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About A Certain Class Of Non-Associative Algebra

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Abstract – In this article, we construct a class of non-associative algebras and study their properties

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Let $M=\{1,2,...,n\}, n \in N$ sets be given. If the $F: M \to M$ reflection is a reciprocal value, R_n is defined between any

$$x(t)=(x_1, x_2, ..., x_n) \; x_i \in R$$
$$y(t)=(y_1, y_2, ..., y_n) \, y_i \in R$$

two elements in the set

$$(x+y)(t)=(x_1+y_1, x_2+y_2, ..., x_n+y_n)$$
$$(x*y)(t)=x(F(t))\cdot y(F(t))$$

+ and * R_n sets of non-associative rings in relation to the actions. Here, in determining the operation *, the $x(F(t))\cdot y(F(t))$ product is the product of the coordinates of the $x(F(t))$ and $y(F(t))$s.

Let us denote this ring by $R_n(F)$. It is also possible to determine the multiplication operation by $\lambda \in R$ with the following,

$$(\lambda x)(t)=\lambda \cdot x(t)$$

equation in the $R_n(F)$ ring, i.e. $R_n(F)$ set forms an associative algebra on the aforementioned operations.

If $F: M \to M$ and $G: M \to M$ are $H: M \to M$ mutually equivalent reflections satisfying $F=H^{-1}GH$ equations for two mutually equivalent reflections, then the reflections *F and G* are said to be similar.

We define each element of R_n in.

$$x(t),\quad t\in M=\begin{Bmatrix}1 & 2 & \dots & n\\ i_1 & i_2 & \dots & i_n\end{Bmatrix}$$

views. In view

$$(x+y)(t)=x(t)+y(t)$$

the sum of the elements is determined. In R_n sets, the multiplication operation can be represented by

$$(x\cdot y)(t)=x(t)\cdot y(t)$$

equations.

For these actions, R_n sets form an associative loop. Now if we determine the product of two $x(t),y(t)\in R_n$ elements using a

$$F:M\to M$$

reflection with the equation

$$(x\cdot y)(t)=x(F(t))\cdot y(F(t)),$$

this operation does not obey the law of associativity, but fulfills the distributive condition, that is, the operations given in the R_n set satisfy the following properties.

1. $((x+y)+z)(t)=(x+(y+z))(t)$
2. $(x+y)(t)=(y+x)(t)$
3. $x+\theta=\theta+x,$ here $\theta=\{0,0,\dots,0\}$
4. For any $x(t)\in R$ element, there is a $x(t)$ opposite element that satisfies the $x(t)+y(t)=\theta$ equation: $x(t)=-y(t)$
5. $((x*y)*z)(t)=(x*z+y*z)(t)=x(F(t))z(F(t))+y(F(t))z(F(t))$.

Let us denote by R_n^F the ring defined by the above conditions.

TheoremFor R_n^F and R_n^G algebras to be isomorphic, it is necessary and sufficient that the substitutions for *F and G* be similar.

Proof: Necessity. Let it be possible to construct an $\Phi:R_n^F\leftrightarrow R_n^G$ isomorphic reflection between R_n^F and R_n^G algebras.

We show that the substitutions for F *and* G are similar. Using the F isomorph, it is clear that the

$$e_1=(1,0,\dots,0)$$
$$e_2=(0,1,\dots,0)$$
$$\dots$$
$$e_n=(0,0,\dots,1)$$

base of the R_n^F space passes to the base of the R_n^G space. In addition, the unit converts to another e_{i_k} vector using the e_k vector F isomorphism. Let's say the equations $\Phi(e_i)=e_{i_k}$ are reasonable.

In this case, if we construct the substitution of H in the form

$$H=\begin{pmatrix} 1 & 2 & \dots & n \\ k_1 & k_2 & \dots & k_n \end{pmatrix}$$

the equation $HF=GH$ is satisfied for the substitutions F and G, that is, the substitutions for F and G are similar.

Sufficiency. Let the substitutions for F and G be similar, i.e. let there be a substitution for H satisfying $HF=GH$. Let us define

$$\Phi : R_n^F \leftrightarrow R_n^G$$

reflection by the equation $\Phi\left(x\left(t\right)\right)=x\left(H\left(t\right)\right)$. In that case the reflection of F is mutually exclusive because H is the substitution. It follows from the last equation

$$\Phi\left(x+y\right)\left(t\right)=\left(x+y\right)\left(H\left(t\right)\right)=x\left(H\left(t\right)\right)+y\left(H\left(t\right)\right)$$

that F holds the reflection + operation. We now show that F saves the reflection * operation.

$$\Phi\left(x*y\right)\left(t\right)=\Phi\left(\left(x\cdot y\right)\left(F\left(t\right)\right)\right)=\left(x\cdot y\right)\left(H\left(F\left(t\right)\right)\right)=\left(x\cdot y\right)\left(G\left(H\left(t\right)\right)\right)=$$
$$=\left(\Phi\left(x\right)\Phi\left(y\right)\right)\left(t\right)$$

There are three types of "multiplication", and the operation R_n^F is a multiplication operation on the ·practical coordinates defined in algebra. Hence F is an isomorphic reflection.

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