with $N=150$ temporal samples, the modulating phase is $\varphi(x,y,t)=1.5\cos(2\pi t/N)\text{peaks}(x,y)$ where peaks() is the well known MATLAB test function [12]-. In this example, the AC and DC terms are given by $m(x,y,t)=b(x,y,t)=100+25\sin(\pi t/N)$, the carrier frequency $\omega_0=0.5\pi$ and $n(t)$ is a zero-mean normally distributed random variable with standard deviation 25. To simulate the saturation we have set $g_n(t)=255$ and $g_n(t)=0$ for those values greater than 255 and smaller than 1. Figure 5 shows a panel of two snapshots of the temporal analysis for $t=6$ and $t=75$. Each panel row presents the interferogram, the mask marking saturated areas and the demodulated phase along time. As can be seen the quadrature and interpolating character of the *RLSQF* permits a good phase recovery even in the case of a saturation problem. For this example the minimum of the fill factor is $\min(P)\approx 3$.

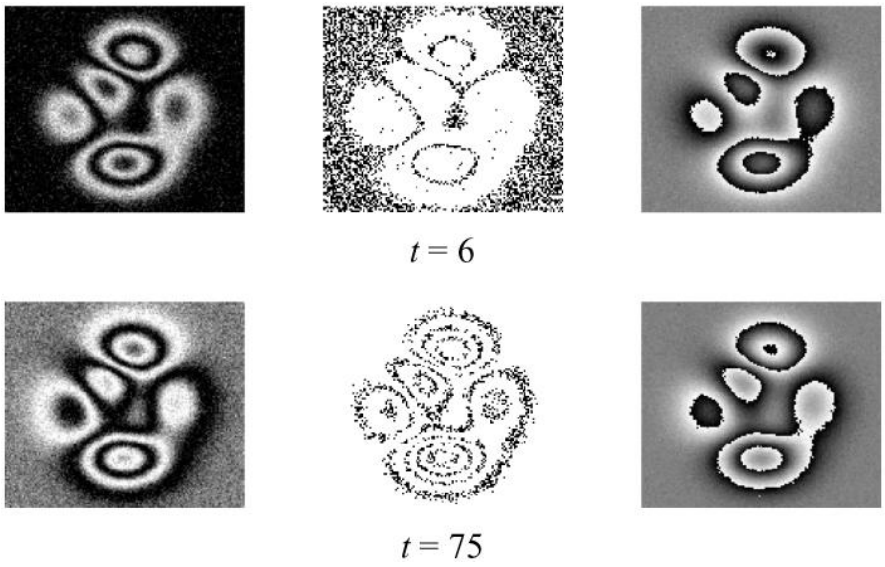

Fig. 5. Temporal demodulation of a time-varying saturated interferogram. From the 150 samples we depict the results for *t*=6 and *t*=75 (see text for details). In each row, we depict the instantaneous interferogram, the processing mask and the demodulated phase.

Conclusions

In this work, we have presented a new quadrature filter using a regularized least squares method. The proposed technique guaranties the quadrature conditions for any combination of carrier frequency, regularization parameter and boundary conditions imposed by the processing mask or missed data. The method is especially useful in temporal PSI when we cannot assume a constant phase or a very long processing window, and with possible missed data. Comparison with existing temporal phase measurement methods demonstrates the performance of the proposed technique.

The MATLAB code to run all the examples of this paper can be downloaded from: goo.gl/RhJq

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