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Groups of linear automata

A linear automaton (or linear sequential machine, see [1]) over a field $\Bbbk$ is a tuple $A = \langle Q, X, \lambda, \pi \rangle$, where

1. Q, X are $\Bbbk$-linear spaces, the space of inner states and the alphabet respectively;
2. $\lambda : Q \oplus X \to Q$ is a $\Bbbk$-linear mapping, the transition function;
3. $\pi : Q \oplus X \to X$ is a $\Bbbk$-linear mapping, the output function.

For each $q \in Q$ the linear automaton A defines in a standard way (see, for example, [2]) a $\Bbbk$-linear mapping $F_{A,q}$ of the space $\oplus_{i=1}^{\infty} X^{(i)}$, $X^{(i)}$ is isomorphic to X, $i \geq 1$. Such a mapping is called a linear automaton transformation over X. We consider the group $LAG(X)$ of non-degenerate linear automaton transformations over X. For an abstract group G we present conditions under which G admits an isomorphic embedding into $LAG(X)$. Some series of finitely generated subgroups of $LAG(X)$ are discussed.

[1] Eilenberg S. Automata, languages and machines, vol. A. — New York-London: Academic Press, 1974.

[2] Grigorchuk R.I., Nekrashevych V.V., Sushchansky V.I. Automata, dynamical systems, and groups// Proceedings of the Steklov Institute of Mathematics. — 2000. — **231**, 134-214.