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# Replacements in the Conway Third Identity

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Dedicated to Professor Shôrô Araki on his sixtieth birthday

In this note we study knots and links in the 3-sphere $S^3$. J. H. Conway introduced the potential function for a link with labels and stated three Identities in [1]. It is well-known that each replacement appearing in the Conway First Identity is a kind of unknotting operation. In the Conway Second Identity, two replacements are an (ordinary) unknotting operation and the other one is unknown even if we ignore labels (cf. [3], [4]). Here, we will consider replacements appearing in the Conway Third Identity. Let $L_1$, $L_2$, $L_3$, and $L_4$ be four links which differ only in one place as shown in Fig. 1.

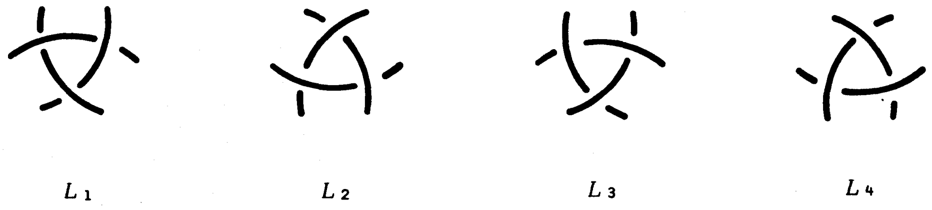


FIGURE 1.

A $\Delta_{ij}$-move is defined to be a local move on a link diagram between $L_i$ and $L_j$. If a diagram of a link $L'$ is a result of a $\Delta_{ij}$-move on a diagram of a link $L$, then we say that $L$ is deformed into $L'$ by a $\Delta_{ij}$-move. $\Delta_{14}$- and $\Delta_{23}$- moves are $\Delta$-unknotting operations defined by H. Murakami and the author in [2]. Our purpose in this note is to show that each $\Delta_{ij}$-move ($i \neq j$) is a kind of unknotting operation and which kind of equivalence relation for links is generated by each $\Delta_{ij}$-move.

## 1. Definitions and theorems.

It is clear that $\Delta_{ij}$-moves never change the number of components of links. And

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