Super-resolution for MAX-SAT

November 15, 2006

We use N to keep track of the best assignment so far. N is a complete assignment, and is assigned arbitrarily at the beginning.

1. Unit-Propagation:

   $M||F, C + k||N \Rightarrow Mk||F, C + k||N$

   if $C + k$ is a super-resolvent, and
   $M \vdash \neg C$, and
   k is undefined in M.

   or if $C + k$ is not a super-resolvent, and
   $M \vdash \neg C$, and
   k is undefined in M, and
   $unsat(M\neg k; F, C + k) \geq unsat(N; F, C + k)$.

2. Semi-Super-resolution:

   $I||F||N \Rightarrow I||F$,(the disjunction of the negated decision literals in I)$||N$

   if $R = Contradiction(I, F) \neq \emptyset$, and
   $unsat(IR; F) \geq unsat(N; F)$.

   Informal: Intuitively, since R is driven by I through unit-propagation, thus, the fact that "$unsat(IR; F) \geq unsat(N; F)$" implies that we have made a mistake by setting the partial interpretation to I, which is the reason why we add the negated decision literals in I to F so that we won't make the same mistake again.

   $Contradiction(I, F)$: there is a sequence of transitions from the state $I||F||N$ by Unit-Propagation to a state $IR||F||N$ where some clause(s) is unsatisfied by (IR). Contradiction returns R if there is a contradiction and $\emptyset$ otherwise.

3. Decide:

   $$M||F||N \Rightarrow Mk^*||F||N$$

   if k is undefined in M, and
   k and $\neg k$ occur in some clause(s) of F.

4. Finale:

   $$M||F||N \Rightarrow M||F||N$$

   if $unsat(M;F) = unsat(N;F)$, and
   M is complete, and
   M contains no decision literals.

5. Restart:

   $$M||F||N \Rightarrow \emptyset||F||N$$

6. Update:

   $$M||F||N \Rightarrow M||F||M$$

   if M is complete, and
   $unsat(M;F) < unsat(N;F)$.

7. Subsumption:

   $$M||F, SR_1, SR_2||N \Rightarrow M||F, SR_2||N$$

   if SR_1 and SR_2 are super-resolvents, and
   SR_2 is a subset of SR_1.