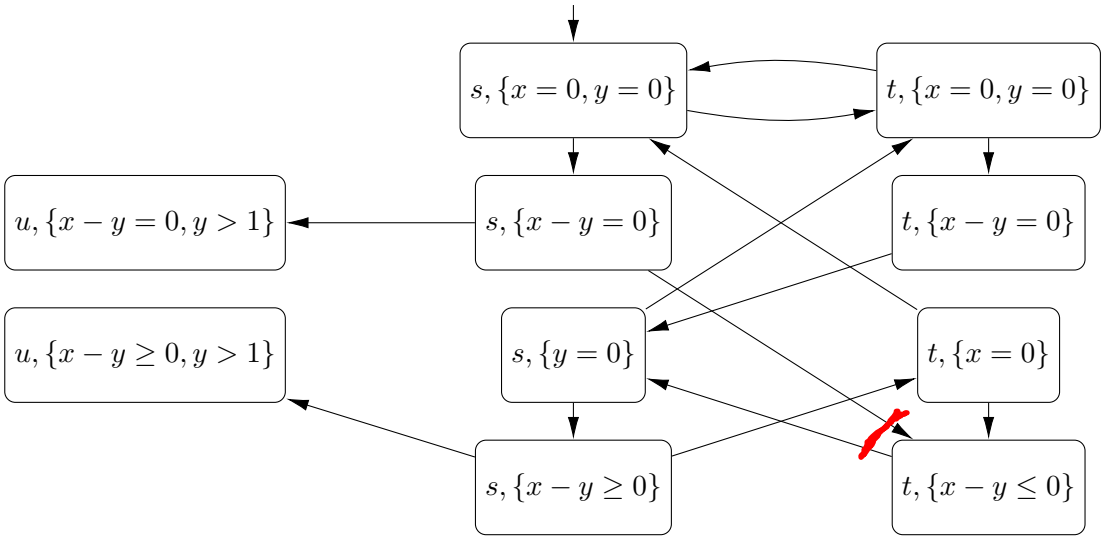
Technische Universität München
Institut für Informatik I07
Theoretical Computer Science

Quantitative Verification 4 - Solutions

Ex 1: Zone Construction



Ex 2: TCTL

- `error` is reachable within 100 time units: $\mathsf{E}\Diamond^{[0,100]}\texttt{error}$.
- The system is `idle` in time units five to ten: $\mathsf{A}\Box^{[5,10]}\texttt{idle}$.
- For the first 1000 time units, whenever there is a `request`, a `grant` will follow in at most five time steps: $\mathsf{A}\Box^{[0,1000]}(\texttt{request} \rightarrow \mathsf{A}\Diamond^{[0,5]}\texttt{grant})$.
- The system is never `idle` on an `error` within the first 1000 time units: $\mathsf{A}\Box^{[0,1000]}(\neg(\texttt{idle} \wedge \texttt{error}))$.
- Whenever $y > 10$ within the first 1000 time units, the system is in `error` within 10 steps: $\mathsf{A}\Box^{[0,1000]}(y > 10 \rightarrow \mathsf{A}\Diamond^{[0,10]}\texttt{error})$.
- At any state reachable within 1000 time units, `error` is reachable within 30 time units: $\mathsf{A}\Box^{[0,1000]}\mathsf{E}\Diamond^{[0,30]}\texttt{error}$.
- Within the first 1000 time units, if a `request` can't be `granted` within three time units, then $x > 4$ and `error` will be reached within ten time units:
  $\mathsf{A}\Box^{[0,1000]}((\texttt{request} \wedge \mathsf{A}\Box^{[0,3]}\neg\texttt{grant}) \rightarrow (x > 4 \wedge \mathsf{A}\Diamond^{[0,10]}\texttt{error}))$.

Note: $\phi \rightarrow \psi := \neg\phi \vee \psi$, $\phi \vee \psi := \neg(\neg\phi \wedge \neg\psi)$.