1095-93-147 **Paul A Fuhrmann*** (fuhrmannbgu@gmail.com) and **Uwe Helmke**. *Open loop control for state systems.* Preliminary report.

Given a discrete-time, reachable linear system, in state space form $(zI-A)x(z)=Bu(z)$, initially at rest. Our aim is to compute controls that steer the system to a prescribed state ξ. The reachability map is defined by $\mathcal{R}_{(A,B)}u=\pi_{zI-A}Bu$ for $u(z)\in\mathbb{F}[z]^m$, which is a surjective $\mathbb{F}[z]$ homomorphism. We note that $\mathcal{R}_{(A,B)}$ has a kernel which is a full submodule, hence representable as $D\mathbb{F}[z]^m$ for a nonsingular $D(z)$. Factoring out the kernel, we get the reduced reachability map given by $\mathcal{R}=\mathcal{R}_{(A,B)}|X_D$. By construction $\mathcal{R}$ is an isomorphism and we invert it by embedding the intertwining relation $BD(z)=(zI-A)H(z)$ the following doubly coprime factorization

$$\begin{pmatrix} Y(z) & X(z) \\ -B & zI-A \end{pmatrix}\begin{pmatrix} D(z) & -X'(z) \\ H(z) & Y'(z) \end{pmatrix}=\begin{pmatrix} I & 0 \\ 0 & I \end{pmatrix}.$$

In this case we have $u_m(z)=\mathcal{R}^{-1}\xi=\pi_D X'\xi$.

Extensions to some standard networks of linear systems will be indicated.

Key words: Linear systems, controllability, open loop control, unimodular embedding.

(Received September 07, 2013)