

GENERATION OF SINE WAVE USING DSP PROCESSOR

Aim

To generate a sine wave using DSP processor

Theory

A **DSP (Digital Signal Processor)** is a specialized microprocessor designed specifically for the efficient processing of signals in digital form. It is commonly used in applications that involve real-time processing of audio, video, communications, radar, and other sensor data. DSPs excel at executing mathematical algorithms that involve large amounts of data in parallel, which is essential for tasks like filtering, Fourier transforms, compression, and more.

Key Characteristics of a DSP Processor:

1. **Optimized for Signal Processing:** DSPs are designed to handle mathematical operations like addition, subtraction, multiplication, and division, which are frequent in signal processing tasks.
2. **Parallel Processing:** Many DSP processors support parallel processing or Single Instruction Multiple Data (SIMD) operations, enabling them to process multiple data streams simultaneously.
3. **High Throughput:** DSPs often have dedicated hardware for tasks like multiplying and accumulating (MAC), which helps them handle high-volume data streams efficiently.
4. **Low Latency:** DSPs are designed to handle real-time processing with minimal delay, making them ideal for applications like audio and video encoding/decoding, telecommunications, and control systems.
5. **Fixed-Point and Floating-Point Arithmetic:** DSPs often support both fixed-point and floating-point arithmetic, with fixed-point being more common for resource-constrained applications where precision requirements are lower.
6. **Specialized Instructions:** DSPs often come with specialized instructions that accelerate specific signal processing operations, such as fast Fourier transforms (FFT) and filtering.
7. **Power Efficiency:** Because many DSP tasks involve repetitive, predictable operations, DSPs are designed to be power-efficient compared to general-purpose CPUs for these tasks.

Examples of DSP Processors:

Texas Instruments (TI) DSPs: These processors are widely used in industrial, automotive, and telecommunications applications. Popular models include the C2000 and TMS320 series.

Procedure

- Open Code Composer studio
Click on file → New → CCS Project
Select the Target → C674 Floating point DSP
TMS320C6748
Connection → Texas Instruments x DS 100V2 USB Debug Probe
And verify
Give the project name and select finish
- Type the code program for generating the sine wave and choose File → Save As and then save the program with a name including “main.c” .Delete the already existing main.c program
- Select Debug and once finished , select run option
- From Tools Bar , select Graphs → Single Time
Select the DSP Data. Type as “32-Bit Floating Point” and time Display Unit as “seconds(s)”
Change the start address with the array name used in the program (Here, a)
- Click OK to apply the settings and Run the program or Click Resume in CCS.

Program

```
#include <stdio.h>

#include <math.h>

#define pi 3.1415625

float a[200];

main(){

    int i=0

    for (i=0 ,i<200,i++){

        a[i]=sin(2*pi*5*i/200)

    }

}
```

Result

Generated sine wave using DSP processor.

OBSERVATION