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Resolution

Translation
Connectives
Why some smaller/different sets are adequate.
Different ways of proving.
Proof argument valid
- truth table.
- e-rule i-rule
- converting things into clauses.
- resolution proof.

Concepts
- Disjunctive normal form
- Tautology

What Happens With Resolution?

- So resolution is nice, but what is happening when we do it?
- What does a set of clauses mean?
  1 {A, B}
  2 {~A, ~B, C}
  3 {~C, D}
- This set of clauses equivalent to the single WFF (sorry if I get () wrong sometimes)
  (((AvB)*(~Av(~BvC))))*(~CvD))

What Happens With Resolution?

- So what happens when we do resolution?
  1 {A, B}
  2 {~A, ~B, C}
  3 {~C, D}
  4 {~A,~B,D} from 2,3
- This set of clauses equivalent to the single WFF
  ((((AvB)*(~Av(~BvC)))*(~CvD))*(~Av(~BvD)))
- So we have just added the new clause to the end of the WFF

What Happens With Resolution?

- Resolution is built on the rule (not an S/I rules but S/I can prove this)
  ((PvQ)*(~PvR)) => (QvR)
- It is extended to more than one *

What Happens With Resolution?

- 1 {A, B}
  2 {~A, ~B, C}
  3 {~C, D}

  To

- 1 {A, B}
  2 {~A, ~B, C}
  3 {~C, D}
  4 {~A,~B,D} from 2,3

What Happens With Resolution?

- Is the same as saying

  ((((AvB)*(~Av~BvC))*(~CvD)) =>
  ((((AvB)*(~Av(~BvC))))*(~CvD))*(~Av(~BvD))))

- So every step of resolution we add another => and another term to the end
- Can’t generate new terms: invalid
- Get the empty clause: valid (negation goes backwards and says we can’t assume the conclusion is false so it must be true)

What Happens With Resolution?

- Why not do 1,2?
  1 {A, B}
  2 {~A, ~B, C}
  3 {~C, D}
  4 {~A,~B,D} from 2,3
  5 {A,~A,C} from 1,2
- This set of clauses equivalent to the single WFF
  (((((AvB)*(~Av(~BvC)))*(~CvD))*(~Av(~BvD)))*((Av~A)vC))

What Happens With Resolution?

- But Pv~P=T TvP=T T*P=P
  so
  (((((AvB)*(~Av(~BvC)))*(~CvD))*(~Av(~BvD)))*((Av~A)vC))
  becomes
  (((((AvB)*(~Av(~BvC)))*(~CvD))*(~Av(~BvD)))*(TvC))
  (((((AvB)*(~Av(~BvC)))*(~CvD))*(~Av(~BvD)))*T)
  ((((AvB)*(~Av(~BvC)))*(~CvD))*(~Av(~BvD)))

  Which is what we started with, so no information is gained

What Happens With Resolution?

- Similarly because P*P = P we don't want to generate the same clause more than once (say we did 2,3 again)

  ((((((AvB)*(~Av(~BvC)))*(~CvD))*(~Av(~BvD)))*(~Av(~BvD)))
  Is equivalent to what we started with
  (((((AvB)*(~Av(~BvC)))*(~CvD))*(~Av(~BvD))))

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