

1 List Of Models

1.1 Infinite Words

- DBA
- NBA
- GBA
- Rabin automaton
- Muller automaton
- Parity automaton
- E automaton
- A automaton
- coBA
- weak BA
- Staiger-Wagner automaton
- ABA
- LTL
- S1S
- \exists S1S
- S1S₀

1.2 Finite Trees

- DTA
- NTA
- \downarrow DTA
- \downarrow NTA
- DUTA
- NUTA
- DTD
- deterministic EDTD
- single-type EDTD

- EDTD
- Relax NG
- FO
- MSO
- Regular expressions
- DTWA
- TWA

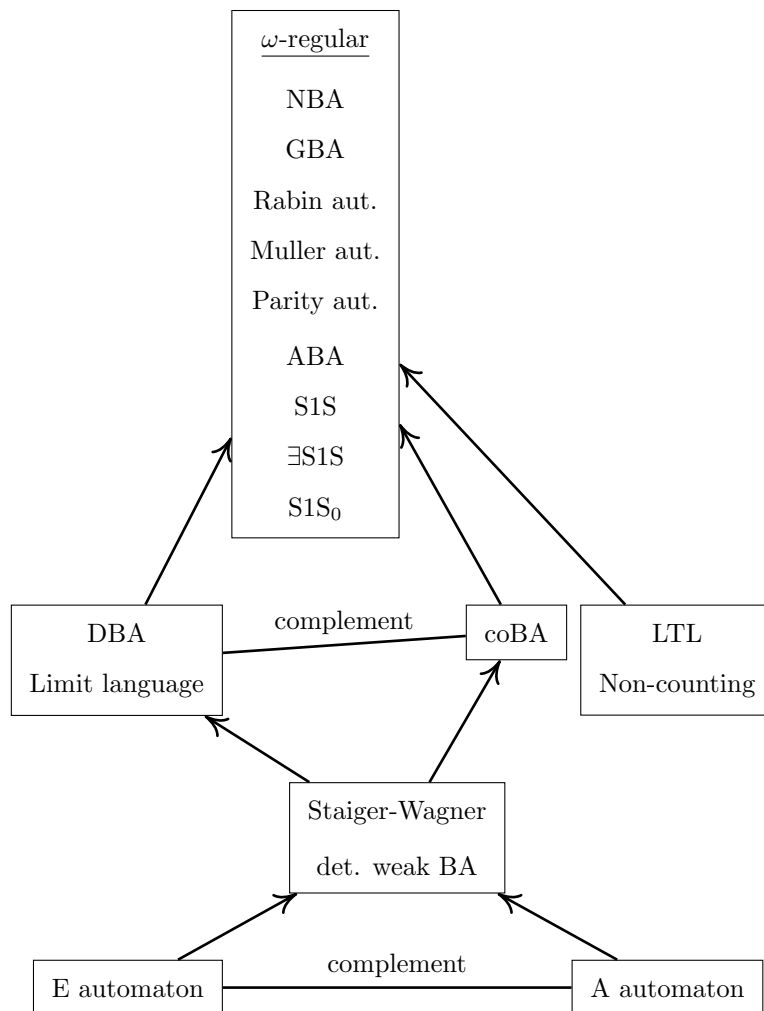
1.3 Infinite Trees

- BTA
- Muller TA
- Parity TA
- DMTA
- S2S (MSO / WMSO)
- S2S₀ (MSO / WMSO)

2 List Of Games

- Büchi
- Staiger-Wagner
- weak Parity
- Reachability
- Safety
- Muller
- Parity
- Rabin
- Streett
- Gale-Stewart
- Wadge

3 Infinite Word Models



3.1 Class Inclusions

- $E \text{ aut.} \subseteq \text{Staiger-Wagner}$
Proof: SWA with $\mathcal{F} = \{Q' \subseteq Q \mid F \cap Q' \neq \emptyset\}$.
- $A \text{ aut.} \subseteq \text{Staiger-Wagner}$
Proof: SW closed under complement,
- $\text{Staiger-Wagner} \subseteq \text{DBA} / \text{coBA}$
Proof: $\mathcal{A} \text{ SWA} \Rightarrow \mathcal{A}' = (Q \times 2^Q, \Sigma, (q_0, \emptyset), \delta', F')$
 Collect all visited states and accept if that set stays in \mathcal{F} .

