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### Application note about Digital signal processing (Tiva)

This application note is focus on the Digital signal processing. Digital signal processing (DSP) represents the signals by a sequence of numbers or symbols and the process of these signals. The goal of DSP is to measure continuous real world signals to digital signals. The first step is use an analog to digital converter to convert the signal from an analog to a digital form. Then, the output signal is an analog output signal by using a digital to analog converter.

In our design, we first want use a DSP unit embeds in our single processing platform. There are a few advantages of using DSP in our design. Firstly, it will give us a X 0.5 to our total score in the weight calculation. Secondly, it is more fast than the Arduino since the microcontroller is much fast. Lastly, the greatest advantage is we can crunch numbers faster with greater precision and less worry about the overflow. For our design, we try to use the Tiva C LaunchPad, which features an ARM Cortex-M4F microcontroller that runs at 80MHz clock rate, which is much high than the Arduino Uno. However, we did not use the Tiva C LaunchPad in our final design due to the following reasons. Firstly, the main reason is we can not get the lunch since the shipping takes at least two weeks, which we do have time to wait. Secondly, the programming for Tiva is hard even though the language is base on C language. Thirdly, the Tiva lacks of library for us to write code. However, the Tiva launchPad is still a powerful tools to know. The following attachment is the main functions and parts of the Tiva.

- **ARM® Cortex™-M4F**
  - **64-pin 80MHz TM4C123GH6PM**
- **On-board USB ICDI**
  - **(In-Circuit Debug Interface)**
- **Micro AB USB port**
- **Device/ICDI power switch**
- **BoosterPack XL pinout also supports**
  - **existing BoosterPacks**
- **2 user pushbuttons**
- **Reset button**
- **3 user LEDs (1 tri-color device)**
- **Current measurement test points**
- **16MHz Main Oscillator crystal**
- **32kHz Real Time Clock crystal**
- **3.3V regulator**
- **Support for multiple IDEs:**

I want to emphasise two things about the Tava. Firstly, the microcontroller. The Microcontroller of Tiva—TM4C123G is the best in class power consumption, which has as low as 370  $\mu\text{A}/\text{MHz}$ , 500 $\mu\text{s}$  wake-up from low-power modes, RTC currents as low as 1.7 $\mu\text{A}$  and Internal and external power control. Secondly, the floating-point. The floating-point is a way to represent real numbers on computers. The IEEE floating-point formats as: half-16bits, single-32bits,double-64bits, quadruple-128bits. The floating pointing unit can provides floating-point computation, enables conversions between fixed-point and floating-point data formats, and floating-point constant instructions. All in all, the Tiva launchPad is a very powerful tools.