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Quarterly Technical Report for Grant F33615-97-1-1014
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A Unified, Multiresolution Framework for Automatic Target Recognition

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This is a quarterly progress report summarizing accomplishments in the research program supported by US Air Force Wright Patterson Laboratory Grant # F33615-97-1-1014. It covers the period from April 1st, 1997 to July 1st, 1997. The principal investigators of this grant are Professors Grimson, Viola and Willsky of MIT. Dr. John Fisher of MIT serves as an additional advisory investigator.

During this quarter we began/completed the following :

1. We presented classification and sar-to-sar image registration results in two separate talks at the SPIE Aerosense conference in Orlando, FL.
2. Initial investigation into the use of multi-resolution representations derived from coherent sub-aperture imagery.

Reaction to both papers was positive. Specifically, Major Tom Burns expressed his interest in the sar-to-sar image registration work and any further investigations that might arise. Unfortunately further investigation into SAR-to-SAR image registration (or multi-sensor image registration) will not take place in the near future for two reasons:

1. there is little multiple look sar imagery available to the university research community, and
2. this work was begun prior to the narrowing of the scope of the grant and we are now concentrating primarily on the classification problem.

Perhaps in the future, at the direction of the sponsor, we will pursue this line of investiagtion.

We have spent the intervening time adapting our existing approach to the new feature set. This work is being conducted by Andrew Kim (a Ph. D. student of Alan Willsky's with experience in SAR image processing). A notional diagram of the feature set being used is shown in the figure 1.

A preliminary ROC curve is shown in figure 2. We should note that these results are over a small set of data (5 degree samping in aspect). Despite the small set of testing data, the results are encouraging, in particular, we note the robustness of the ROC.

We anticipate more extensive testing of this adaptation of the algorithm in the next quarter and reporting our results at the Image Understanding Workshop in November.

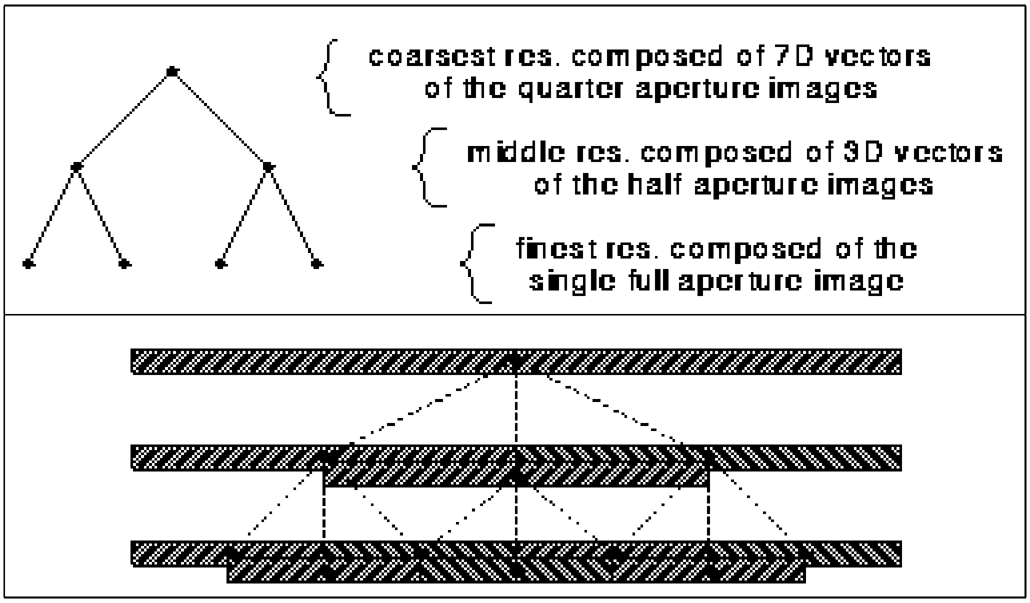

Figure 1: Coarse-to-fine sub-aperture tree structure (top) and corresponding sub-aperture tree (inverted, bottom)

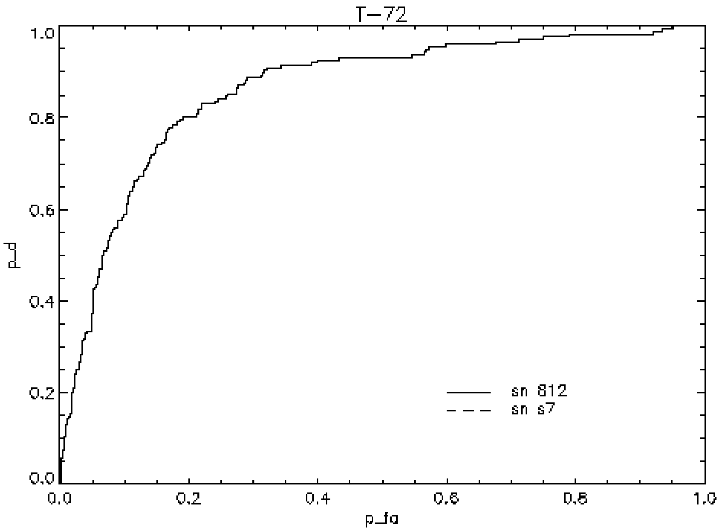

Figure 2: ROC for T72 sampled at 5 degree intervals.