Investigating Indecomposable Prime Matrices in the Special Linear Group and Applications in Information Theory

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I investigated how to determine indecomposable matrices in SL(n, Z) (where Z is the set of all positive integers including zero) and attempted a generalization for n dimensions. Simply put, an indecomposable matrix is defined as a matrix that does not equal the dot product of two other matrices when confined to the semi-group SL(n, Z). The properties of these matrices were analyzed to determine how closely they follow the structure of prime integers, such as the Fundamental Theorem of Arithmetic. Previous work has shown that the set SL(2,Z) has a finite number of primes. A proof was developed proving the existence of two prime matrices in SL(2, Z), and the first generalization for $n \times n$ dimensions was achieved. A mathematical structure was discovered that proves why there are a finite number of primes in SL(2,Z), and also indicates that all higher dimensions have infinitely many primes. Lastly, two uses of these prime matrices were explored; an application for data compression with which a brand new, efficient, compression method could be constructed, and the use of these matrices to find prime integers.