Lecture S18 Muddiest Points

General Comments

Today we looked at why coherent demodulation is impractical if there are phase errors. We found that time-varying phase errors will cause the demodulated signal to fade in and out. To fix this problem, commercial stations use double sideband with carrier (AM-DSB/WC), which allows envelope detection to be used instead of coherent demodulation, without errors, so long as the modulation index is less than 100%.

Responses to Muddiest-Part-of-the-Lecture Cards

(5 cards)

1. ***When demodulating AM-DSB/WC [using the diode-resistor-capacitor circuit from the notes], how do you ensure that the circuit decays fast enough to catch each peak of $y(t)$? (1 student)*** Good question! Basically, for the highest frequency $x(t)$ that can occur (about 10 kHz for commercial AM), you have to make sure that the RC time constant is short enough that no peak is missed, but not much shorter. This ensures that the envelope detector has an output that is close to the actual envelope.

2. ***Don't really understand modulation index. (1)*** The modulation index is defined as

$$m = \frac{\max |x(t)|}{A}$$

   where A is the amplitude of the carrier added to the modulated signal. when $m < 100\%$, envelope detection correctly recovers the envelope $(x(t) + A)$, and there is no demodulation error. When $m > 100\%$, envelop detection results in distortion, because the resulting envelope is *not* $x(t) + A$.

3. ***No mud. (3)***