Complexity: LTL $\rightsquigarrow$ NBA

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$$\mathcal{L}_\omega(\mathcal{A}) \quad = \quad \mathit{Words}(\varphi)$$

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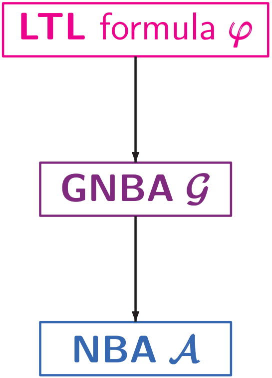

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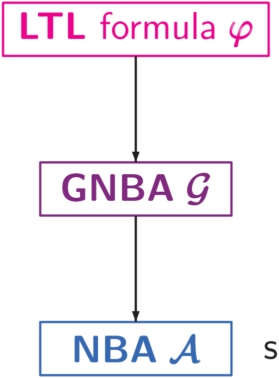

size: $\mathit{size}(\mathcal{G}) \cdot |\mathcal{F}|$

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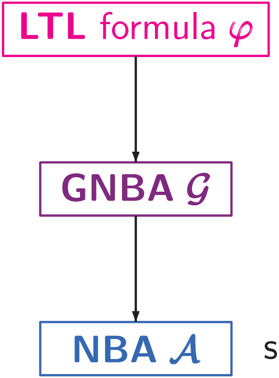

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LTL formula φ

↓

GNBA $\mathcal{G}$

↓

NBA $\mathcal{A}$ size: $\mathit{size}(\mathcal{G}) \cdot |\mathcal{F}|$

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$$\mathcal{L}_\omega(\mathcal{A}) \quad = \quad \mathit{Words}(\varphi)$$

LTL formula φ

↓

GNBA $\mathcal{G}$ — size: $2^{|cl(\varphi)|}$

↓

NBA $\mathcal{A}$ — size: $\mathit{size}(\mathcal{G}) \cdot |\mathcal{F}|$

$|\mathcal{F}|$ = number of acceptance sets in $\mathcal{G}$ $\leq |\varphi|$

Complexity: LTL $\rightsquigarrow$ NBA

For each **LTL** formula φ, there is an **NBA** $\mathcal{A}$ s.t.

$$\begin{aligned} \mathcal{L}_\omega(\mathcal{A}) &= \mathit{Words}(\varphi) \text{ and} \\ \mathit{size}(\mathcal{A}) &\leq 2^{|\mathit{cl}(\varphi)|} \cdot |\varphi| \end{aligned}$$

LTL formula φ

↓

GNBA $\mathcal{G}$ — size: $2^{|\mathit{cl}(\varphi)|}$

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NBA $\mathcal{A}$ — size: $\mathit{size}(\mathcal{G}) \cdot |\mathcal{F}|$

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Complexity: LTL $\rightsquigarrow$ NBA

For each **LTL** formula φ, there is an **NBA** $\mathcal{A}$ s.t.

$$\mathcal{L}_\omega(\mathcal{A}) = \mathit{Words}(\varphi) \text{ and}$$

$$\mathit{size}(\mathcal{A}) \leq 2^{|cl(\varphi)|} \cdot |\varphi| = 2^{\mathcal{O}(|\varphi|)}$$

LTL formula φ

↓

GNBA $\mathcal{G}$ — size: $2^{|cl(\varphi)|}$

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Size of NBA for LTL formulas

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For the proposed transformation **LTL** $\rightsquigarrow$ **NBA**:

> The constructed NBA for LTL formulas are often unnecessarily complicated

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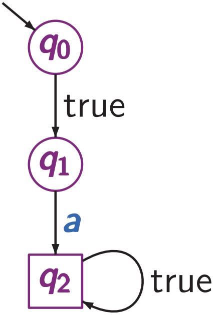
NBA for $\bigcirc a$



constructed GNBA has **4** states and **8** edges

Size of NBA for LTL formulas

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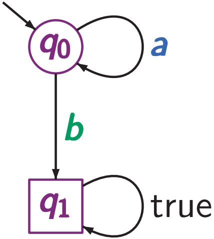
NBA for $a \, \mathbf{U} \, b$



constructed (G)NBA has
5 states and **20** edges

Size of NBA for LTL formulas

For the proposed transformation **LTL** $\rightsquigarrow$ **NBA**:

The constructed NBA for LTL formulas are often unnecessarily complicated

... but there exists LTL formulas φ_n such that

- $|\varphi_n| = \mathcal{O}(poly(n))$
- each NBA for φ_n has at least 2^n states