

DESIGN AND IMPLEMENTATION OF PULSE CODE MODULATION USING MATLAB SIMULINK

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ABSTRACT

In the world of communication the most important aspect is quality i.e. non distorted communication in modulation process. Modulation in sense is used to improve the quality obtained to the user at receiver.

In this paper we design and implement pulse code modulator. For our work, we have design and implemented PCM by using MATLAB Simulink tool. In the communication arena where interface between physical world and digital world is needed, PCM is the answer. Our study on PCM implies about reducing the complexity, no matter how complex they are all analog data can be digitized. Now this input data version with characteristic of reduced complexity is very easy to store. The digital data can be processed easily and transmission of the signal is well received.

Through PCM we achieve rather we can in near future design system in which we can incorporate the sound signal associated with video data for distribution over existing link. The repeatability of information can be obtained with PCM.

Now the modus operandi of acquiring PCM through MATLAB Simulink software is as mentioned simulink block sets required for simulator include scope , quantizer,encoder,sample and hold circuit ,and a pulse generator block for generating signal.

The main function does the Quantizer block which passes the signal through stair step so that many neighboring points on input are approximated thus through PCM we acquire knowledge in greater depth on handling of digital signal, its storage and get out the quality of low noise susceptibility. Along with time analysis, we have performed frequency analysis respectively

Index Terms: Modulation, PCM, Simulink block sets, Quantizer, Sample and Hold Circuit

1. INTRODUCTION

MATLAB is ideal software for computational finances, control systems, communication and most importantly signal and image processing. It can also be used for developing algorithms for hyper sonic vehicles analyzing data. Simulink provide us with continuous test and verification of embedded system and automatic code generation. Simulink is an added tool in matlab for designing communication tools easily. Simulink is a great tool for bringing the project into work without using hardware devices. Simulink helped us analyze the result of our model. Algorithm or programs can be connected to hardware for real time testing and embedded system deployment. In this paper we provide an easy way to understand pulse code modulation (PCM) to students not directly involved in engineering program. Our approach includes use of matlab and Simulink tools to analyze the result.

2. DIGITAL MODULATIONS

Modulation is defined as superimposing of parameters of base band signal on carrier signal parameters of the carrier signal is varied in accordance with signal to be transmitted. Modulation can be sub divided into two categories mainly as continuous wave modulation and pulse modulation. PCM comes in category of digital modulation.

A. Pulse code modulation

PCM is a digital scheme of converting analog data into digital data. The signal output of PCM is in binary format i.e. in two possible states logic 1 and logic 0. It is possible to digitize all forms of analog data like virtual reality, telemetry, music, video and other disciplines.

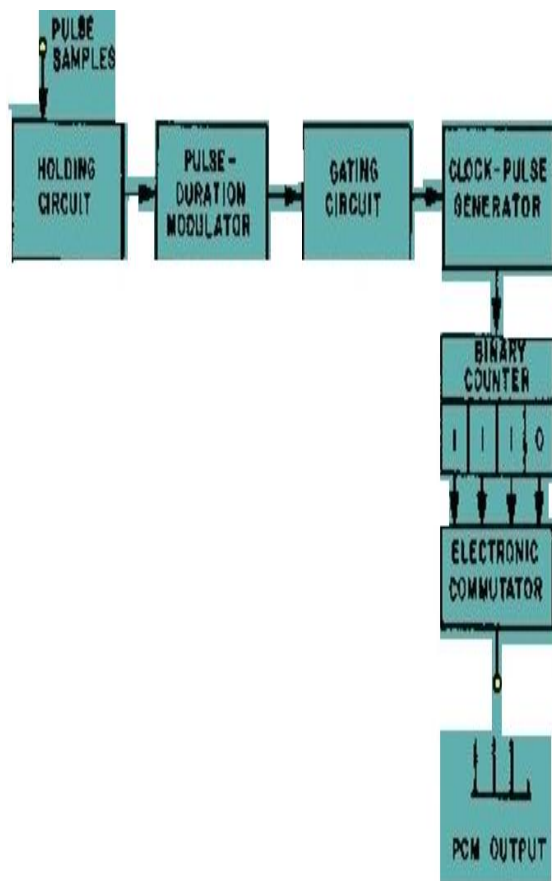


Figure 1: Schematic block diagram of pulse code modulation.

3. SIMULATION OF DIGITAL MODULATION WITH COMMUNICATION TOOLBOX

A.SIMULINK

Simulink in matlab is an added tool for multi domain implementation and analyzes. Simulink includes library for predefined blocks .It contains model configuration parameters, model adviser, and simulation data instructor to name a few. Simulink model uses m-code etc.

As shown in the block diagram of pulse code modulator, the pulse samples i.e. carrier signal in addition with the modulating input (here sine wave) are sampled in the holding circuit which samples the sine wave at certain amplitudes with respect to the carrier pulses. Further these sampled signals are quantized to the nearest value which gives us our required step signal output.

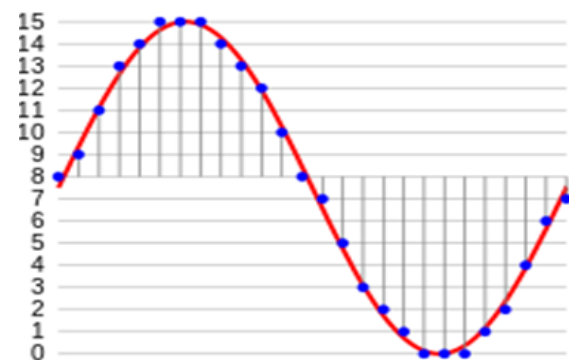


Figure 2: Sampling and quantization of a signal

B.SIMULATION OF PULSE CODE MODULATION

The learners won't have to go deep into theory and formulas but basically have to understand the components and implement model using simulink. The following figure illustrates the blocks needed to design pulse code modulation.

