	Generations	7.00	77.01	41.89	221.00
15	BoolT4sgp5k	80	Generations	10.00	73.10	52.75	256.00
19	BoolT4sgp6k	80	Generations	95.00	460.68	100.68	500.00
23	BoolT5sgp2k	80	Generations	1.00	1.00	0.00	1.00
27	BoolT5sgp3k	80	Generations	1.00	1.00	0.00	1.00
31	BoolT5sgp4k	80	Generations	1.00	1.23	0.55	4.00
35	BoolT5sgp5k	80	Generations	1.00	1.20	0.56	4.00
39	BoolT5sgp6k	80	Generations	1.00	7.22	4.27	23.00

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

Summary of statistics of experiment ExpE.

	Treatment	Trials	Variable	min	mean	sd	max
2	BoolT4sgp2k	80	Seconds	0.16	0.24	0.06	0.39
6	BoolT4sgp3k	80	Seconds	0.21	0.30	0.06	0.68
10	BoolT4sgp4k	80	Seconds	1.32	17.93	11.89	71.35
14	BoolT4sgp5k	80	Seconds	1.50	18.16	17.35	103.10
18	BoolT4sgp6k	80	Seconds	26.67	193.42	52.41	277.97
22	BoolT5sgp2k	80	Seconds	0.17	0.22	0.02	0.29
26	BoolT5sgp3k	80	Seconds	0.20	0.25	0.03	0.35
30	BoolT5sgp4k	80	Seconds	0.20	0.31	0.11	0.91
34	BoolT5sgp5k	80	Seconds	0.25	0.34	0.09	0.74
38	BoolT5sgp6k	80	Seconds	0.38	1.93	1.38	9.60

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

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 ExpE

	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 ExpE

Treatment: BoolT4sgp2k

	Treatment	Trials	Variable	min	mean	sd	max
4	BoolT4sgp2k	80	Evaluations	200.00	200.00	0.00	200.00
1	BoolT4sgp2k	80	Fitness	0.00	0.00	0.00	0.00
3	BoolT4sgp2k	80	Generations	1.00	1.00	0.00	1.00
2	BoolT4sgp2k	80	Seconds	0.16	0.24	0.06	0.39

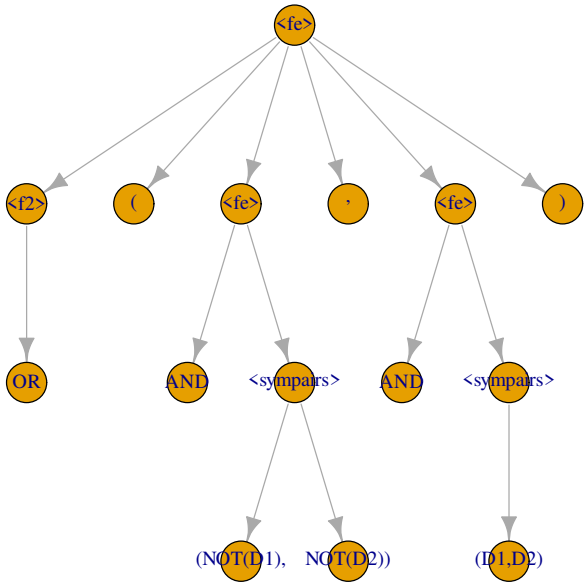
Table: Treatment: BoolT4sgp2k

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

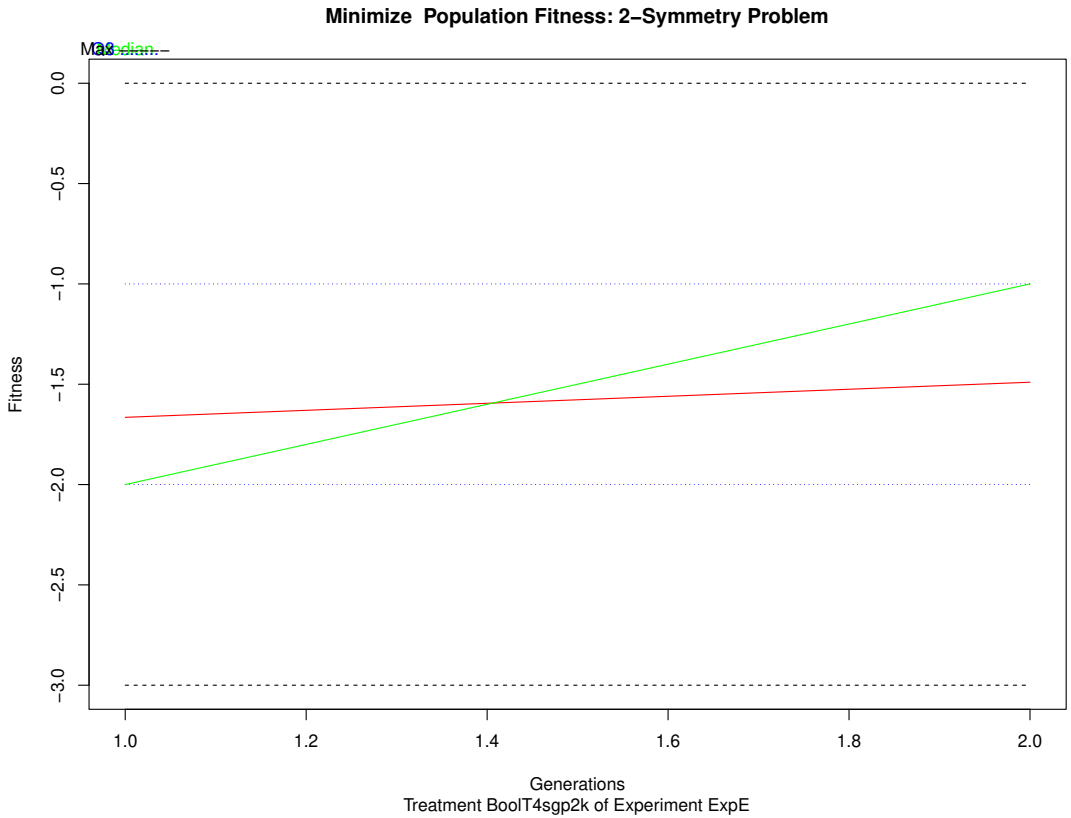
	Solution
1	OR(AND(NOT(D1), NOT(D2)), AND(D2, D1))

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

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



Plot of last xegaRun for Treatment BoolT4sgp2k of Experiment ExpE



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 ExpE

	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 ExpE

Treatment: BoolT4sgp3k

	Treatment	Trials	Variable	min	mean	sd	max
8	BoolT4sgp3k	80	Evaluations	200.00	202.50	22.36	400.00
5	BoolT4sgp3k	80	Fitness	0.00	0.00	0.00	0.00
7	BoolT4sgp3k	80	Generations	1.00	1.01	0.11	2.00
6	BoolT4sgp3k	80	Seconds	0.21	0.30	0.06	0.68

