Outline

Satisfiability Checking
Satisfiability Checking in FOL

- Set of satisfiable formulas is not r.e., so no complete procedure;
- Various methods developed:
  - Saturation (no good model representation)
  - Finite model building
  - Instantiation based methods
Satisfiability Using Saturation

- A complete strategy must be used;
- Non-redundant clauses cannot be discarded;
- In the case of success, no good representation of a model can be built.

vampire SYN901-1.p
Instance Generation

There are several powerful methods of instance generation.

- Different from SMT: use unification;
- Use SAT solver;
- Lots of implementation can be reused (clauses, indexing, unification, SAT solver);
- Can cooperate with saturation;
- Decision procedure for EPR (clauses without function symbols).

vampire --saturation_algorithm inst_gen
Finite Model Building

- The class of problems having finite models is r.e., so complete methods exist.
- In practice, the most powerful method of checking satisfiability (but not always!)
- Increment model size, starting with very small sizes.
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  Given a first-order formula $F$ and a positive integer $n$, find out whether $F$ has a model of the size $n$. 

Vampire can search for finite models using the BFNT translation into EPR:

```
vampire --bfnt on
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  - algorithm for translation;
  - SAT solver.
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