

A Novel Technique for the Transmission of Digital Data through Bandlimited Channel using Multi-Antenna Approach in the Presence of Channel Fading

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Abstract - In this paper, the authors have introduced a technique for the transmission of data using wireless method where the transmitter and the receiver should contain 4 antennas each. It utilizes the method of Multiple Input Multiple Output (MIMO) technique where there will be 'n' number of users transmitting the information. The data transmission will be wireless, so the main target will be to increase the data rate such that it conveys the useful information to the user on the other end. The result shows that with the amount of the increasing users, the execution of the system should also increase. The basic need for the future communication system (wireless) is that they should be having high information rates.

Key Words: Multiple Input Multiple Output (MIMO), Space Shift Keying (SSK)

1. INTRODUCTION

Multiple antenna methods are becoming one of the main features of wireless communication technologies that are used in the recent scenario. For enhanced complexity and price, it has been developed with much more information rates and with greater error efficiency. The usage of various antennas on the transmitter and receiver end can considerably improve the efficiency of data transmission, efficiency and performance, wireless connectivity between the transmitter and the receiver and its reliability.

One of the major components which has become the key feature in research of wireless communication access technology is the need for elevated data rate transmission to satisfy the requirements of present environments as well as emerging data applications and their related services. The operation of antennas which are multiple in number however, has faced several obstacles due to its complexity, avoidance of inter channel interference and hardware cost because of the synchronization between different antennas, and the chain of Radio Frequency (RF) maintenance requirements. Therefore, a new scheme has been introduced which is recognized as Spatial Modulation. This method has arisen as promising alternatives for spectral and energy efficient wireless communication technologies as they help to maintain a nice equilibrium between the frequency efficiency, energy effectiveness, faulty performances and the complexity of the receiver. Spatial Modulation (SM) is a

transmission method that focuses on the MIMO scheme to provide low system complexity, enhanced data rate and better results of errors in correlated channel settings. Spatial modulation technique is a very newly launched technique in which there will be multiple number of users utilizing multiple number of antennas. The most challenging advantage of Spatial Modulation is that it generally reduces the complexity and enhances energy efficiency. The focus or the purpose is mainly to transmit the data in the form of binary digits (combination of 0's and 1's) through wireless techniques of communication. One specialized and important form of spatial modulation with MIMO technique is the Space Shift Keying (SSK). In this scheme, the transmission antennas of the source are being selected and the method of Space Shift Keying is being implemented using the chosen antennas. The Space Shift Keying (SSK) principle is based on a wireless fading channel which is particularly based on different multipath characteristics of separate antennas. The receiver can therefore use the separate received signals from the different transmitting antennas to distinguish between the transmitted data signals and the messages, resulting in a cost-effective receiver framework. This will therefore present the idea of binary signaling in which the data are transmitted in the form of bits (combination of 0's and 1's). If the transmitter antenna, transmits data bit 0, then a signal will be generated by only the first antenna. A particular signal will be generated by the first and second antenna if the data bit transmitted will be 1.

2. SPACE SHIFT KEYING

Space Shift Keying modulation scheme is a wireless model that places various electrically operating switches between the transmitting side and the receiving side. In case the designed signal is transmitted only by the first antenna when the information bit 0, and when the information bit is 1, both the first and the second antenna transmit the designed signal. It is a unique type of Spatial Modulation Multiple Input Multiple Output (SMMIMO) used for replacing data rate complexities at the end of the receiver.

Here, the data is transferred using only the antenna indices. Using a direct link and preexisting relays, the transmitter and receiver transfer information. The blocks of data pieces are mapped into a transmitting antenna's index in SSK modulation. This antenna is turned on and on and no energy

is emitted by the remaining antennas while the information is transmitted. Space Shifting Key Modulation utilizes the channel's (wireless) location specific feature for information modulation.

2. EXPERIMENTAL SETUP

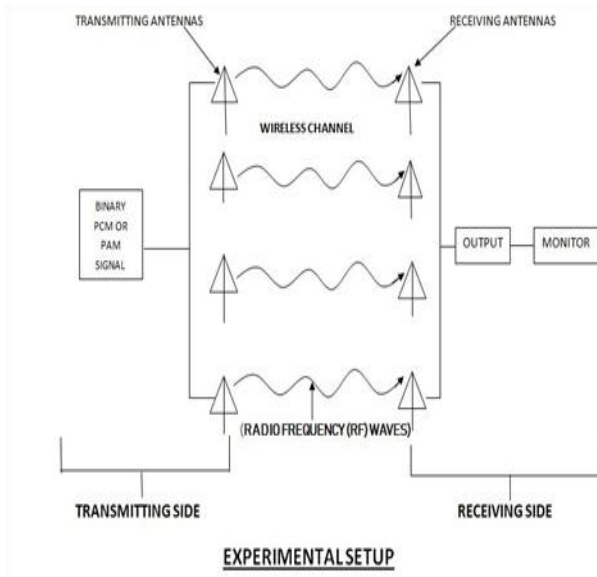


Fig -1: Block diagram

This is the required block diagram of the experimental setup. In this setup, the binary PCM signal or the Pulse Amplitude Modulated (PAM) signal is taken as the input. The transmitting side contains four antennas where a wireless communication will take place. In the space shift keying technique, there were no transmitted signals. Only the indices of the transmitting antenna were used for conveying the information through wireless channel. Since there are no symbols being transmitted, SSK reduced the complexity of the system by removing the concept of amplitude and phase modulation which is required in the transmission and receiving components. The receiver can utilize the different received signals from various transmitting antennas to discriminate against the transmitted data message, resulting in making of a very easy and cost effective receiver structure. On the receiver end, there are four antennas for decoding the information. The output is then further connected with the monitor or the LCD where the final output is displayed. This diagram has been employed in order to increase the data rate transmission and reducing complexity.

