

# The Design and Analysis of 2ASK Communication System based on SystemView and Matlab

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**Keywords:** digital communication system; 2ASK; design and analysis.

**Abstract:** Digital communication is an important part of modern communication system. Digital communication systems that are easy to deal with, store, exchange and encrypt data information are mainly used in data communication. 2ASK is a typical digital communication system. The design and analysis of 2ASK communication system based on SystemView and Matlab are put forward. Under the environments of SystemView and Matlab, the 2ASK communication system is designed and simulated respectively. Finally, two different implementation methods of 2ASK communication system are compared and analyzed.

## 1. Introduction

The communication system refers to the sum of all technical equipment needed to transmit information. Modern communication system has developed from a single telephone network to a comprehensive communication system to realize a variety of information services. The communication terminal has developed from single telephones to mobile stations, fax machines, computers and other data terminals. The transmission media changes from cable to microwave radio. Communication system has become one of the most important infrastructures to support modern economy.

The communication system includes analog communication systems [1] and digital communication systems [2]. Digital communication system is easy to deal with, store, transmit and encrypt. Binary amplitude shift keying (2ASK) of digital communication system is widely used in data transmission [3].

## 2. Operation Principle of 2ASK Communication System

The General Model of Digital Communication System is shown in figure 1. Digital modulation refers to use digital base band signal to control high frequency carrier and convert digital base band signal into digital band signal. Digital demodulation is to recover the digital band signal to the digital base band signal.

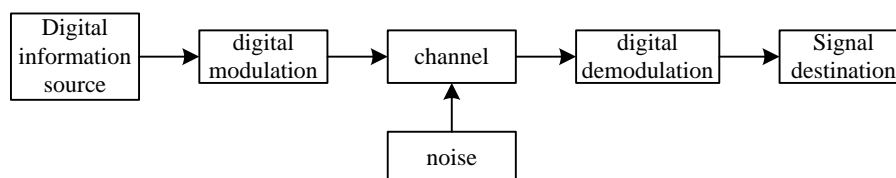


Fig. 1 General Model of Digital Communication System

2ASK is the most common communication system of digital communication system. Because the implementation circuit of 2ASK, it is beneficial to carry on the data transmission. 2ASK digital modulation includes analog modulation and key controlling. Environment of SystemView [4] and Matlab [5], the analog modulation method is adopted in the design. 2ASK digital demodulation can use coherent demodulation and incoherent demodulation and coherent demodulation is adopted in

this paper. The modulation and demodulation block diagram of 2ASK communication system is shown in figure 2.

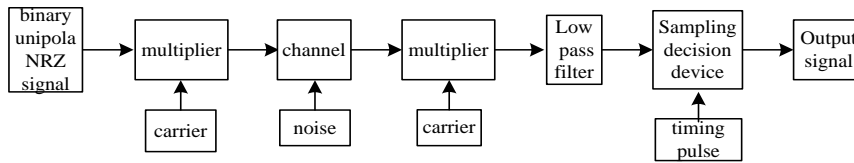


Fig. 2 Modulation and demodulation block diagram of 2ASK communication system

### 3. Design of 2ASK Communication System based on SystemView

The design of 2ASK communication system based on SystemView is shown in figure 3.

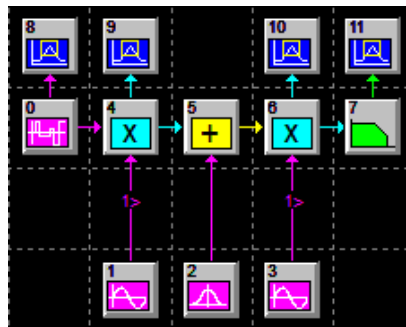


Fig. 3 Design of 2ASK communication system based on SystemView

The component parameters of the 2ASK communication system are set as follows. Token 0 is the base band signal that is PN code sequence. Token 4 and Token 6 are multipliers. Token 1 and Token 3 are carriers. Token 7 is a Butterworth analog low pass filter. Token 9 is the Gaussian white noise. Token 8, Token 9, Token 10 and Token 11 are analyzing and observing windows.

