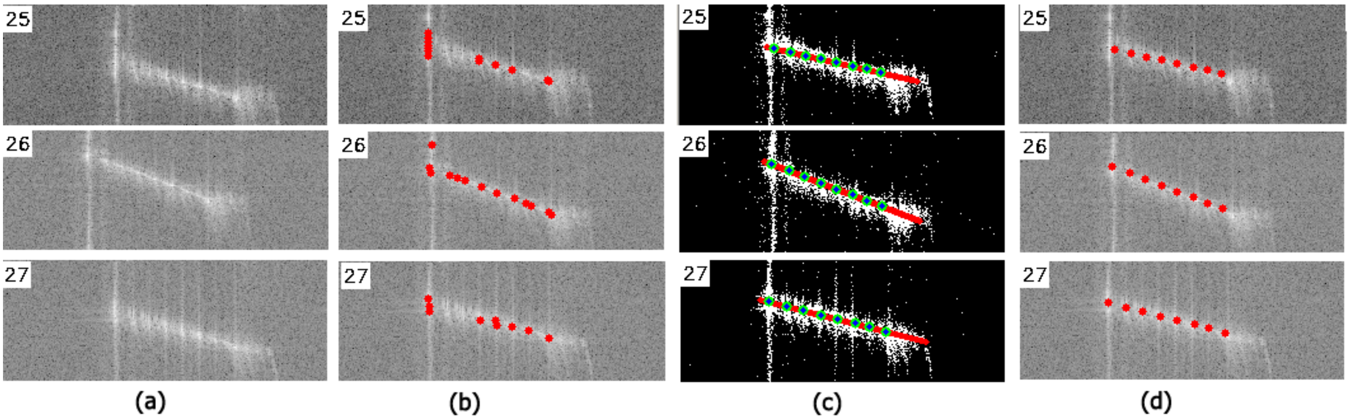

Fig. 5. Dominant scatter detection (a) ISAR images; (b) initial intensity based detection; (c)-(d) detection after multiframe optimization: (c) scatters projected to the extracted object line (d) scatters projected to the original input

Table 1. $E(\{u_t\},\{u_t^{\mathrm{gt}}\})$ error rates of the initial detection (Init Err.) and optimized detection steps (F^mMPP Err.)

Sequence	Frames	Init Err.	F^mMPP Err.
Ship 1	13	52.0	7.5
Ship 2	13	67.1	37.8
Ship 3	13	17.2	12.8
Ship 4	54	43.7	12.6

detection results to the GT. The error measure is defined as:

$$E(\{u_t\},\{u_t^{\mathrm{gt}}\}) = \sum_{t=1}^{n} \Big(|x(u_t) - x(u_t^{\mathrm{gt}})| + |y(u_t) - y(u_t^{\mathrm{gt}})| + $$
$$+ |l(u_t) - l(u_t^{\mathrm{gt}})| + |\theta(u_t) - \theta(u_t^{\mathrm{gt}})| \Big)$$

where x, y and l are measured in pixels and θ in degrees. Results in Table 1 confirm that the proposed F^mMPP optimization process reduces the errors significantly.

We demonstrate the *dominant scatterer* tracking procedure in Fig. 5. Although intensity based feature point detection is very noisy in the individual frames (Fig. 5(b)), the eight permanent scatters are correctly identified by the histogram based technique (see Fig. 4(b) and 5(c)-(d)).

6. CONCLUSION

This paper has addressed the detection and classification of ship targets in ISAR image sequences using an energy minimization approach. We have shown that the proposed Multi-frame Marked Point Process schema outperforms the frame-by-frame direct detection techniques, while a permanent scatterer detection algorithm based on histograming technique may efficiently contributes to target classification.

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