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Monotonic CMs
(notes de cours)

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Monotonic CM

• Theo: Monotonic CM are WSTS.

• Proof:
  – The ordering ≤ is a wqo, hence a wpo.
  – Monotony...
  – Hence they are WS.
Decidability

• Finiteness: FRT or with two semi-decidable arguments.

• Termination: the « same ».

• Control-state reachability and coverability: by the computation of Pre*(I) with I upward-closed.
Undecidability

• Boundedness:
  – D for transfer-VASS
  – U for reset-VASS: the proof contains a new idea!

• Place-boundedness: U for transfer-VASS and reset-VASS

• Reachability: Undecidable
  – for VASS with 4 counters whose two allow reset (or transfer).
  – For VASS with 4 counters whose two allow double actions.

• Reachability: D for LCM and LCS: with Pre*
Undecidability

- Proof....

Fig. 8. Update of place $K$ in $N_M$
Repeated control-state reachability

• U for VASS with reset
• U for LCM

• Buchi/LTL properties: U
And for VASS?

- Place-Boundedness is decidable with the KM algo.

- Idea only given.
Omega-recursivity

- Extension (by continuity) of functions to $\mathbb{N}_\omega$.

- All $g$ from $\mathbb{N}$ into $\mathbb{N}$ are $\omega$-recursive.

- There is a $g$ from $\mathbb{N}^2$ into $\mathbb{N}^2$ which is not $\omega$-recursive.

- $\omega$-WSN: extension of VASS to recursive non-decreasing $\omega$-recursive functions.