It is needed to select and drag blocks from library and arrange according to required model. The scope blocks are used to view the inputs and to check or analyze output and rectify accordingly

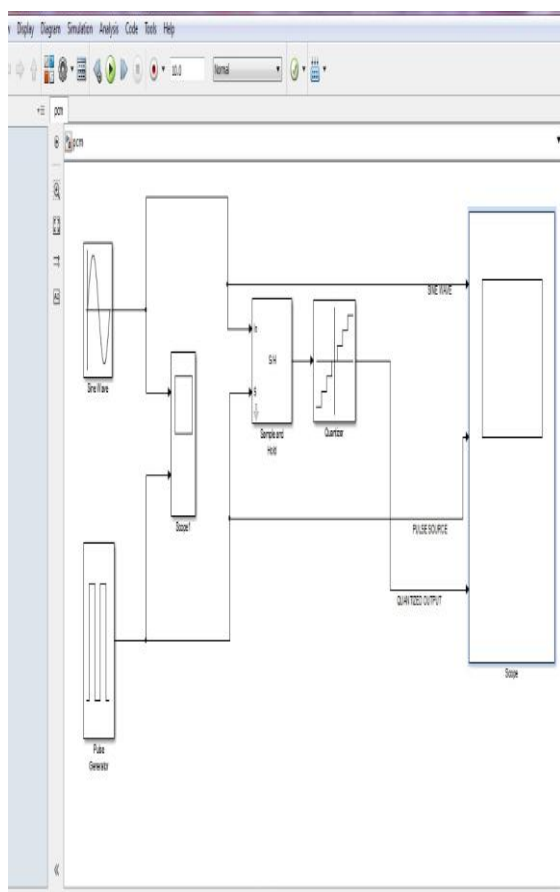


Figure 3: The model of PCM using Simulink

The blocks used in this paper for studying pulse code modulation includes input sources, scope as an output verifier, Quantizer and sample-hold circuitry respectively.

TABLE: MORE DETAILING INTO SIMULINK MODEL

(Moving left to right-Figure 3)

BLOCKS	SPECIFICATIONS
1.Sine wave	Used as modulating signal.
2.Pulse generator	Used as pulse carrier.
3.Sample and hold	Samples and holds at certain amplitudes
4.Quantizer	The sampled amplitudes are rounded to nearest values.
5.Scope	Used as screen to check results.

B. Scope of paper

Due to its low noise susceptibility, many military and secret agencies can use PCM for their communication application. It can be used for incorporation of the sound signal associated with a television program into the video waveform for distribution over different links. PCM can be design and simulated in different ways like using a Matlab function block we can also model it. It requires Matlab programming.

4. Results

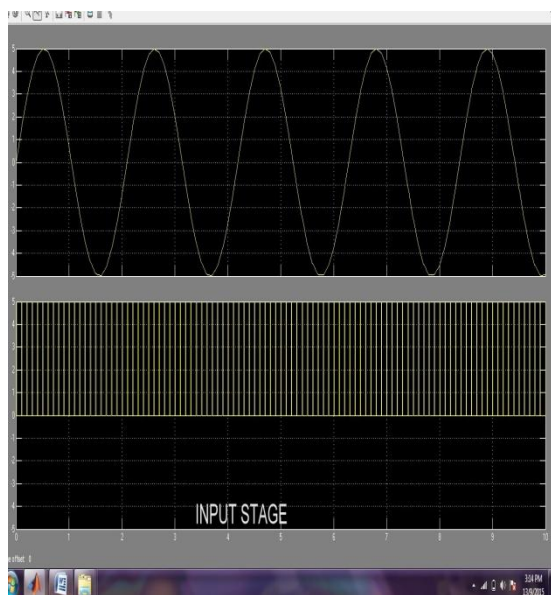


Figure 4: The inputs obtained viz. the modulating and pulse carrier using scope block in Simulink.

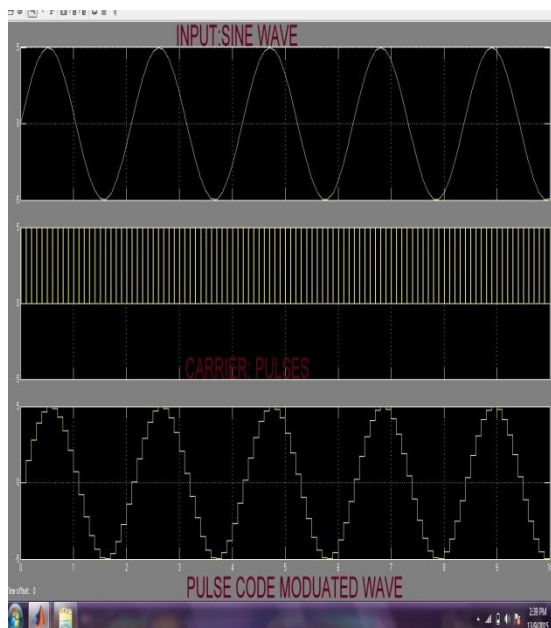


Figure 5: Pulse code modulated output obtained.

5. Conclusion

The simulink model of pulse code modulation was studied and performed.

Without going much into the theoretical part, the concepts behind use of simulink tool in the matlab software were understood.

Moreover, pulse code modulation was understood by the performers, also about the advantages and disadvantages of using Quantizer block.

6. References

1. www.techopedia.com/definition/24128/pulse-code-modulation-pcm
2. www.mathwork.com
3. Kennedy's Electronic communication
Tata McGraw publications.

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