

EECE 5612 HW6

Stav Ronen

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To find the doppler frequency, the following equation was used:

$$\operatorname{argmax}_{F_D} |\mathfrak{F}\{v(t)u^*(t)\}|$$

Where $v(t)$ is the baseband received signal and $u^*(t)$ is the conjugate of the baseband pulse signal. The estimate of the doppler frequency is then used to find the velocity with the equation

$$v = c \left(\frac{f_D}{f_0} \right)$$

Where the original frequency is 20 Ghz and c is the speed of electromagnetic wave propagation = $3 * 10^8$ m/s. V was found to be 1.065 m/s.

```
v_t = load("hwk6_1.mat").v;  
u_t = load("hwk6_1.mat").u;  
fs = load("hwk6_1.mat").fs;  
  
% estimate the doppler frequency offset  
argmax = fft(v_t .* conj(u_t));  
  
plot(abs(real(argmax)));  
  
[val, f_D] = max(abs(real(argmax)));  
  
f_0 = 20 * 10^9;  
disp("f_0 (Hz):")  
disp(f_0)  
  
disp("f_D (Hz):")  
disp(f_D)  
  
c = 3 * 10^8;  
v = c * (f_D / f_0) ;  
disp("v: (m/s)")  
disp(v)
```