Expressiveness of Temporal Logics

Conclusions

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Summary of the course

Three levels for measuring expressiveness:

- **distinguishing power:**
  - very coarse measure: $\mathcal{L}(X)$ and LTL+Past have the same distinguishing power;
  - proofs generally easy.
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    - ad hoc techniques: families of models;
    - via other formalisms: first-order logic, automata theory, ...
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    - via other formalisms: first-order logic, automata theory, ...

- **succinctness:**
  - very precise measure;
  - proofs generally very very involved:
    - through automata theory,
    - Ehrenfeucht-Fraïssé games, ...
Summary of the course

Linear time

CTL

CTL*

Branching time

LTL

CTL
Summary of the course

Linear time

- LTL
- \( \mathcal{L}(U) \)
- \( \mathcal{L}(X) \)
- LTL+Past

Branching time

- CTL
- ECTL
- ECTL+
- CTL*
- CTL+
Summary of the course

Linear time

- LTL
- CTL
- $\mathcal{L}(U)$
- $\mathcal{L}(X)$

Branching time

- CTL*
- ECTL$^+$
- ECTL
- CTL +

Trace equiv.

Bisimulation
Summary of the course

Linear time

- First-order logic
- LTL
  - $\mathcal{L}(U)$
  - $\mathcal{L}(X)$
  - LTL+Past

Branching time

- Second-order logic
  - Monadic path logic
  - $\text{CTL}^*$
  - $\text{ECTL}^+$
  - $\text{ECTL}$
  - $\text{CTL}^+$

Trace equiv.

Bisimulation
Summary of the course

Linear time

First-order logic

- LTL
- L[X]
- L[U]

LTL+Past

Büchi automata

Trace equiv.

Branching time

Second-order logic

Monadic path logic

CTL

ECTL

ECTL+

CTL*

Bisimulation

Alternating tree automata

1-w.ABA

1-w.ABA

1-w.ABA

1-w.ABA