The antiautomorphisms of simple finite-dimensional ternary algebras

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A classification of antiautomorphisms is motivated by a study of antipodes in Hopf $(2,3)$-algebras, which can be embedded in the usual Hopf algebra. In this paper we consider antiautomorphisms of simple finite-dimensional ternary algebras, depending on whether they consist proper ideals or not. In the first case, we consider antiautomorphisms of order 2 or involutions of $(2,3)$-algebra $\Delta_m^3(c,\varphi) = Mat(m,k)$ as maps

$$\gamma : Mat(m,k) \to Mat(m,k)$$

defined by $\gamma(x) = \mu z^t x^t z^{-1}$, where $\mu = \pm 1$ and z is invertibile matrix from $Mat(m,k)$ (T.2.1).
In the second case, we describe antiautomorphisms of $(2,3)$-algebra

$$R = Hom_k(V_1, V_2) \oplus Hom_k(V_2, V_1)$$

in two cases, as

$$\gamma \begin{pmatrix} 0 & Y \\ X & 0 \end{pmatrix} = \begin{pmatrix} 0 & {}^tA^{-1t}X^tB \\ {}^tB^{-1t}Y^tA & 0 \end{pmatrix},$$

where ${}^tA = \lambda A$, ${}^tB = \lambda B$ and $\lambda = \pm 1$(T.3.1) and

$$\gamma \begin{pmatrix} 0 & Y \\ X & 0 \end{pmatrix} = \begin{pmatrix} 0 & \lambda^{-1} A^{-1t}Y^tA \\ \lambda\, {}^tA^{-1t}XA & 0 \end{pmatrix}$$

(T.3.2), depending of whether matrix $\begin{pmatrix} A & 0 \\ 0 & B \end{pmatrix}$, by which is defined automorphism of R, preserves blocks in matrix $\begin{pmatrix} 0 & Y \\ X & 0 \end{pmatrix}$ or not.

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