Challenge 2016

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Challenge 2016

20 benchmarks * 5 instances = 100 instances

20 minutes time limit

Scoring system:

each instance compares each pair of solvers

1 point for every solver you beat

If both prove optimality/satisfiability/unsatisfiablitiy in time t1 and t2

Solver 1 gets t2/(t1+ t2) points

Four categories:

single engine fixed search: single solving algorithm, must follow given search strategy

single engine free search: search however you want

single engine parallel search: free search on 4 CPUs with hyper threading (8 threads)

open parallel search: parallel search including portfolio solvers

Entry System

VM based solver installation

- solver writers download VM
- install solver in VM
- run test script on 2014 challenge subset
- upload VM
- we run same script on 2016 problems

2016 Benchmarks

NEW

cryptanalysis	differential cryptanalysis	real world, SAT
diameterc-mst	diameter constrained MST	combinatorial, MIN
gbac	academic curriculum	combinatorial, MIN
gfd-schedule	scheduling in groups	real world, MIN
java-auto-gen	models generated by Java	combinatorial, MIN
mapping	scheduling appns on CPUs	real world, MAX
maximum-dag	max DAG in a dirgraph	combinatorial, MAX
mrcpsp	multimode RCPSP	combinatorial, MIN
nfc	network flow	combinatorial, MIN
oocsp_racks	rack config	real world, SAT
rcpsp-wet	RCPSP earliness/tardiness	combinatorial, MIN
zephyrus	deployment configuration	real world, MIN

OLD problems (mainly new instances)

carpet_cutting, celar, depot-placement, elitserien, filters, prize-collecting, solbat, tpp.

Globals

- alldifferent
- at_most
- bin_packing_load
- count
- cumulative
- diffn
- element
- global_cardinality
- increasing
- inverse
- lex_less, lex_greatereq
- maximum
- network_flow_cost
- nvalue
- regular

The official contestants

choco: Java based trailing FD solver
concrete: Scala based FD solver
izplus: C based hybrid FD/local search solver
jacop: Java based trailing FD solver
minisatid: C++ ASP solver with constraints
mistral: C++ based trailing FD solver
or_tools: C++ based FD solver
oscar: local search solver for MiniZinc (Scala
picat-CP: trailing CLP(FD) solver
picat-SAT: translation to SAT approach to FD solving
sunny-cp-less: portfolio solver (no G12 solvers involved): **choco**, **gecode, haifaCSP, jacop, izplus, minisatID, mistral, opturion_cpx, or_tools**, **picat**

NEW

haifaCSP: C++ FD learning solver
sunny-cp-less-less: portfolio solver (no G12 solvers involved): **gecode, haifaCSP, jacop, minisatID, mistral, picat-SAT.**
yuck: local search solver for MiniZinc (Scala)

The unofficial contestants

cbc: open source MIP solver (new linearisation)

cplex: commercial MIP solver (new linearisation)

chuffed: C++ based trailing lazy clause generation solver

g12-fd: Mercury and C based trailing FD solver

gecode: C++ based copying FD solver

gurobi: commercial MIP solver (new linearisation)

scip: research MIP solver with CP features

sunny-cp: portfolio solver using **chuffed, gecode, g12fd, g12_cpx, g12-lazyfd, gurobi, choco, haifaCSP, minisatID, mistral, opturion_cpx, or_tools, izplus, picat**

LCG-glucose: C++ LCG solver based on glucose SAT solver

LCG-glucose-UC: above solver using UNSAT Core search

The hard worker(s)

Andreas Schutt

- Managing entrants
- Running the competition and the preliminary round checking
- Handling submitted problems (fixing them up and suggesting instances to judges)
- Setting up the VM
- Scripts, webpage
- Checking validity (examining the results in detail)

Ignasi Abio, Thibaut Feydy, David Hemmi

- Preliminary round checking
- Problem checking

Thank you for all your hard work!

Fixed search category

picat-CP-fd: 186.10

concrete-fd: 228.32

g12_fd-fd: 250.59

sicstus-fd: 320.00

choco-fd: 422.81

jacop-fd: 425.01

or_tools-fd: 455.02

gecode-fd: 479.90

chuffed-fd: 726.74

LCG-glucose-fd: 758.51

BRONZE Medal

SILVER Medal

GOLD Medal

Free search category

yuck-free: 297.50
oscar-free: 447.50
picat-CP-fd: 461.35
concrete-free: 585.15
g12fd-free: 692.56
cbc-free: 712.00
sisctus-fd: 734.01
or_tools-free: 850.74
jacop-fd: 881.75
gecode-free: 924.12
scip-free: 940.71
minisatid-free: 946.05
mistral-free: 949.28
choco-free: 1027.34
izplus-free: 1231.07
cplex-free: 1256.60
gurobi-free: 1334.01
picat-SAT-free: 1335.92
haifa-CSP-free: 1356.47
LCG-glucose-UC-free: 1497.73
chuffed-free: 1654.87
LCG-glucose-free: 1730.72

