August 3 Update

Simulating a Modulated Signal

From Kian's thesis we have the following formula for signals with frequency modulation:

$$X_t = \sum_m \mu_m cos(2\pi f_m t + 2\pi \int_0^t \phi_m(\tau) d\tau) + Z_t$$

Now let $\theta(t) = 2\pi f_m t + 2\pi \int_0^t \phi_m(\tau) d\tau$. Since ϕ and θ are both polynomials, we can simplify to:

$$\phi(\tau) = \sum_{p=0}^{P} a_p \tau^p$$

$$\theta(t) = 2\pi f_m t + 2\pi \int_0^t \sum_{p=0}^{P} a_p \tau^p d\tau$$

$$\theta(t) = 2\pi f_m t + 2\pi \sum_{p=0}^{P} \frac{a_p}{p+1} t^{p+1}$$

Using these formulas I wrote a function to simulate a modulated signal given a length N, number of frequencies m, and the maximim degree of polynomial to consider P.