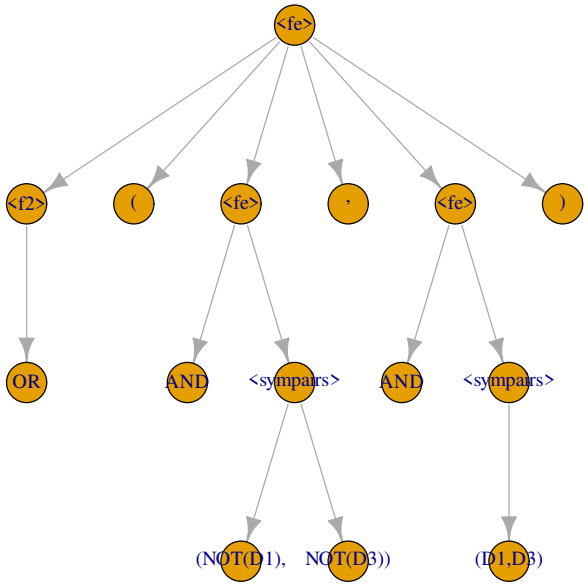
Table: Treatment: BoolT4sgp3k

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

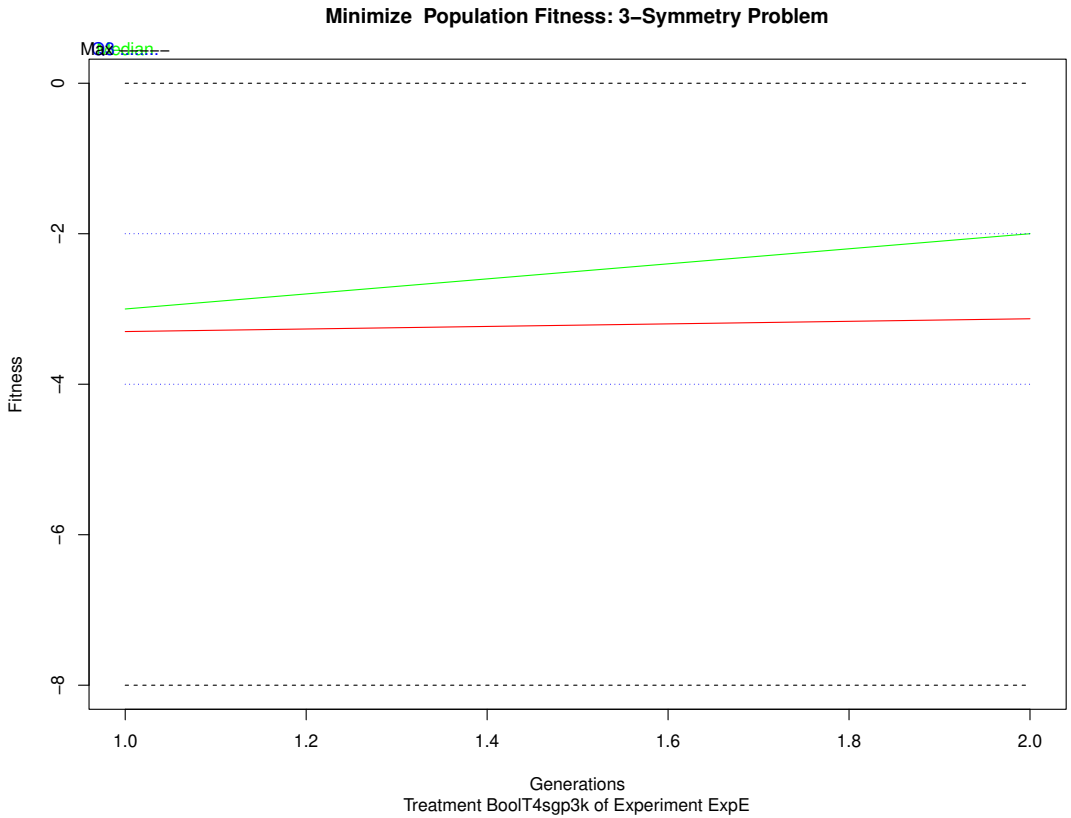
	Solution
1	OR(AND(NOT(D1), NOT(D3)), AND(D1, D3))

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

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



Plot of last xegaRun for Treatment BoolT4sgp3k of Experiment ExpE



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 ExpE

	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 ExpE (Part 1)

The Production Table of Treatment BoolT4sgp4k of Experiment ExpE

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

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

Treatment: BoolT4sgp4k

	Treatment	Trials	Variable	min	mean	sd	max
12	BoolT4sgp4k	80	Evaluations	1400.00	15402.50	8377.03	44200.00
9	BoolT4sgp4k	80	Fitness	0.00	0.00	0.00	0.00
11	BoolT4sgp4k	80	Generations	7.00	77.01	41.89	221.00
10	BoolT4sgp4k	80	Seconds	1.32	17.93	11.89	71.35

