ICS 171 Sudoku Project Report

PE Tests

PE1.txt

	# Backtracks	solution time / backtracks	Success?
FC	6	0.0701	yes
MRV	1556	0.0206	yes
AC	1556	0.0205	yes
MRV, DH	1556	0.0188	yes
LCV	1369	0.0218	yes
NKP	1556	0.0206	yes
NKT	1556	0.0187	yes
FC, AC	6	0.0725	yes

PE2.txt

	# Backtracks	solution time / backtracks	Success?
FC	9	0.0611	yes
MRV	2405	0.01663	yes
AC	-	-	no
MRV, DH	2405	0.01482	yes
LCV	2193	0.01618	yes
NKP	2405	0.01429	yes
NKT	2405	0.01679	yes
FC, AC	9	0.06186	yes

PE3.txt

	# Backtracks	solution time / backtracks	Success?
FC	69	0.04400	yes
MRV	-	-	no
AC	-	-	no
MRV, DH	2405	0.01482	yes
LCV	2193	0.01618	yes
NKP	-	-	no
NKT	-	-	no
FC, AC	69	0.05923	yes

PE4.txt

	# Backtracks	solution time / backtracks	Success?
FC	17	.05430	yes
MRV	14897	0.0181	yes
AC	-	-	no
MRV, DH	14897	0.0206	yes
LCV	14689	0.0221	yes
NKP	14897	0.0180	yes
NKT	14897	0.0202	yes
FC, AC	17	.07372	yes

PE5.txt

	# Backtracks	solution time / backtracks	Success?
FC	5	0.0505	yes
MRV	460	0.0203	yes
AC	4	1.9904	yes
MRV, DH	460	0.0191	yes
LCV	281	0.0255	yes
NKP	460	0.0188	yes
NKT	460	0.0199	yes
FC, AC	5	.05046	yes

After running the test on these problems we found that the most productive heuristic alone is forward checking. When running the heuristics on this level forward checking heuristic had the least amount of backtracks. The forward checking heuristic takes generally takes the most amount of time to perform each backtrack because it has to perform the least it is the most productive out of the heuristics.

PM Tests

PM1.txt

	# Backtracks	solution time / backtracks	Success?
FC	2947	0.1443	yes
MRV	-	-	no (timed out)
AC	-	-	no (timed out)
MRV, DH	-	-	no (timed out)
LCV	-	-	no (timed out)
NKP	-	-	no (timed out)
NKT	-	-	no (timed out)
FC, AC	2947	0.1216	yes

PM2.txt

	# Backtracks	solution time / backtracks	Success?
FC			no (timed out)
MRV			no (timed out)
AC			no (timed out)
MRV, DH			no (timed out)
LCV			no (timed out)
NKP			no (timed out)
NKT			no (timed out)
FC, AC			no (timed out)

PM3.txt

	# Backtracks	solution time / backtracks	Success?
FC	730	0.1373	yes
MRV	-	-	yes
AC	-	-	no (timed out)
MRV, DH	-	-	no (timed out)
LCV	-	-	no (timed out)
NKP	-	-	no (timed out)
NKT	-	-	no (timed out)
FC, AC	730	0.1645	yes

PM4.txt

	# Backtracks	solution time / backtracks	Success?
FC	-	-	no (timed out)
MRV	-	-	no (timed out)
AC	-	-	no (timed out)
MRV, DH	-	-	no (timed out)
LCV	-	-	no (timed out)
NKP	-	-	no (timed out)
NKT	-	-	no (timed out)
FC, AC	-	-	no (timed out)

PM5.txt

	# Backtracks	solution time / backtracks	Success?
FC	1748	0.20205	no (timed out)
MRV	-	-	no (timed out)
AC			no (timed out)
MRV, DH			no (timed out)
LCV			no (timed out)
NKP			no (timed out)
NKT			no (timed out)
FC, AC	1748	0.1965	yes

For this level of tests many of the heuristics timed out with the constraint time we used. With using the same constraints on each heuristic or combination we were able to find that the combination of forward checking and arc consistency was the most productive. Given the time constraints other heuristics could not perform as well as this combination.

PH Tests

PH1.txt

	# Backtracks	solution time / backtracks	Success?
FC			No(timed out)
MRV			No(timed out)
AC			No(timed out)
MRV, DH			No(timed out)
LCV			No(timed out)
NKP			No(timed out)
NKT			No(timed out)
FC, AC			No(timed out)

PH2.txt

	# Backtracks	solution time / backtracks	Success?
FC	438	0.2839	yes
MRV			No(timed out)
AC			No(timed out)
MRV, DH			No(timed out)
LCV			No(timed out)
NKP			No(timed out)
NKT			No(timed out)
FC, AC	438	0.4174	yes

PH3.txt

	# Backtracks	solution time / backtracks	Success?
FC			No(timed out)
MRV			No(timed out)
AC			No(timed out)
MRV, DH			No(timed out)
LCV			No(timed out)
NKP			No(timed out)
NKT			No(timed out)
FC, AC			No(timed out)

PH4.txt

	# Backtracks	solution time / backtracks	Success?
FC			No(timed out)
MRV			No(timed out)
AC			No(timed out)
MRV, DH			No(timed out)
LCV			No(timed out)
NKP			No(timed out)
NKT			No(timed out)
FC, AC			No(timed out)

PH5.txt

	# Backtracks	solution time / backtracks	Success?
FC			No(timed out)
MRV			No(timed out)
AC			No(timed out)
MRV, DH			No(timed out)
LCV			No(timed out)
NKP			No(timed out)
NKT			No(timed out)
FC, AC			No(timed out)

After running the test on these problems we found that the most productive heuristic alone is forward checking. When running the heuristics on this difficulty level forward checking heuristic had the least amount of backtracks. It also performed the within the time constraint we ran with the heuristics. The forward checking heuristic generally takes the most amount of time to perform each backtrack but because it has to perform the least it is the most productive out of the heuristics.