Welcome

Talk about radar (radio detection and ranging) / passive radar

Difficulties in passive radar – (non-coop) Illuminators of opportunity.

Possible set-ups (number of Tx/Rx and stationary/moving)

Advantages of passive

Why passive hasn’t been used till recently

* computationally expensive (only recently have DSP capabilities)
* Needs strong broadcast signal to work –DVB-T, DAB,

My thesis project was focused on researching current possible solutions to the problem with the goal of extending a current technique or proposing a new one

First half Researching and imitating the state of the art in passive radar detection

The second half of my project was focused on developing a new technique.

BUT first half now

I examined multiple techniques

* Generalised canonical correlation (START DEMO)
* source localization techniques
* GLRT and Bayesian detection techniques for known-rank signals

All involved simultaneous processing of signal and some form of eigenvalue decomposition was required to get some form of a generalised likelihood ratio test.

HAD STUFF IN COMMON

Form a matrix of time/freq scaled received data  
All techniques developed a field of probabilities from hypothesis on each point.  
So every possible point and frequency needed to be analysed.  
All the received info together

I wanted to reverse this approach and get a set of possible points from a field of probabilities.

I was motivated by the idea that the costs cheaper

Using the aforementioned techniques, signals are captured and then must be transmitted to a centralised processing centre for analysis. This creates problems with time synchronisation from receivers and having to transmit large chunks of received signal data.

CREATED THE NEED FOR SEPARATE PROCESSING

RD maps are the answer I found

Work by correlating received signal with itself since RX has both direct path and target path signal. Or even could use special receivers.

Correlation can also be done as point wise multiplication in frequency domain

so we have the beginnings a fast algorithm

Now my technique is currently just a proof of concept, more fine tuning and analysis, but the foundation is solid.

I present, the range-Doppler transformation.

COMPARE THE TWO TIME COMPLEXITY OF vote and consensus is O(rt^2) worst case

will now discuss the functionality and practical considerations

FUNCTIONALITY

* Sidelobes in RD map due to ambiguity function in range and Doppler
* Targets located in different spatial positions but at same range
* Timing and synchronisation issues become more dominant and amount of computation increases

Questions about implementation or specifics or anything?