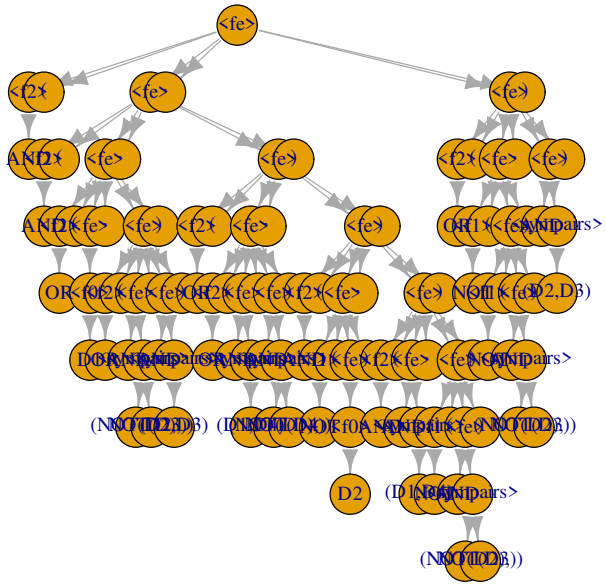
Table: Treatment: BoolT4sgp4k

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

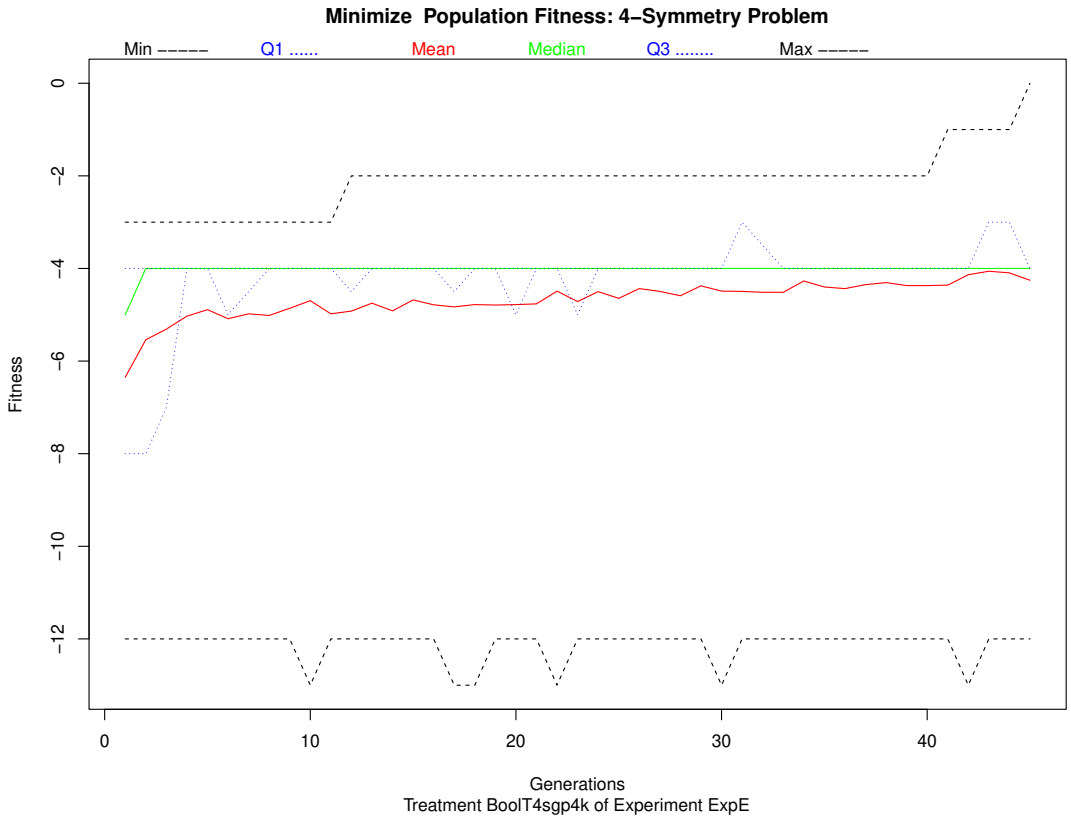
	Solution
1	AND(OR(AND(NOT(D2), NOT(D3)), AND(D2, D3)), OR(AND(D1, D4), AND(NOT(D1), NOT(D4))))

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

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



Plot of last xegaRun for Treatment BoolT4sgp4k of Experiment ExpE



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 ExpE

	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 ExpE (Part 1)

The Production Table of Treatment BoolT4sgp5k of Experiment ExpE

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

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

Treatment: BoolT4sgp5k

	Treatment	Trials	Variable	min	mean	sd	max
16	BoolT4sgp5k	80	Evaluations	2000.00	14620.00	10549.35	51200.00
13	BoolT4sgp5k	80	Fitness	0.00	0.00	0.00	0.00
15	BoolT4sgp5k	80	Generations	10.00	73.10	52.75	256.00
14	BoolT4sgp5k	80	Seconds	1.50	18.16	17.35	103.10

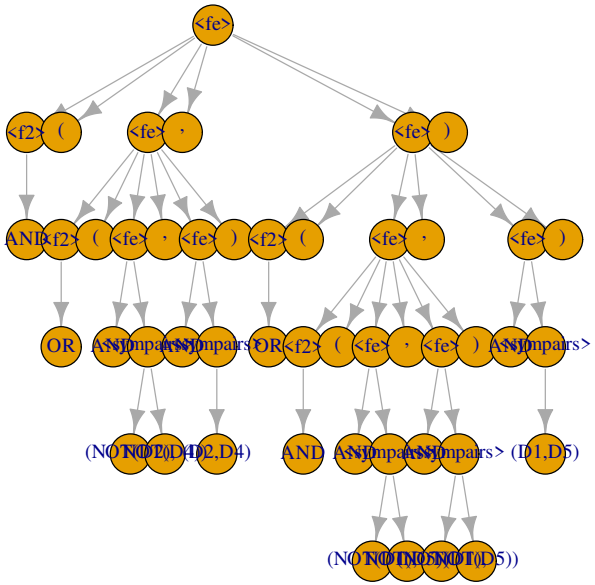
Table: Treatment: BoolT4sgp5k

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

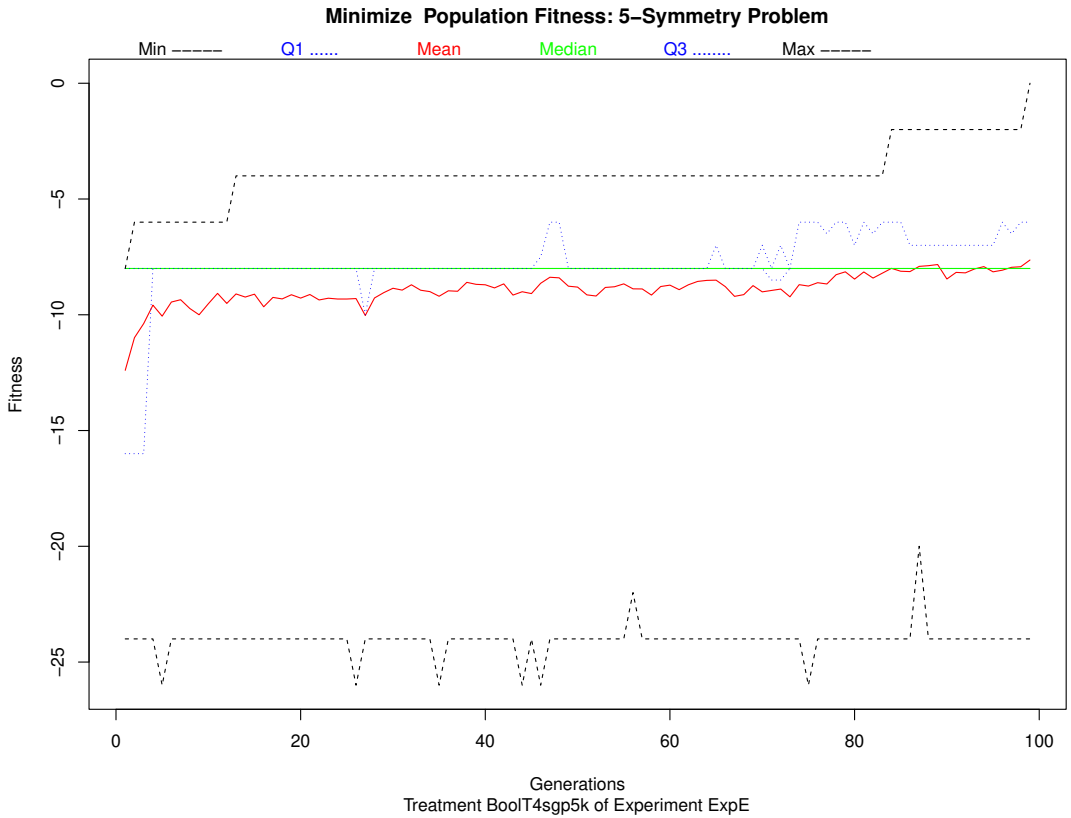
	Solution
1	AND(OR(AND(NOT(D2), NOT(D4)), AND(D2, D4)), OR(AND(NOT(D1), NOT(D5)), AND(D1, D5)))

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

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



Plot of last xegaRun for Treatment BoolT4sgp5k of Experiment ExpE



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 ExpE

	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 ExpE (Part 1)

