

TOPOLOGICAL CLASSIFICATION OF LINEAR MAPPINGS

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We consider pairs of linear mappings $(\mathcal{A}, \mathcal{B})$ of the form

$$V \begin{array}{c} \xrightarrow{\mathcal{A}} \\ \xleftarrow{\mathcal{B}} \end{array} W \quad (1)$$

in which $\begin{array}{c} \xrightarrow{\mathcal{A}} \\ \xleftarrow{\mathcal{B}} \end{array}$ is \rightleftarrows or \rightrightarrows ; V and W are finite dimensional unitary or Euclidean spaces. We say that (1) transforms to

$$V' \begin{array}{c} \xrightarrow{\mathcal{A}'} \\ \xleftarrow{\mathcal{B}'} \end{array} W'$$

(with the same orientation of arrows) by bijections $\varphi_1 : V \rightarrow V'$ and $\varphi_2 : W \rightarrow W'$ if

$$\begin{array}{ll} \mathcal{A}'\varphi_1 = \varphi_2\mathcal{A} \text{ and } \mathcal{B}'\varphi_2 = \varphi_1\mathcal{B} & \text{for the case } \rightleftarrows \\ \mathcal{A}'\varphi_1 = \varphi_2\mathcal{A} \text{ and } \mathcal{B}'\varphi_1 = \varphi_2\mathcal{B} & \text{for the case } \rightrightarrows \end{array}$$

We say that $(\mathcal{A}, \mathcal{B})$ and $(\mathcal{A}', \mathcal{B}')$ are *linearly equivalent* if φ_1 and φ_2 are linear bijections and *topologically equivalent* if φ_1 and φ_2 are homeomorphisms.

A pair of linear mappings $(\mathcal{A}, \mathcal{B})$ is *regular* if \mathcal{A} and \mathcal{B} are bijections, and *singular* otherwise. Each pair of linear mappings $(\mathcal{A}, \mathcal{B})$ possesses a regularizing decomposition in direct sum of the regular part and indecomposable singular pairs of linear mappings.

We obtained classification of pairs of linear mappings up to topological equivalence in [1] for the case \rightrightarrows and in [2] for the case \rightleftarrows . We combine these results in the following theorem.

Theorem 1. *The pairs of linear mappings $(\mathcal{A}, \mathcal{B})$ and $(\mathcal{A}', \mathcal{B}')$ of the form (1) are topologically equivalent if and only if their regular parts are topologically equivalent and their indecomposable singular summands are linearly equivalent.*

References

- [1] V. Futorny, T. Rybalkina, V. V. Sergeichuk, *A regularizing decomposition of matrix pencils and a topological classification of pairs of linear mappings.* Linear Algebra Appl. **450** (2014), 121-137.
- [2] T. V. Rybalkina, *Topological classification of pairs of counter linear maps.* Mat. Stud. **39** (2013), 21-28 (in Ukrainian).