

Example 3-8: Synthesize a Chirp Formula

Suppose we want to synthesize a frequency sweep from $f_1 = 220$ Hz to $f_2 = 2320$ Hz over a 3-second time interval, i.e., the beginning and ending times are t = 0 and $t = T_2 = 3$ sec. First of all, it is necessary to create a formula for the instantaneous frequency

$$f_i(t) = \frac{f_2 - f_1}{T_2}t + f_1 = \frac{2320 - 220}{3}t + 220$$

Then we must integrate $2\pi f_i(t)$ to get the angle function:

$$\psi(t) = \int_{0}^{t} \omega_{i}(u) du$$

$$= \int_{0}^{t} 2\pi \left(\frac{2320 - 220}{3} u + 220 \right) du$$

$$= 700\pi t^{2} + 440\pi t + \phi$$

where the phase shift, ϕ , is an arbitrary constant. The chirp signal is $x(t) = \cos(\psi(t))$.

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