The Production Table of Treatment BoolT4sgp6k of Experiment ExpE

	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 ExpE (Part 2)

Treatment: BoolT4sgp6k

	Treatment	Trials	Variable	min	mean	sd	max
20	BoolT4sgp6k	80	Evaluations	19000.00	92135.00	20136.92	100000.00
17	BoolT4sgp6k	80	Fitness	0.00	3.33	1.61	6.00
19	BoolT4sgp6k	80	Generations	95.00	460.68	100.68	500.00
18	BoolT4sgp6k	80	Seconds	26.67	193.42	52.41	277.97

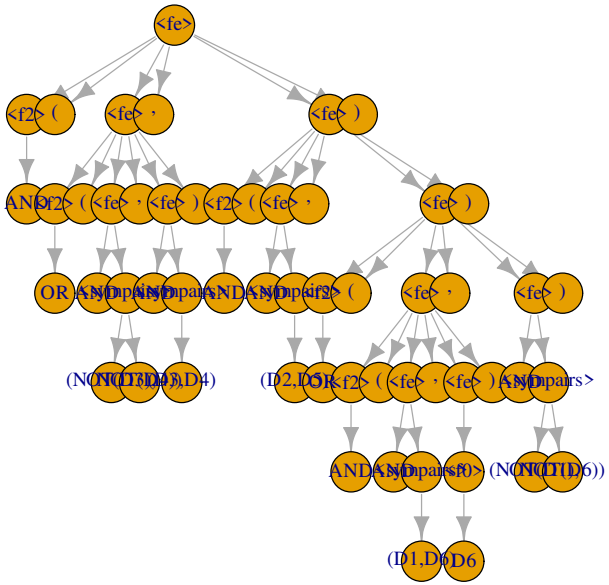
Table: Treatment: BoolT4sgp6k

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

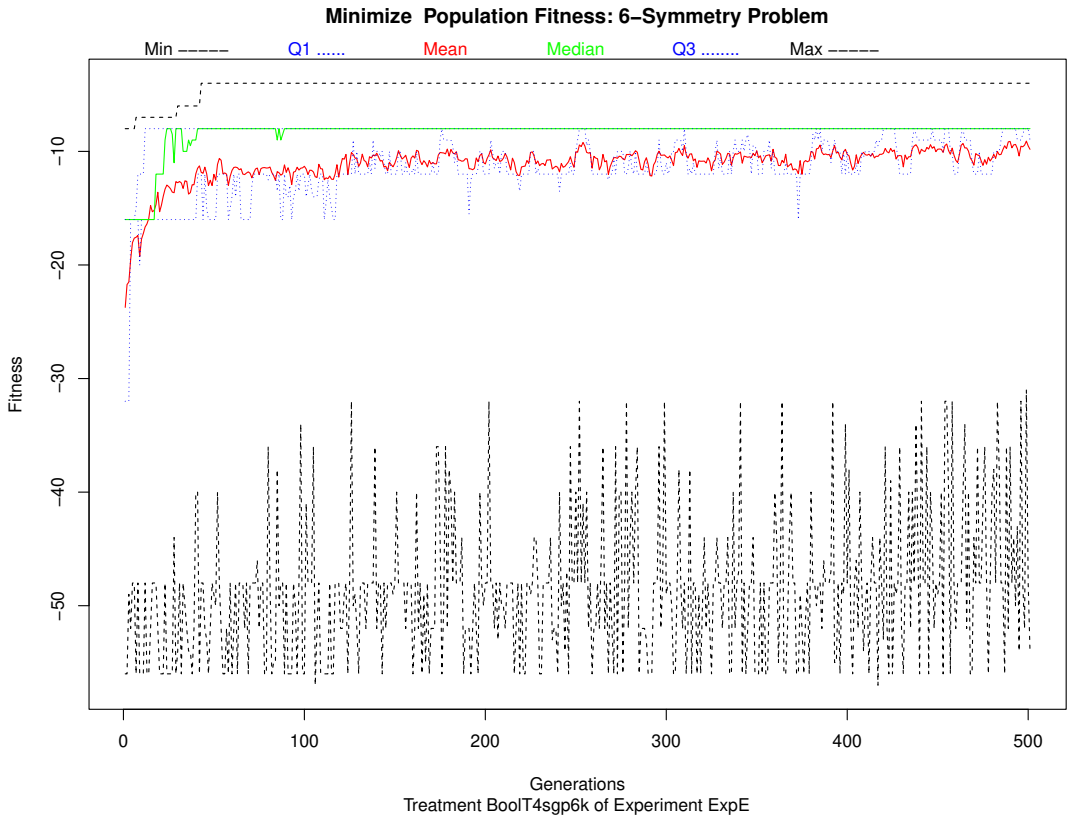
	Solution
1	AND(AND(OR(AND(NOT(D1), NOT(D6)), AND(D1, D6)), OR(AND(NOT(D3), NOT(D4)), AND(D3, D4))), OR(AND(D2, D5), AND(NOT(D2), NOT(D5))))

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

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



Plot of last xegaRun for Treatment BoolT4sgp6k of Experiment ExpE



Parameters of treatment: BoolT5sgp2k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EE
treatmentName	BoolT5sgp2k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT5sgp2k

Parameters of treatment BoolT5sgp2k passed to xegaRun

	Parameter Values
penv	2-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned5.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 BoolT5sgp2k passed to xegaRun (Part 1)

Parameters of treatment BoolT5sgp2k 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 BoolT5sgp2k passed to xegaRun (Part 2)

Parameters of treatment BoolT5sgp2k passed to xegaRun

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

Table: Parameters of treatment BoolT5sgp2k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT5sgp2k of Experiment ExpE

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

Table: The Production Table of Treatment BoolT5sgp2k of Experiment ExpE

Treatment: BoolT5sgp2k

	Treatment	Trials	Variable	min	mean	sd	max
24	BoolT5sgp2k	80	Evaluations	200.00	200.00	0.00	200.00
21	BoolT5sgp2k	80	Fitness	0.00	0.00	0.00	0.00
23	BoolT5sgp2k	80	Generations	1.00	1.00	0.00	1.00
22	BoolT5sgp2k	80	Seconds	0.17	0.22	0.02	0.29

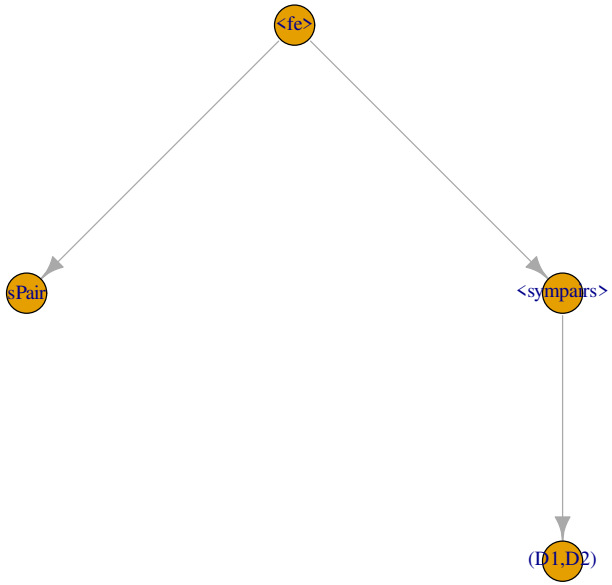
Table: Treatment: BoolT5sgp2k

The Solution Table of Treatment BoolT5sgp2k of Experiment ExpE. Fit: 0. Unique Shortest Solutions: 13.