- $\text{DBA} \subseteq \text{NBA}$
trivial
- $\text{coBA} \subseteq \text{NBA}$
Proof: NBA closed under complement.
- $\text{LTL} \subseteq \text{NBA}$
Proof: ??
- $\text{LTL} \subseteq \text{ABA}$
Proof: ??

3.2 Class Exclusions

- $\text{E aut.} \not\subseteq \text{A aut.}$
Example: $(a + b)^* a (a + b)^\omega$
Proof: ??
- $\text{A aut.} \not\subseteq \text{E aut.}$
Example: $\{a^\omega\}$
Proof: ??
- $\text{DBA} \not\subseteq \text{coBA}$
Example: $(a^* b)^\omega$
Proof: ??
- $\text{coBA} \not\subseteq \text{DBA}$
Example: $(a + b)^* a^\omega$
Proof: ??
- $\text{LTL} \not\subseteq \text{NBA}$
Example: $((a + b) a)^\omega$
Proof: ??

3.3 Class Equalities

3.3.1 NBA

- $\text{NBA} \Rightarrow \omega\text{-regular}$
Proof: ??
- $\omega\text{-regular} \Rightarrow \text{NBA}$
Proof: ??
- $\text{NBA} \Rightarrow \exists \text{S1S}$
Proof: ??
- $\text{S1S} \Rightarrow \text{S1S}_0$
Proof: ??

- $S1S_0 \Rightarrow NBA$

Proof: ??

- Det. Muller $\Rightarrow NBA$

Proof: NBA with $L(\mathcal{A}) = \bigcup_{F \in \mathcal{F}} \left(\bigcap_{q \in F} L(\mathcal{A}_q) \cap \bigcap_{q \notin F} \overline{L(\mathcal{A}_q)} \right)$ where \mathcal{A}_q is \mathcal{A} starting in q .

- $NBA \Rightarrow \text{det. Muller}$

Proof: ??

- (det.) Muller \Rightarrow (det.) Parity

Proof: ??

- $ABA \Rightarrow NBA$

Proof: ??

3.3.2 LTL

LTL \Leftrightarrow Non-counting

No proof. Remarks in F8.

3.3.3 SW

Staiger-Wagner \Leftrightarrow det. weak BA

Proof: ??

3.4 Closures

3.4.1 NBA

- Closed under union

Proof: ??

- Closed under intersection

Proof: ??

- Closed under complement

Proof: ??

3.4.2 DBA

- Not closed under complement (inf. many $a \leftrightarrow$ fin. many a)

3.4.3 SW

- Closed under union

Proof: ??

- Closed under intersection

Proof: ??

- Closed under complement
Proof: ??

3.5 Characterizations

- Parity conditions are directly convertible to Rabin chain conditions and vice-versa.
Proof: Assign priorities in ascending order; $E_k \rightarrow 0$, $F_k \setminus E_k \rightarrow 1$, $E_{k-1} \setminus F_k \rightarrow 2 \dots$
- U is ω -regular iff U is a Boolean combination of DBA-languages
Proof: NBAs are closed under Boolean operations.
- U is DBA-recog. iff $U = \lim(L)$ for some regular $L \subseteq \Sigma^*$.
Proof: ??
- U is E-recog. iff $U = L \cdot \Sigma^*$ for some regular $L \subseteq \Sigma^*$.
Proof: ??
- Landweber's theorem
Proof: ??
- $\text{DBA} \cap \text{coBA} \Rightarrow \text{SW}$
Proof: ??

