

A new communication theory

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Abstract

In this paper, we propose a communication transmission theory based on the set that the sum of all sub-sets is not equal, combined with the sine function. In theory, it can be realized that any number of binary symbols can be transmitted at one instant. Theoretically, it remains achievable even in noisy environments. The transmission of an infinite number of binary symbols with finite signal power can be achieved by using a sine function with a vertical shift.

Index Terms

Principle of communication, Wireless communication, Transmission rate.

I. INTRODUCTION

In modern communication technology, how to solve the problem of transmitting multiple values at the same time is a key problem in the field of communication. Time division multiple access, frequency division multiple access and code division multiple access technologies have been proposed to solve this key problem. In this paper, we propose a new communication method to solve the key problem of transmitting multiple values at the same time. In this paper, we will give a communication method.

II. PRINCIPLES OF MATHEMATICS

We need to transmit n ($n \rightarrow \infty$) binary numbers simultaneously, we just need to find a set of n numbers:

$$N = \{a_1, a_2, \dots, a_n\} \quad (1)$$

The sum of the elements in all subsets of N must be distinct. Specifically, for any two subsets A and B of N , $\sum_{a \in A} a \neq \sum_{b \in B} b$.

To construct such a set N , it is necessary to ensure that each element in the set grows sufficiently fast. Specifically, the k -th element should be greater than the sum of the previous $k-1$ elements in the set, namely: $N\{k\} > \sum_{i=1}^{k-1} N\{i\}$. It is evident that each new element is greater than the sum of all previous elements, thus ensuring that the sum of any subset including the new element will be greater than any previous sum, and all sums will be distinct. Moreover, by increasing the spacing between elements in the set N , the influence of noise can be ignored during decoding, and this can also be achieved in a noisy environment.

III. PRINCIPLE OF COMMUNICATION

In communication, sine functions are commonly used as carriers for transmitting information:

$$y = A \sin(\omega t + \varphi) + b \quad (2)$$

Where A is the amplitude, ω is the angular frequency, φ is the phase, and b is the offset. The new communication method presented in this paper can be applied to all four parameters.

Taking the offset b as an example: simply, consider transmitting a 3-bit binary number at the same time instance using the transmission function :

$$f(t) = \sin t + b \quad (3)$$

We define the set $N = \{1, 2, 4\}$. Where the elements of N are: $a_1 = 1, a_2 = 2, a_3 = 4$. All subcollections of N is: $N_s = \{\{\phi\}, \{a_1\}, \{a_2\}, \{a_3\},$

$\{a_1, a_2\}, \{a_1, a_3\}, \{a_2, a_3\}, \{a_1, a_2, a_3\}\}$
The set of subset sums $N_{sum} = \{0, 1, 2, 4, 3, 5, 6, 7\}$.

Each element is uniquely associated with a respective set in the N_s collection. Upon receiving a shift value $b \in N_{sum}$, the corresponding set within the N_s collection can be identified. The presence of an element in this set is represented by

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a '1', and its absence by a '0'. For instance, if the received analog signal has a shift value of $b=3$, and the corresponding set in the N_s collection is $\{a_1, a_2\}$, then the transmitted data is decoded as 110. In theory, the size of the set N can be extended to $n \rightarrow \infty$. In this limit, an arbitrary number of binary symbols can be transmitted at a given moment. However, this requires the infinite expansion of the set N and the corresponding sets N_s and N_{sum} .

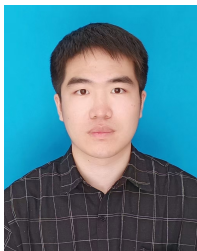
Similarly, the amplitude A , angular frequency ω , and phase φ can also undergo the same operations. Additionally, the four parameters can be used in combination, theoretically increasing the transmission efficiency by a factor of four. Of course, other functions with more parameters, suitable for communication, can also be used as carriers, and the transmission efficiency is positively correlated with the number of parameters. However, in the case of the sine function, the amplitude A and shift b are more suitable for use, while the angular frequency ω and phase φ have more limitations. Therefore, when using other functions as carriers, this issue must also be taken into account.

IV. CONCLUSION

This paper presents a new communication method based on subsets and distinct sets, combining sine functions to propose a communication transmission approach. Theoretically, it is possible to transmit an arbitrary number of binary symbols at a given moment. The trade-off is that the mapping set increases as the number of symbols transmitted at the same time increases, and at the receiver, the decoding requires the corresponding mapping relationship of the known sets. Additionally, by combining the four parameters of the sine function, data can be transmitted with four times the efficiency. In a noisy environment, the values of the elements in the set N can still be adjusted to resist the interference of noise, and an infinite rate can be achieved in a noisy environment. In the past, achieving unlimited information transmission in a noise-free environment required unlimited power. However, this theory - especially when using the Y-axis offset of the sine function for transmission - does not need unlimited signal power.

REFERENCES

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