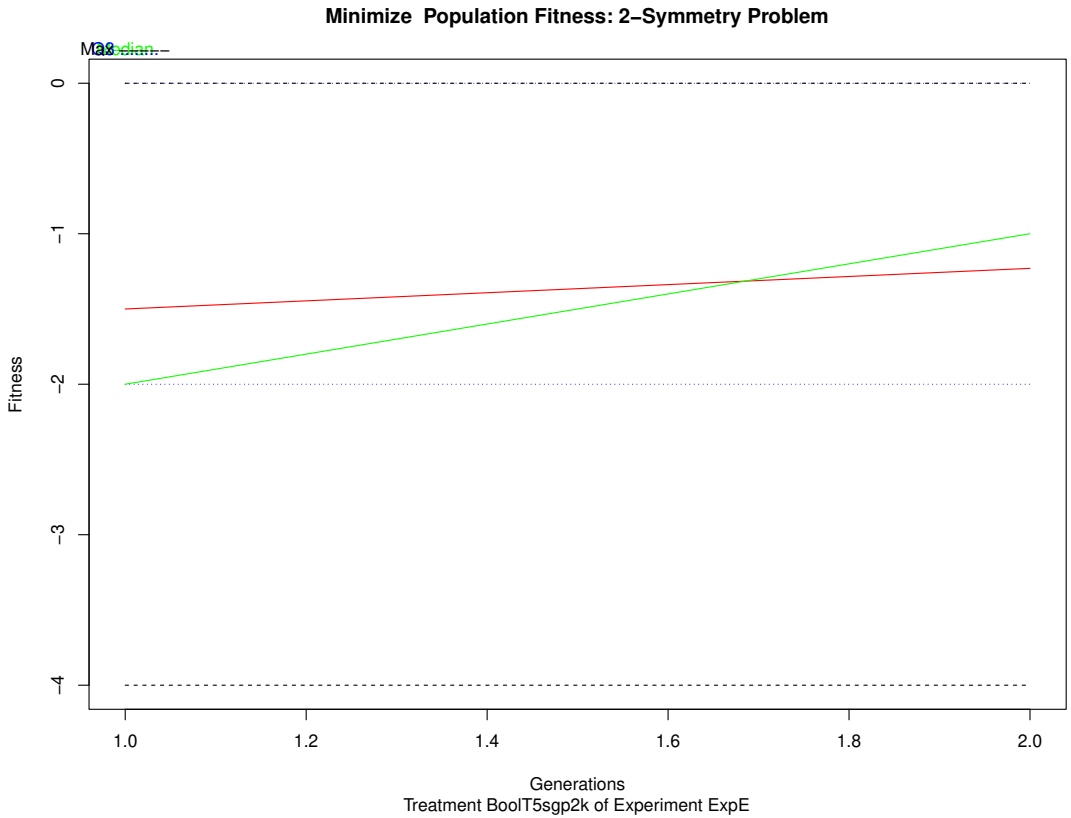
	Solution
1	sPair(D1, D2)

Table: The Solution Table of Treatment BoolT5sgp2k of Experiment ExpE. Fit: 0. Unique Shortest Solutions: 13.

The Derivation Tree of a Solution of Treatment BoolT5sgp2k of Experiment ExpE



Plot of last xegaRun for Treatment BoolT5sgp2k of Experiment ExpE



Parameters of treatment: BoolT5sgp3k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EE
treatmentName	BoolT5sgp3k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT5sgp3k

Parameters of treatment BoolT5sgp3k passed to xegaRun

	Parameter Values
penv	3-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned5.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 BoolT5sgp3k passed to xegaRun (Part 1)

Parameters of treatment BoolT5sgp3k 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 BoolT5sgp3k passed to xegaRun (Part 2)

Parameters of treatment BoolT5sgp3k passed to xegaRun

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

Table: Parameters of treatment BoolT5sgp3k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT5sgp3k of Experiment ExpE

	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>	sPair<sympairs>
8	<sympairs>	(D1,D3)
9	<sympairs>	(NOT(D1),NOT(D3))
10	<f1>	NOT
11	<f2>	OR
12	<f2>	AND

Table: The Production Table of Treatment BoolT5sgp3k of Experiment ExpE

Treatment: BoolT5sgp3k

	Treatment	Trials	Variable	min	mean	sd	max
28	BoolT5sgp3k	80	Evaluations	200.00	200.00	0.00	200.00
25	BoolT5sgp3k	80	Fitness	0.00	0.00	0.00	0.00
27	BoolT5sgp3k	80	Generations	1.00	1.00	0.00	1.00
26	BoolT5sgp3k	80	Seconds	0.20	0.25	0.03	0.35

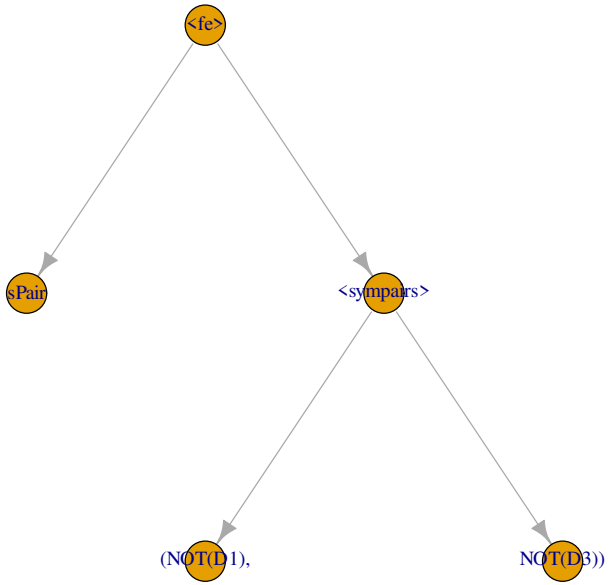
Table: Treatment: BoolT5sgp3k

The Solution Table of Treatment BoolT5sgp3k of Experiment ExpE. Fit: 0. Unique Shortest Solutions: 11.