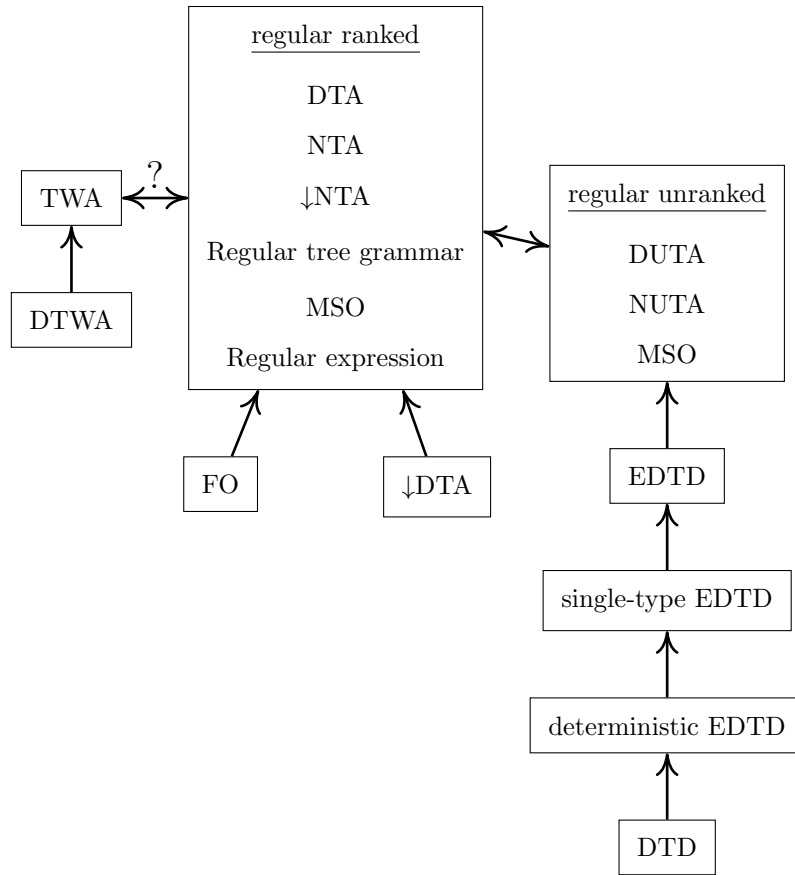
3.6 Duality

- U is A-recog. iff $\Sigma^\omega \setminus U$ is E-recog.
Proof: ??
- U is coBA-recog. iff $\Sigma^\omega \setminus U$ is DBA-recog.
Proof: ??

3.7 Problems / Complexity

- Emptiness problem for NBAs is decidable in poly. time.
Proof: ??
- Emptiness problem for ABAs is PSPACE-complete.
No proof. Remarks in F23.
- Membership problem for ABAs is decidable in poly. time.

4 Finite Tree Models



4.1 Class Differences

TODO

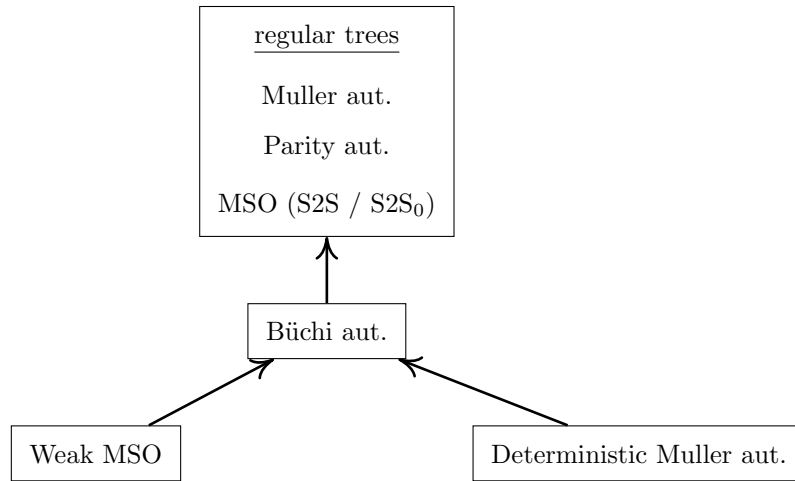
4.2 Class Equalities

TODO

4.3 Closures

TODO

5 Infinite Tree Models



5.1 Class Differences

TODO

5.2 Class Equalities

TODO

5.3 Closures

TODO