1.1 Stepwise Representation

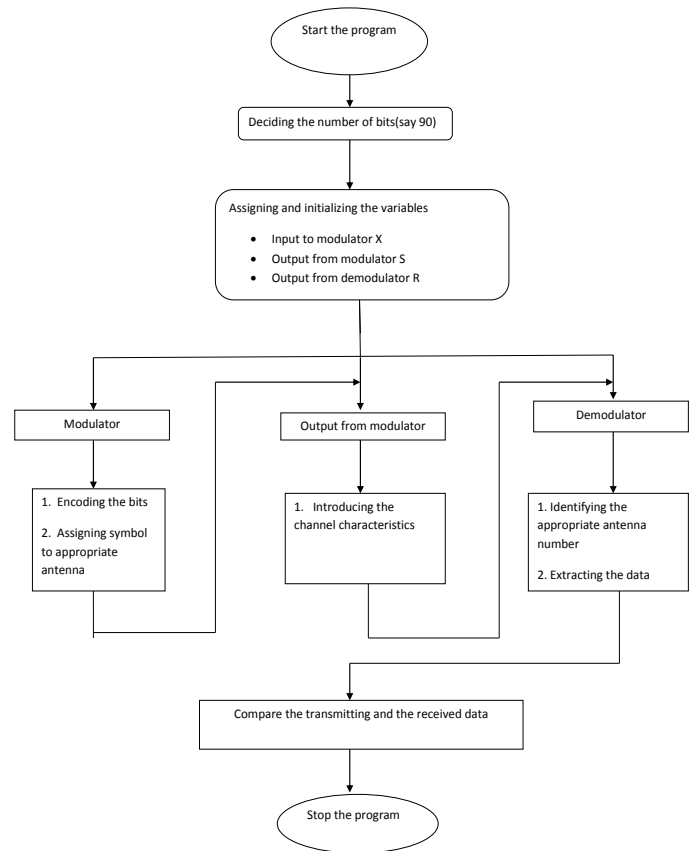


Fig -2: Flowchart

1.2 Input - Output Plots

- Transmitted data

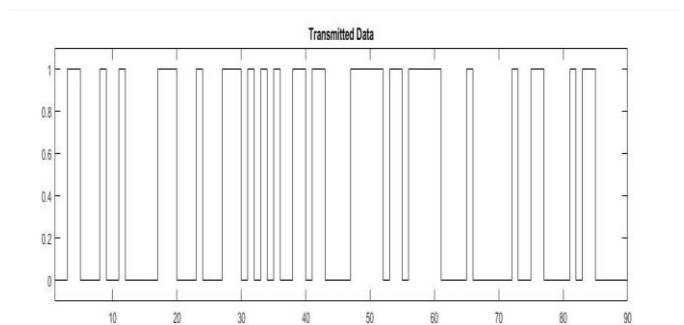


Chart -1: Transmitted signal

In this model, the number of bits taken are respectively 90, which is a multiple of 3. The data is passed through 4 antennas and a standard output is received.

- Received data

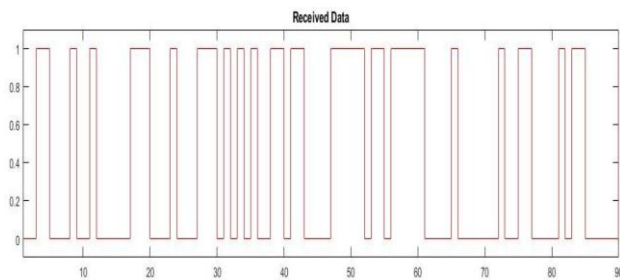


Chart -2: Received signal

The output received is as same as the input signal. There is no overlapping or no wastage of bandwidth. Therefore, this model to supposed to run with maximum performance efficiency.

3. CONCLUSION

In this paper, we have finally concluded the space shift keying method using 4 antennas with no error at the output. The input is taken as the Binary Pulse Amplitude Modulated(PAM) or Pulse Code modulated(PCM) signal. The multiple input and Multiple output method(MIMO) is used since in the recent times it has been considered as the key feature for wireless communication. The transmitting antennas produces bit streams of data which is basically a combination of 0's and 1's. It is transmitted using wireless fading channel and the receiver on the other end receives and decodes the information. In the space shift keying technique, there were no transmitted signals. Only the indices of the antenna were used for conveying the information through wireless channel. Since there are no symbols being transmitted, SSK reduced the complexity of the system by removing the concept of amplitude and phase modulation which is required in the transmission and receiving components. Hence the complexity is being reduced along with the error. The final output which is generated in receiver end is produced in the monitor or the LCD.

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