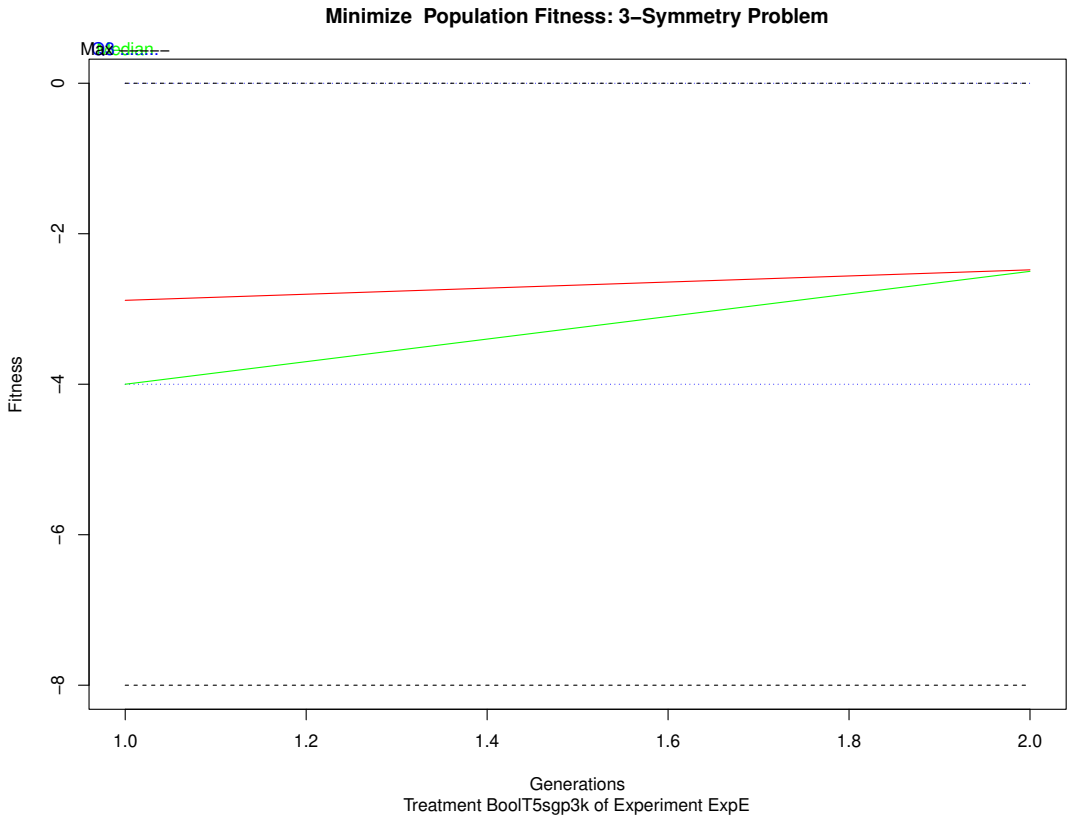
	Solution
1	sPair(D1, D3)

Table: The Solution Table of Treatment BoolT5sgp3k of Experiment ExpE. Fit: 0. Unique Shortest Solutions: 11.

The Derivation Tree of a Solution of Treatment BoolT5sgp3k of Experiment ExpE



Plot of last xegaRun for Treatment BoolT5sgp3k of Experiment ExpE



Parameters of treatment: BoolT5sgp4k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EE
treatmentName	BoolT5sgp4k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT5sgp4k

Parameters of treatment BoolT5sgp4k passed to xegaRun

	Parameter Values
penv	4-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned5.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 BoolT5sgp4k passed to xegaRun (Part 1)

Parameters of treatment BoolT5sgp4k 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 BoolT5sgp4k passed to xegaRun (Part 2)

Parameters of treatment BoolT5sgp4k passed to xegaRun

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

Table: Parameters of treatment BoolT5sgp4k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT5sgp4k of Experiment ExpE

	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>	sPair<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 BoolT5sgp4k of Experiment ExpE

Treatment: BoolT5sgp4k

	Treatment	Trials	Variable	min	mean	sd	max
32	BoolT5sgp4k	80	Evaluations	200.00	245.00	110.12	800.00
29	BoolT5sgp4k	80	Fitness	0.00	0.00	0.00	0.00
31	BoolT5sgp4k	80	Generations	1.00	1.23	0.55	4.00
30	BoolT5sgp4k	80	Seconds	0.20	0.31	0.11	0.91

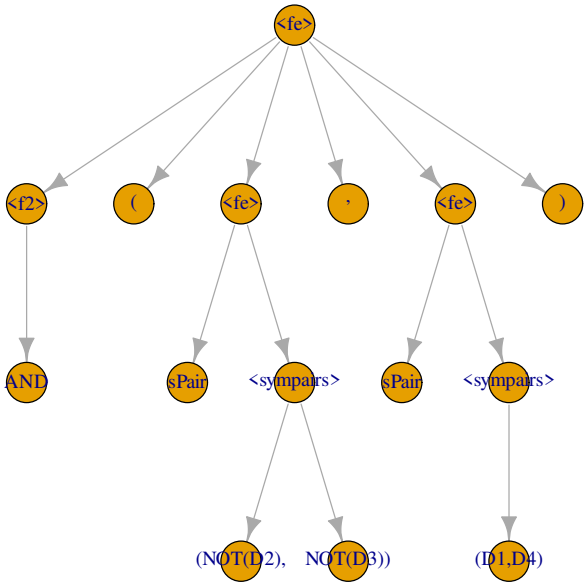
Table: Treatment: BoolT5sgp4k

The Solution Table of Treatment BoolT5sgp4k of Experiment ExpE. Fit: 0. Unique Shortest Solutions: 39.

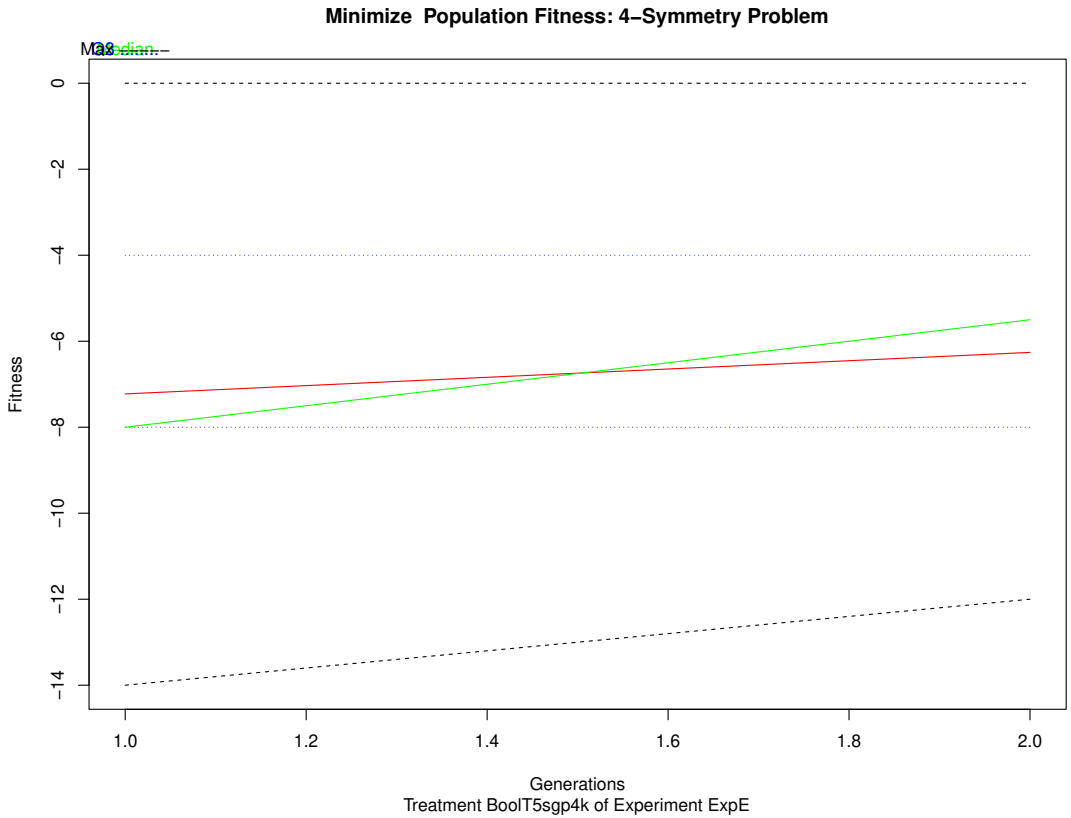
	Solution
1	AND(sPair(D2, D3), sPair(D1, D4))

Table: The Solution Table of Treatment BoolT5sgp4k of Experiment ExpE. Fit: 0. Unique Shortest Solutions: 39.

