

Design of Sine and Cosine Waveforms Using Direct Digital Synthesizer

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Abstract: Direct Digital Synthesizer (DDS) is important role in modern digital communication. DDS is new frequency synthesis technique which starts from the concept of phase and directly synthesis waveform required. It has beneficial for fast frequency switching, fine frequency resolution, large bandwidth, and good spectral purity. DDS consists of a phase accumulator, a phase to sine amplitude converter, digital to analog converter. The DDS consisting of two major parts are sine/cosine generator and phase to sine amplitude converter. DDS producing sine and cosine output simultaneously by using only one lookup table. It has able to work in high speed frequencies and it is a method for digitally creating arbitrary waveforms from a single, fixed frequency reference clock. It also consumes very less power than the conventional signal generator. DDS circuit occupies less area and power dissipation. It is to generate multifunctional waveforms at any desired frequency.

1. Introduction

DDS is a method of producing an analog waveform usually a sine wave by generating a time varying signal in digital form and then performing a digital conversion to analog conversion. Digital frequency meter is a measuring instrument and it can be use in general simple measurement & in other fields, like teaching, scientific research and industrial control. The accurate and efficiency of frequency measurement often determine the performance and benefit of instrument, meter or industrial control system, but the precision of frequency measurement has a direct relation with the scientifically and rationality of frequency measurement methods. DDS device are primarily digital, it can offer fast frequency switching between output frequencies, fine frequency resolution, and operation over a broad spectrum of frequencies. A number of high efficiency generations of spectrally pure, wide-band, multi carrier waveforms is a key objective in modern communication and radar applications. A high-efficiency signal generator is a device that cans various type outputs of

Signal waveforms, such as sine, cosine, saw tooth, square, triangle, trapezoidal wave and so on. This aims can be achieved by direct digital synthesis (DDS) of high-frequency RF waveforms with high bandwidth and linearity. Such a DDS would exclude non-linear, narrow-band, high-cost analog microwave components, Implementing an essentially digital transmitter. It would allow one to combine digitally multiple waveforms. Then synthesize directly the composite RF signal. Maintaining the digital nature of the generated RF signal all the way to the power amplifier would be enabled by the use of new highly efficient high-speed semiconductor digital amplifiers. It also would enable the implementation of digital pre-distortion at the RF level compensating for non-linearity of the amplifier chain. Such Digital RF architecture. Today's DDS devices are very compact and draw little power.

DDFS we developed a new structure for the ROM section that makes it to give us the sine and cosine wave digital output signals simultaneously by used of just one lookup table in an efficient way. A direct digital frequency synthesizer plays an important role in modern digital communications. It has advantages of fast frequency switching, fine frequency resolution, large bandwidth. DDFS is an essential technique to generating mention frequencies whenever extremely precise frequency resolution and fast switching speed are required. DDS consists of a phase accumulator, a phase to sine amplitude converter, a digital to analog converter and a filter. Its major parts are sine or cosine wave generator and phase to sine amplitude converter. Producing the sine and cosine output simultaneously has used basically in quadrature structure.

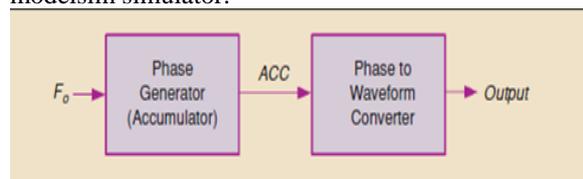
2. Related Work

In this paper we generating Sine & Cosine wave with the help of Direct Digital Synthesis (DDS). By using the combination of Phase Accumulator and Phase to Waveform converter. Phase accumulator is nothing but a counter which resets periodically after n clock pulses. Phase to waveform converter

converts the phase value (count) into the wave form amplitude. We can obtain the output.

3. Proposed Methodology

Proposed work consists of sine and cosine wave has to be simulate with the help of modelsim simulator for showing the result in the analog form and remaining waveform such as square, triangular, & saw-tooth waveform can generate using Xilinx ISE in the form of digitally and it also simulate using modelsim simulator.



▲ 1. Fundamental DDS process.

Fig. 1 Fundamental DDS process

In this paper the DDS consist of phase accumulator and phase to waveform converter. Phase accumulator is nothing but a counter which resets periodically after n clock pulses. Phase accumulator value has change then output frequency will be change. If phase accumulator value is low then output frequency is high & if high then output frequency is low.

Phase accumulator: Phase accumulator is nothing but a counter which resets periodically after n clock pulses. Hence the period of each waveform will be equal to n clock pulses. If phase accumulator value is low then output frequency is high & if high then output frequency is low. If we increase this 'n' value, the frequency of the generated wave can be decreased.

Phase to waveform converter converts: Phase to waveform converter converts the phase value into the wave form amplitude. This is also called phase to amplitude converter.

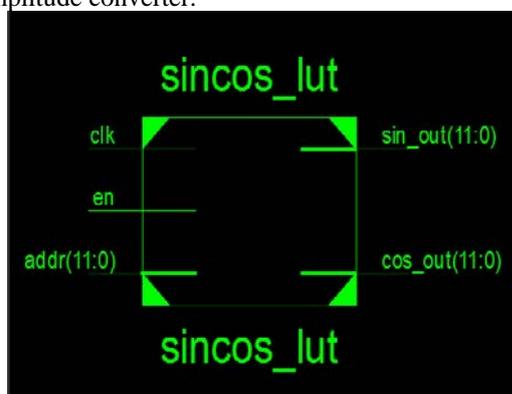


Fig. 2 Sine & Cosine Wave Generation:

OUTPUT:-

In this module we are generating only sine and cosine waveform in digital form & also simulate in analog form with the help of Modelsim simulator.

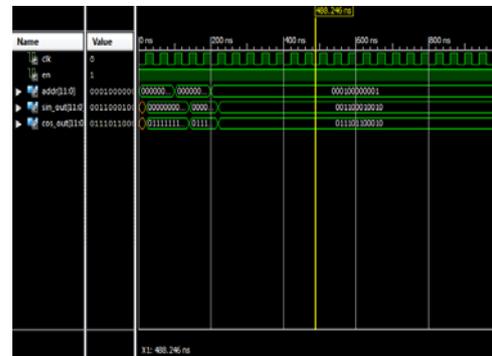


Fig. 3 Output Waveform

4. Conclusion

Direct Digital Synthesizer is used to generate sine and cosine waveform in digital form. That can be applied to generate any waveform at any frequency. By the combination of phase accumulator and phase to waveform converter.

5. Future Scope

In future work we have to generate square and saw-tooth waveform based on DDS technique. Also we are design counter for measuring the frequency generated by DDS. We can obtain the output in analog form with the help Modelsim simulator.

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