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ELEG 305

5/20/19

Contemporary Issues

At the fundamental level, a fourier transform is a mathematical method to represent almost any function as the sum of sine and cosine waves. This is particularly useful in telecommunications and specifically bandwidth. Bandwidth is the frequency spectrum where the voltage gain is mostly constant. In practical terms, bandwidth is generally referred to as the volume of information per unite of time that a transmission medium (such as an internet connection) can handle. If you were a telecommunication engineer, you would like to have infinite Bandwidth, however this is not possible because we can’t make the spectrum hold infinite amounts of data. For example, if you wanted to send a square pulse wave, the derivative at the rising edge of the wave is infinite, it goes straight up. In real life, this would be equivalent to a capacitor charging up instantly, it can’t happen because the capacitor needs time to charge up. This is where fourier transforms are useful. We can use a fourier transform to estimate a square wave without needing infinite bandwidth. With a high enough frequency and amplitude, we can approximate almost any wave/signal using a linear combination of complex exponentials. By using a fourier transform, we can model signals while using limited resources (bandwidth), that functionally are the same as the original wave that we are trying to recreate.