Symmetries on Euclidean plane and mechanics

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The new branches of geometry appear with transferring the results of other mathematical sections, such as set theory, algebra, etc. generally. Hilbert suggested to consider the linguistic rules in addition to the axioms $\mathbb{R}^2$. In the present study hypothesis extended to the plane itself , which is proposed as text. Levels of study of the text are its internal relations. As basic postulates were used: permutation, mirror and with unitary matrix symmetries by Dieudonne, table automorphisms and transfer symmetry by H. Weyl, definition of symmetry by M. Born, binary automorphisms by F. Bachman.

Extended table of Dieudonne symmetries was built on the base of relational algebra and semiotic analyze:

1. Existing of set ($A \neq \emptyset$ Zermelo).
2. Existing of relation ($a_1 \mathbf{R} a_2$ Codd).
3. Membership element of set ($a \in A$ Fraenkel).
4. Universal relation ($f : \Omega \to \Omega'$ implication).
5. Linguistic description of the set (Descartes).
6. Linguistic presentation of the relation (Descartes).
7. Saving cardinality ($\mathbf{m}(A) = const$ Lagrange).
8. Saving power relations ($n = const$ in $C_1 x^n + C_2 y^n + C_3 x^{n-1} y^{n-1} + ... + C_{k-1} x + C_k y + C_0$ Klein).
9. Linguistic order ($\vec{v} = xi + yj + zk + w$ Hamilton).
10. Mathematical order ($a_i \prec a_{i+1}$, where $a_i, a_{i+1} \in \mathbb{R}$ Kantor).
11. Permutation ($a_i \leftrightarrow a_j$).
12. Mirror ($a_i \times -1 = -a_i$).

Symmetries are joined the set theory and universal algebra, so there are two methods for solving the characteristic equation $\mathbf{T}\vec{v} = \lambda\vec{v}$ are exist.

The Jordan curves are the basis for many of the kinematic mechanisms. An exactitude of mechanism causes the trajectory of its motion [2]. The solution of differential equations can be obtained in an analytical form if the trajectory is given of the exact analytical formula. Experiments have shown a difference between the theoretical and actual trajectory less than 5%.

References

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[2] P. Božek, Yu. Turygin, Measurement of the operating parameters and numerical analysis of the mechanical subsystem. *Measurement Science Review* **14** (2014) 198–203. ISSN 1335-8871.