#### 3.1 Simulation Realization of 2ASK Communication System based on SystemView

The running time is set to 1.023 seconds and the sampling frequency is 1000Hz, so the sampling points are 1024. After running the system in Systemview, the analyzing and observing windows of Token 8, Token 9, Token 10 and Token 11 are observed. The simulation of 2ASK communication system based on SystemView is shown in figure 4.

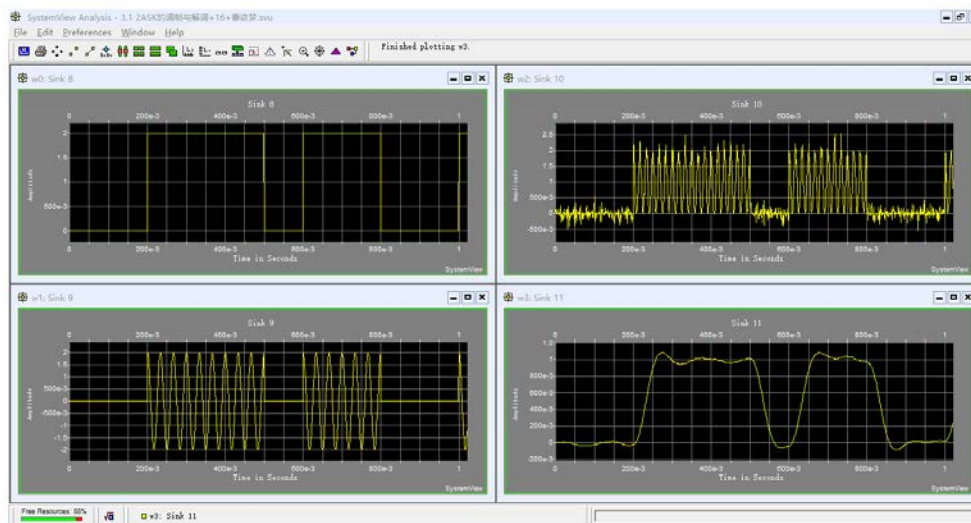


Fig. 4 Simulation of 2ASK communication system based on SystemView

Figure W0 is base band signal waveform. Figure W2 shows the 2ASK modulated signal. Figure W3 is a base band signal waveform recovered by coherent demodulation. It is summarized that 2ASK communication system based on SystemView can realize BPSK communication very well.

#### 4. Design of 2ASK Communication System based on Matlab

The frequency of carrier signal is  $c(t)$ . The frequency of carrier signal,  $f_c$ , is set for  $100H_z$ . The baseband signal,  $m(t)$ , is set for  $[1,0,0,1,1,0,1,0,0,1]$  and that are random numbers between 0 and 1 generated by the *rand* function. The modulated signal of 2ASK is  $S_{AM}(t)$ . The carrier signal of coherent demodulation must be fully synchronized with the modulation carrier.  $d(t)$  is the output signal of low pass filter. Sample decision signals,  $r(t)$ , is baseband signal that is recovered from the modulated signal. The design code of 2ASK communication system in Matlab has been omitted.

##### 4.1 Simulation Realization of 2ASK Communication System based on Matlab

The simulation of 2ASK communication system based on Matlab is shown in figure 5.

