

## A Classification Theory of Prehomogeneous Vector Spaces

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This is a survey of a classification theory of prehomogeneous vector spaces including some unpublished results of Professor Mikio Sato around 1962 with proofs under his permission (Sections 8, 10 and 15) and some results by the author (Section 9) not published elsewhere. This paper consists of the following 15 sections.

- § 1. Basic definitions.
- § 2. Trivial P.V.'s and P. V.-equivalences.
- § 3. A classification of irreducible P.V.'s.
- § 4. A classification of simple P.V.'s.
- § 5. A classification of 2-simple P.V.'s.
- § 6. A classification of reductive P.V.'s with finitely many orbits.
- § 7. Some generalization of castling transformations and a classification of certain P.V.'s (Y. Teranishi's result).
- § 8. A classification of certain reductive P.V.'s (M. Sato's unpublished result I).
- § 9. Prehomogeneity of some reductive triplets.
- § 10. P.V.'s of associative algebras (M. Sato's unpublished result II).
- § 11. A classification of regular irreducible P.V.'s with universally transitive open orbits (J. Igusa's result).
- § 12. Universal transitivity of simple P.V.'s and 2-simple P.V.'s.
- § 13. Irreducible P.V.'s of characteristic  $p \geq 3$  (Z. Chen's result).
- § 14. A classification of irreducible P.V.'s of parabolic type and their real forms (H. Rubenthaler's result).
- § 15. Indecomposable commutative Frobenius algebras and  $\delta$ -functions; Examples of quasi-regular, non-regular P.V.'s (M. Sato's unpublished result III).

S. Kasai, Xiao-wei Zhu, M. Inuzuka, M. Taguchi and others are trying to classify some P.V.'s respectively, but since they are not completed yet, we do not contain their result here. About other aspects of the theory of P.V.'s originated by M. Sato and developed by many other mathematicians, one can see the papers in the references. The author would like to