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On joint realization of (0,1) matrices. (English)

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Consider nonnegative integral vectors $R = (r_1, ..., r_m)$, $S = (s_1, ..., s_n)$, $R' = ({r'}_1, ..., {r'}_m)$, $S' = ({s'}_1, ..., {s'}_n)$. Denote by $\mathcal{A}(R, S)$ the class of (0,1) matrices with row sum vector R and column sum vector S. The three classes $\mathcal{A}(R, S)$, $\mathcal{A}(R', S')$, $\mathcal{A}(R + R', S + S')$ are called jointly realizable if there exist matrices A in $\mathcal{A}(R, S)$ and B in $\mathcal{A}(R', S')$ such that $A + B \in \mathcal{A}(R + R', S + S')$. Suppose all these classes nonempty but not jointly realizable, then the existence of a matrix having one of the unavoidable configuration

$$\begin{pmatrix} 1 & 1 \\ 1 & 0 \\ 0 & 0 \end{pmatrix}, \quad \begin{pmatrix} 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$

in the first two classes is shown. A similar theorem about unavoidable configurations in $\mathcal{A}(R+R', S+S')$ is proved. A slight generalization of Anstee's theorem by *R. A. Brualdi* [ibid. 33, 159- 231 (1980; Zbl 0448.05047)], regarding joint realization of matrices with one of the classes having row sums differing by at most 1, is proved.

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05B20 (0,1)-matrices (combinatorics)

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