The Derivation Tree of a Solution of Treatment BoolT5sgp4k of Experiment ExpE



Plot of last xegaRun for Treatment BoolT5sgp4k of Experiment ExpE



Parameters of treatment: BoolT5sgp5k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EE
treatmentName	BoolT5sgp5k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT5sgp5k

Parameters of treatment BoolT5sgp5k passed to xegaRun

	Parameter Values
penv	5-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned5.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 BoolT5sgp5k passed to xegaRun (Part 1)

Parameters of treatment BoolT5sgp5k 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 BoolT5sgp5k passed to xegaRun (Part 2)

Parameters of treatment BoolT5sgp5k passed to xegaRun

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

Table: Parameters of treatment BoolT5sgp5k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT5sgp5k of Experiment ExpE

	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>	sPair<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 BoolT5sgp5k of Experiment ExpE (Part 1)

The Production Table of Treatment BoolT5sgp5k of Experiment ExpE

	LHS	RHS
16	<f2>	AND

Table: The Production Table of Treatment BoolT5sgp5k of Experiment ExpE (Part 2)

Treatment: BoolT5sgp5k

	Treatment	Trials	Variable	min	mean	sd	max
36	BoolT5sgp5k	80	Evaluations	200.00	240.00	112.06	800.00
33	BoolT5sgp5k	80	Fitness	0.00	0.00	0.00	0.00
35	BoolT5sgp5k	80	Generations	1.00	1.20	0.56	4.00
34	BoolT5sgp5k	80	Seconds	0.25	0.34	0.09	0.74

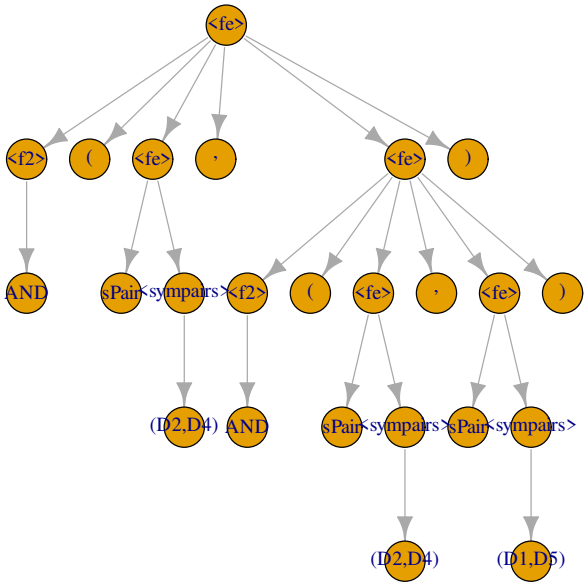
Table: Treatment: BoolT5sgp5k

The Solution Table of Treatment BoolT5sgp5k of Experiment ExpE. Fit: 0. Unique Shortest Solutions: 33.

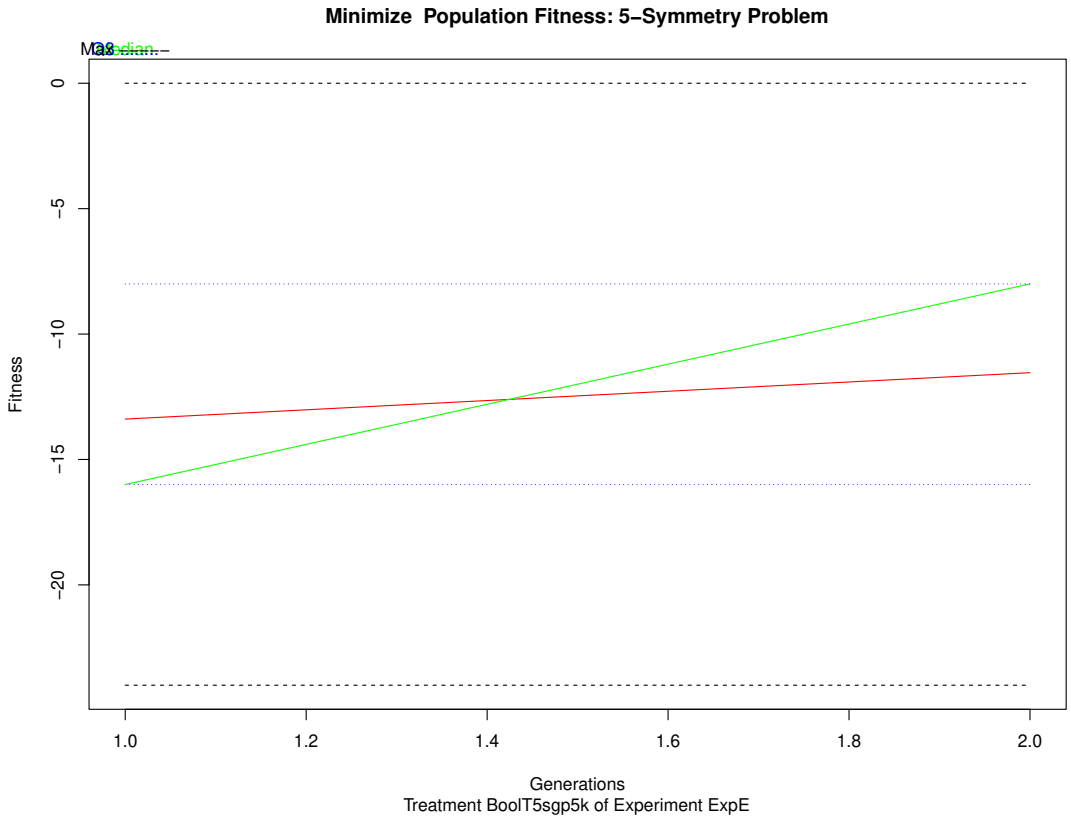
	Solution
1	AND(sPair(D1, D5), sPair(D2, D4))

Table: The Solution Table of Treatment BoolT5sgp5k of Experiment ExpE. Fit: 0. Unique Shortest Solutions: 33.

