RADAR AND SONAR PROCESSING

(Winter 2020)

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Results

```
7]: # Target Detection
    # Find Peaks still used as threshold function was built later

    from scipy.signal import find_peaks
    R_unamb_zoom = R_unamb
    scalar = np.median(np.absolute(xcorr_array[0:int(len(xcorr_array)/10)]))*2.2
    peaks, _ = find_peaks(xcorr_array, height=scalar, distance=60)

    # make the distance vector
    nsamps = int(len(xcorr_array))
    x = np.linspace(0,R_unamb_zoom, nsamps)
    dx = R_unamb_zoom/nsamps

    # Pandas Table
    import pandas as pd
    # intialise data of lists.
    data = {'Distance':peaks*dx,
            'Return Strength':xcorr_array[peaks]}

    # Create DataFrame
    df = pd.DataFrame(data)
    df = df.style.set_properties(**{
        'font-size': '10pt'})

    # Print the output.
    display(df)
    print('Total Targets: {}' .format(len(peaks)))
```

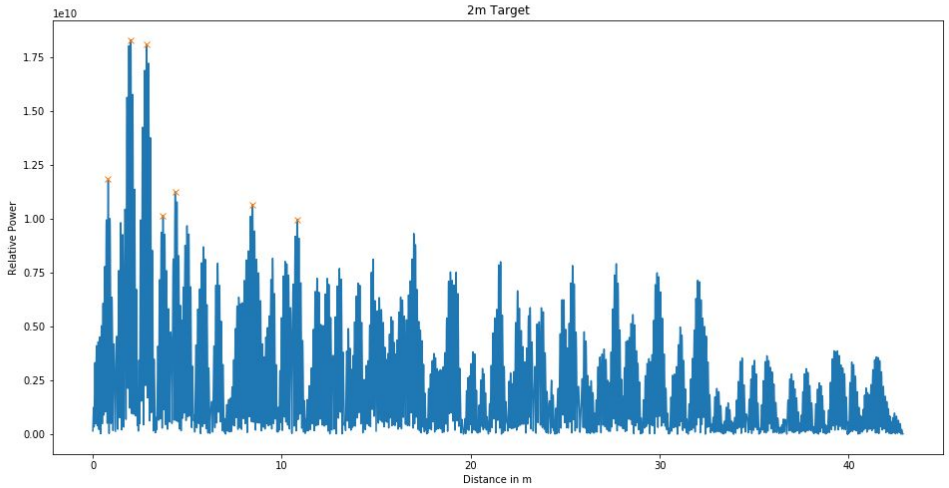
	Distance	Return Strength
0	0.807472	1.18169e+10
1	2.0099	1.82807e+10
2	2.84371	1.80694e+10
3	3.71262	1.01325e+10
4	4.35333	1.12515e+10
5	8.45212	1.06477e+10
6	10.8131	9.96702e+09

```
Total Targets: 7
```

```
In [48]: # Distance Plot

    plt.figure(figsize=(16,8))
    plt.plot(x,xcorr_array[0:nsamps])
    plt.plot(peaks*dx,xcorr_array[peaks], 'x')
    plt.title('2m Target')
    plt.xlabel('Distance in m')
    plt.ylabel('Relative Power')
```

```
Out[48]: Text(0, 0.5, 'Relative Power')
```



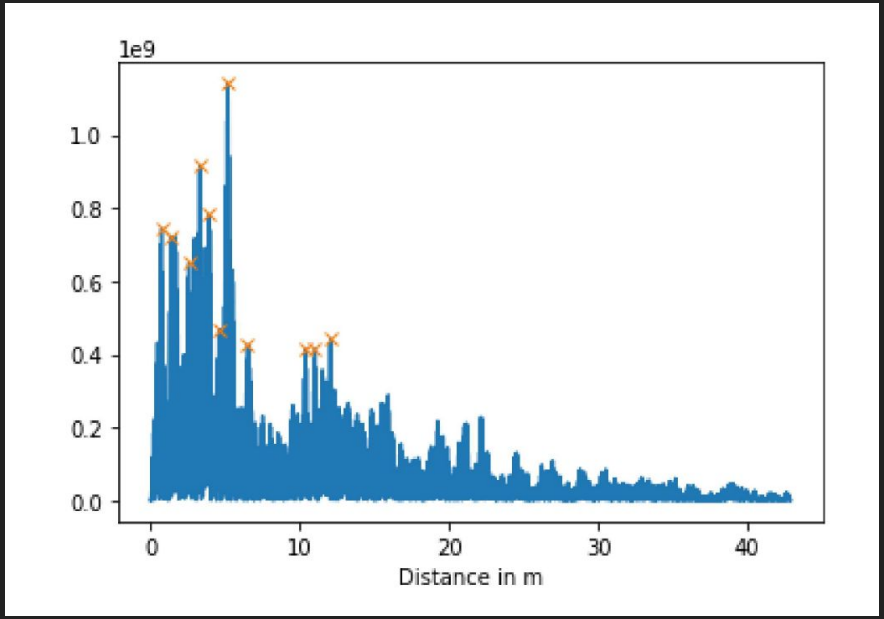
Conclusions

Maximum range detected: ~10m (30 ft.)

Resolution: ~0.5m

FM Chirps from 3-5kHz

Cross Correlated and Filtered (2.5-5.5kHz)



Tips for the Future:

-Dont try to install Librosa on a rPi

-Write better Pseudocode and do more planning

-Our rPi does not like dynamic arrays with several million data points.