Quantitative Evaluation of Embedded Systems

Solutions for the set of exercises

Graph 4
\[ \overline{x}(n+1) = \begin{pmatrix} -\infty & 0 & -\infty \\ 3.3 & -\infty & 5.8 \\ 4.4 & -\infty & 6.9 \end{pmatrix} \overline{x}(n) \max \begin{pmatrix} -\infty \\ 3.3 \\ 4.4 \end{pmatrix} u(n) \]

\[ y(n) = \begin{pmatrix} 4.4 & -\infty & 6.9 \end{pmatrix} \overline{x}(n) \max (4.4) u(n) \]
Calculate the maximal cycle mean

\[
\frac{3.3}{2} = 1.65
\]

\[
\frac{6.9}{1} = 6.9 = \text{MCM}
\]
Give a periodic schedule for arbitrary μ.

Independent of μ.
Bound/plot the w.c. latency

Latency \leq 5.8 + 1.1 = 6.9
Optimize the per. sched. for arbitrary $\mu$

There is nothing to optimize.
Regardless of \( \mu \) delaying the input, one can improve latency up to 2.5 time units.

\[
5.8 + 1.1 - 2.5 = 4.4
\]
Only one simple cycle is added. \( \frac{3.8}{\beta} \leq \mu \)

\[ \beta \geq \frac{3.8}{\mu} \quad \text{for } \mu \geq 6.9 \]

Therefore taking \( \beta = 1 \) is always sufficient.

\( \beta = 0 \) leads to deadlock.