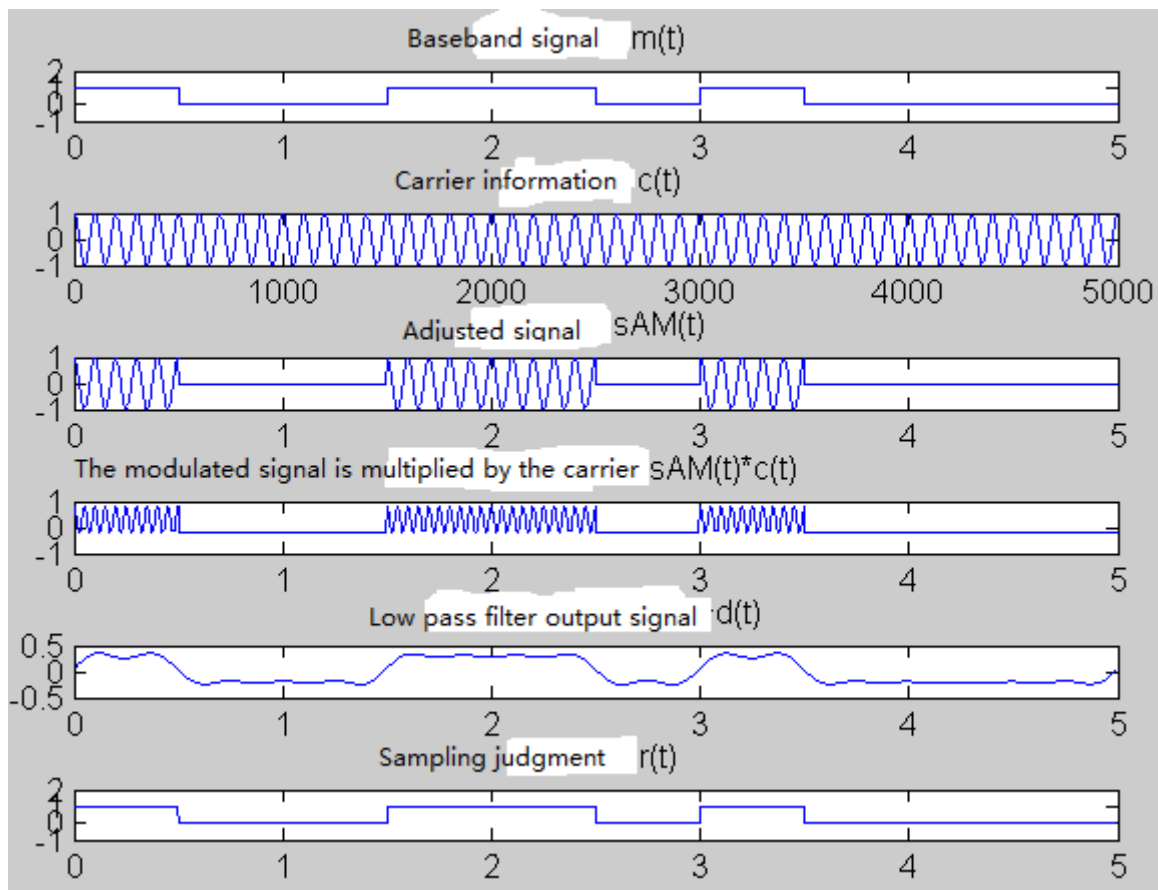


Fig. 5 Simulation of 2ASK communication system based on Matlab

By observing the simulation waveform of 2ASK communication system in Matlab, it can be summarized as follows.  $m(t)$  is baseband signal.  $c(t)$  is a high frequency carrier. Modulated signal,  $S_{AM}(t)$ , is obtained by modulating the amplitude of carrier by using baseband signal. Time domain waveform of coherent demodulation signal is shown. The waveform of  $d(t)$  that come from low pass filter is correct. AND  $r(t)$  recovered from Sampling decision device is as same as the baseband signal.

## 5. Analysis of 2ASK Communication System based on SystemView and Matlab

SystemView is graphical design and it is image, intuitive, simple. If the 2ASK communication principle is mastered, the design of the 2ASK communication system in SystemView can be completed.

Matlab is a language programming and writing code is difficult. It is required that not only the 2ASK communication principle be mastered, but also the professionals who are familiar with Matlab programming can complete the design of 2ASK communication system in Matlab. The design of 2ASK communication system is complex in Matlab.

The design of 2ASK communication system based on SystemView and Matlab can also simulate and realize 2ASK communication system correctly.

## 6. Summary

Modern communication system is a kind of communication network that uses cable or electromagnetic wave propagated in free space to offer various information services. Digital communication is an important part of modern communication system. The data information is easy to deal with, store, exchange and encrypt data information is the advantages of digital communication systems that are mainly used in data communication. 2ASK is a typical digital communication system. The 2ASK communication system are designed and analyzed based on SystemView and Matlab. In SystemView and Matlab, two 2ASK communication systems are designed and simulated respectively. Finally, two different implementation methods of 2ASK communication system are compared and analyzed. The design of 2ASK communication system based on SystemView is simple. But, the design of 2ASK communication system based on Matlab is complex. Both the 2ASK communication system realized on SystemView and Matlab can simulate and realize 2ASK communication system.

## Acknowledgments

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