The Derivation Tree of a Solution of Treatment BoolT5sgp5k of Experiment ExpE



Plot of last xegaRun for Treatment BoolT5sgp5k of Experiment ExpE



Parameters of treatment: BoolT5sgp6k

	Parameter Values
tRNG	L'Ecuyer-CMRG Inversion Rejection
tReplay	0
experimentName	EE
treatmentName	BoolT5sgp6k
trials	20
everyK	10
outpath	data
batchPath	.
tVerbose	1

Table: Parameters of treatment: BoolT5sgp6k

Parameters of treatment BoolT5sgp6k passed to xegaRun

	Parameter Values
penv	6-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned5.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 BoolT5sgp6k passed to xegaRun (Part 1)

Parameters of treatment BoolT5sgp6k 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 BoolT5sgp6k passed to xegaRun (Part 2)

Parameters of treatment BoolT5sgp6k passed to xegaRun

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

Table: Parameters of treatment BoolT5sgp6k passed to xegaRun (Part 3)

The Production Table of Treatment BoolT5sgp6k of Experiment ExpE

	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>	sPair<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 BoolT5sgp6k of Experiment ExpE (Part 1)

The Production Table of Treatment BoolT5sgp6k of Experiment ExpE

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

Table: The Production Table of Treatment BoolT5sgp6k of Experiment ExpE (Part 2)

Treatment: BoolT5sgp6k

	Treatment	Trials	Variable	min	mean	sd	max
40	BoolT5sgp6k	80	Evaluations	200.00	1445.00	853.27	4600.00
37	BoolT5sgp6k	80	Fitness	0.00	0.00	0.00	0.00
39	BoolT5sgp6k	80	Generations	1.00	7.22	4.27	23.00
38	BoolT5sgp6k	80	Seconds	0.38	1.93	1.38	9.60

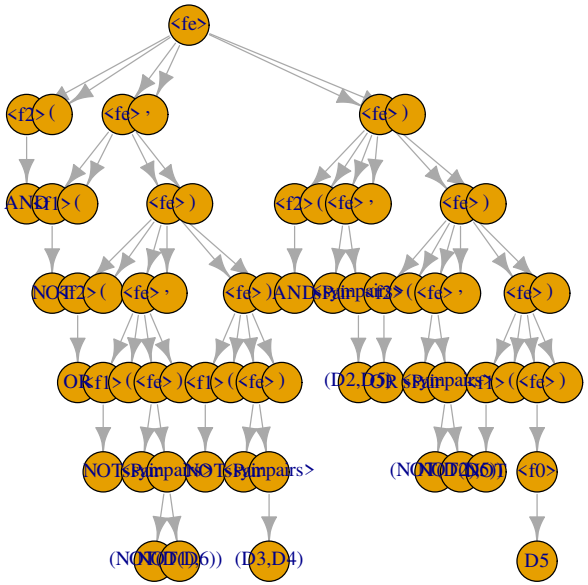
Table: Treatment: BoolT5sgp6k

The Solution Table of Treatment BoolT5sgp6k of Experiment ExpE. Fit: 0. Unique Shortest Solutions: 75.

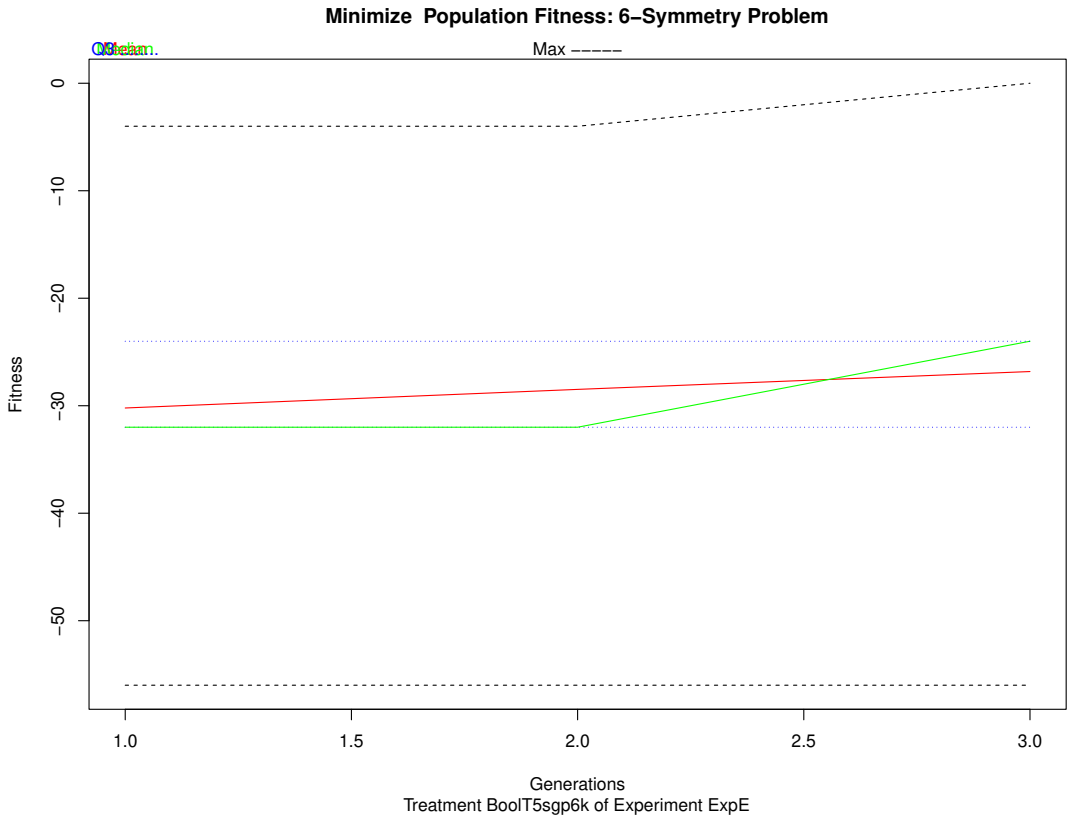
	Solution
1	AND(sPair(D2, D5), AND(sPair(D1, D6), sPair(D3, D4)))

Table: The Solution Table of Treatment BoolT5sgp6k of Experiment ExpE. Fit: 0. Unique Shortest Solutions: 75.

The Derivation Tree of a Solution of Treatment BoolT5sgp6k of Experiment ExpE



Plot of last xegaRun for Treatment BoolT5sgp6k of Experiment ExpE



All parameters of xegaRun of treatment BoolT4sgp2k

	Parameter Values
penv	2-Symmetry Problem
grammar	/home/dj2333/dev/cran/kSymmetry/BNF/AndOrNotTuned4.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 BoolT4sgp2k (Part 1)

All parameters of xegaRun of treatment BoolT4sgp2k

	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 BoolT4sgp2k (Part 2)

All parameters of xegaRun of treatment BoolT4sgp2k

	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 BoolT4sgp2k (Part 3)

All parameters of xegaRun of treatment BoolT4sgp2k

	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 BoolT4sgp2k (Part 4)

All parameters of xegaRun of treatment BoolT4sgp2k

	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 BoolT4sgp2k (Part 5)

All parameters of xegaRun of treatment BoolT4sgp2k

	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 BoolT4sgp2k (Part 6)