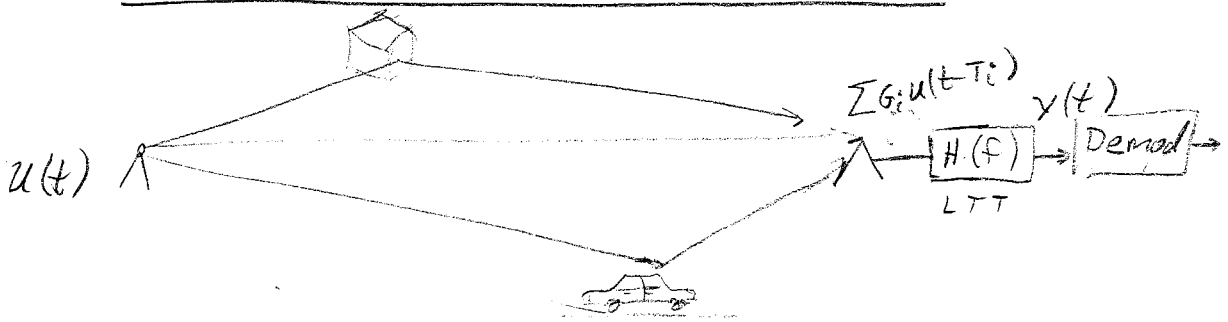
ECE 901: Special Topics in Communications

Wireless Multipath Channel Models



$$z(t) = \sum_i G_i u(t-T_i)$$

$$y(t) = \sum_i G_i \underbrace{(h*u)(t-T_i)}_{x(t-T_i)}$$

Note: duration of x = (duration of h) + (duration of u)

So time between the T_i's and the duration of x (not the duration of u) will determine how much overlap there is between the shifted copies $x(t-T_i)$ and $x(t-T_j)$ for $j \neq i$.

Duration & bandwidth are inversely proportional.
Motion of objects ⇒ Doppler shift.
Indoor environment vs. outdoor environment.
Urban vs. Rural.
Home vs. office vs. Industrial.

Need models for gains G_i & delays T_i
Can also consider angle of departure, angle of arrival, vertical + horizontal polarization.
Clustering

Stochastic Model

The G_i & T_i are random variables (RVs)

Then $y(t)$ is a random process.

Questions For fixed t, what is $P(y(t) \le y)$?

$E[y(t)]$

For fixed t_1, t_2, what is

$E[y(t_1)\overline{y(t_2)}]$?

What is $P\left(\sum_i |G_i|^2 \le g\right)$, $E\left[\sum_i |G_i|^2\right]$?

If we transmit $x(t) = x_0(t)$ or $x(t) = x_1(t)$,
& receive $r(t) = y(t) + w(t)$ $w(t)$ AWGN,
what is the prob. of a decision error?