TI DSP, MCU, Xilinx Zynq FPGA 프로그래밍 전문가 과정

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$$f(x) = \frac{1}{2}a_0 + \sum_{n=1}^{\infty}\left(a_n\cos\left(\frac{n\pi x}{L}\right) + b_n\sin\left(\frac{n\pi x}{L}\right)\right)$$

$$f(x) = \frac{1}{2}a_0 + \sum_{n=1}^{\infty}\left(a_n\cdot\cos\left(\frac{n\pi}{T}x\right) + b_n\cdot\sin\left(\frac{n\pi}{T}x\right)\right)$$

$$\int_{-T}^{T} f(x)\,dx = \int_{-T}^{T}\frac{1}{2}a_0\,dx + \sum_{n=1}^{\infty}\left\{a_n\int_{-T}^{T}\cos\left(\frac{n\pi}{T}x\right)dx + b_n\int_{-T}^{T}\sin\left(\frac{n\pi}{T}x\right)dx\right\}$$

$$= a_0 T + 0$$

$$\therefore a_0 = \frac{1}{T}\int_{-T}^{T} f(x)\,dx$$

$$f(x)\cos\left(\frac{n\pi}{T}x\right) = \frac{1}{2}a_0\cdot\cos\left(\frac{n\pi}{T}x\right) + \sum_{n=1}^{\infty}\left\{a_n\cdot\left[\cos\left(\frac{n\pi}{T}x\right)\right]^2 + b_n\cdot\sin\left(\frac{n\pi}{T}x\right)\cdot\cos\left(\frac{n\pi}{T}x\right)\right\}$$

$$\int_{-T}^{T} f(x)\cdot\cos\left(\frac{n\pi}{T}x\right)dx = \frac{1}{2}a_0\int_{-T}^{T}\cos\left(\frac{n\pi}{T}x\right)dx + \sum_{n=1}^{\infty}\left\{a_n\int_{-T}^{T}\left[\cos\left(\frac{n\pi}{T}x\right)\right]^2 dx + b_n\int_{-T}^{T}\sin\left(\frac{n\pi}{T}x\right)\cdot\cos\left(\frac{n\pi}{T}x\right)+\right.$$

$$= 0 + a_n\int_{-T}^{T}\left[\cos\left(\frac{n\pi}{T}x\right)\right]^2 dx + 0$$

$$= T a_n$$

↳ $\int_{-T}^{T}\cos^2\left(\frac{n\pi}{T}x\right)dx$

$$= \int_{-T}^{T}\frac{e^{\frac{2n\pi}{T}x} + e^{-\frac{2n\pi}{T}x} + 2}{4}\,dx$$

$$= \frac{1}{2}\int_{-T}^{T}\frac{e^{\frac{2n\pi}{T}x} + e^{-\frac{2n\pi}{T}x}}{2} + 1\,dx$$

$$= \frac{1}{2}\left|x\right|_{-T}^{T} = T$$

↳ $\therefore a_n = \frac{1}{T}\int_{-T}^{T} f(x)\cdot\cos\left(\frac{n\pi}{T}x\right)dx$

$\therefore b_n = \frac{1}{T}\int_{-T}^{T} f(x)\cdot\sin\left(\frac{n\pi}{T}x\right)dx$