Positions on 20 problems	*1st*	*2nd*	*3rd*
oscar-free		***1***	
cbc-free	***1***		
or_tools-free		***1***	
scip-free		***1***	
minisatid-free			***1***
choco-free			***1***
izplus-free	***2***		
cplex-free	***2***		***2***
gurobi-free	***2***	***3***	***3***
picat-sat-free	***1***		***3***
haifa-CSP-free		***2***	
LCG-glucose-UC-free	***6***	***2***	***1***
chuffed-free	***5***	***4***	***2***
LCG-glucose-free	***1***	***6***	***7***

Free search category (incomplete)

yuck-free: 378.50
picat-CP-fd: 595.65 −1
concrete-free: 602.21 −1
oscar-free: 650.50 +2
cbc-free: 757.47
g12fd-free: 770.29
sisctus-fd: 772.49
or_tools-free: 919.23
minisatid-free: 921.30 −3
scip-free: 928.03 −1
jacop-fd: 955.37 +2
mistral-free: 976.09 −1
gecode-free: 1013.27 +3
choco-free: 1054.94
cplex-free: 1120.92 −1
gurobi-free: 1181.08 −1
LCG-glucose-UC-free: 1173.08 −3
picat-SAT-free: 1224.06
haifa-CSP-free: 1237.32
izplus-free: 1248.40 +5
chuffed-free: 1369.70
LCG-glucose-free: 1414.11

BEST Local Search Solver

Obviously a LS hybrid

Parallel search category

yuck-par: 290.00 =

oscar-free: 433.00

picat-CP-fd: 447.19

concrete-free: 544.44

g12_fd-free: 657.62

cbc-free: 693.54

sicstus-fd: 712.37

mistral-par: 767.72 −4

jacop-fd: 855.72

scip-free: 907.74

minisatid-par: 920.30 −1

gecode-par: 1029.10 +2

or_tools-par: 1047.51 +5

choco-par: 1253.26 =

izplus-par: 1262.59 =

picat-SAT-free: 1303.79

cplex-par: 1309.98 +1

haifa-CSP-free: 1334.71

gurobi-par: 1352.92 +2

LCG-glucose-UC-free: 1487.36

chuffed-free: 1624.04

LCG-glucose-free: 1709.10

free is better than par!

free is better than par!

free is better than par!

BRONZE Medal

SILVER Medal

GOLD Medal

Open search category

yuck-par, oscar-free, picat-CP-fd, concrete-free, g12_fd-free, **sicstus-fd ,**cbc-free, **mistral-par, jacop-fd,** scip-free, **minisatid-par**

gecode-par: 1110.19

or_tools-par: 1115.80

choco-par: 1342.41

sunny-cp-less-open: 1365.31

izplus-par: 1374.12

picat-SAT-free: 1423.81

cplex-par: 1436.05

haifa-CSP-free: 1448.35

gurobi-par: 1499.04

sunny-cp-less-less-open: 1620.82

LCG-glucose-UC-free: 1671.52

chuffed-free: 1795.57

sunny-cp-open: 1877.79

LCG-glucose-free: 1899.23

BRONZE Medal

SILVER Medal

GOLD Medal

Summary

A year for solvers with learning

Haifa-CSP, **picat-SAT**

The mysterious **izplus** remains very competitive

Unsat core approach show they have a role in CP.

More portfolio solvers! More local search solvers!

Ideally we should work on annotations for local search!

Please send us more real world benchmarks

Conclusions

Congratulations to the winners

	Fixed	Free	Par	Open
GOLD	*OR_tools*	*HaifaCSP*	*HaifaCSP*	*sunnycp⁻ ⁻*
SILVER	*JacoP*	*picat-SAT*	*picat-SAT*	*HaifaCSP*
BRONZE	*Choco*	*iZ_plus*	*iZ_plus*	*picat-SAT*

Many thanks to our judges for helping select the instances and making rulings when required

Jimmy Lee, Barry O'Sullivan, Roland Yap

Enter your solver next year, send us some problem instances!

final word

Learn MiniZinc

- https://www.coursera.org/learn/modeling-discrete-optimization

Use MiniZinc

Make all your benchmarks available in MiniZinc

- and add them to CSPlib (after the challenge!)

Try out different solvers on the same model

- Maybe you should be using SAT, ASP, SMT or MIP for your problem?