

# Robust Methods for Optical Interferometry Images

## Ph.D Thesis

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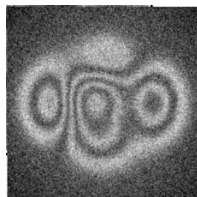
Asesor: Dr. Julio Estrada Rico.

Co-Asesor: Dr Manuel Servin Guirado.

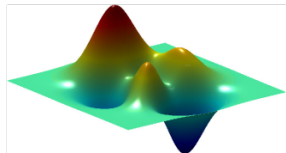
# Algoritmos de Cuadratura

Patrón de franjas:

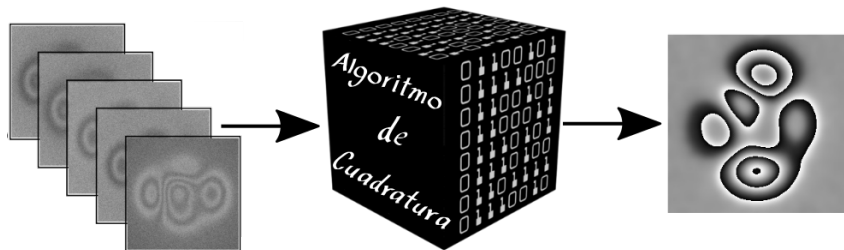
$$I(x, y) = a(x, y) + b(x, y)\cos[\phi(x, y)] \quad (1)$$



$$= a + b \cos\left[ \right]$$

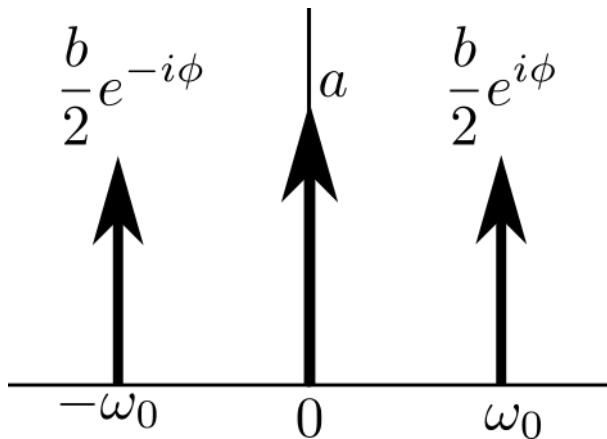


# Algoritmos de Cuadratura



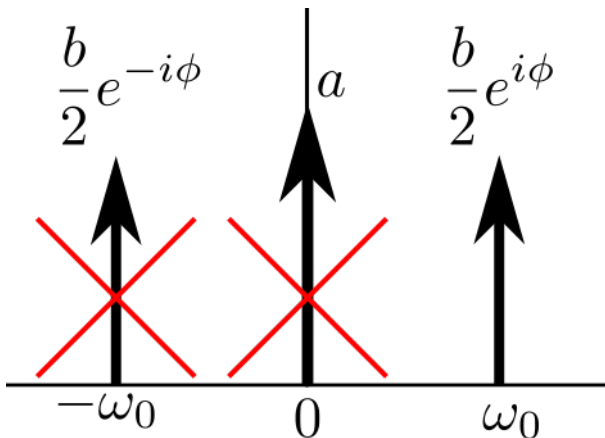
# Algoritmos de Cuadratura

$$\begin{aligned}\mathcal{F}[I(x, y)] &= I(\omega) \\ &= a\delta(\omega) + \frac{b}{2}e^{-i\phi}\delta(\omega - \omega_0) + \frac{b}{2}e^{i\phi}\delta(\omega + \omega_0) \quad (2)\end{aligned}$$



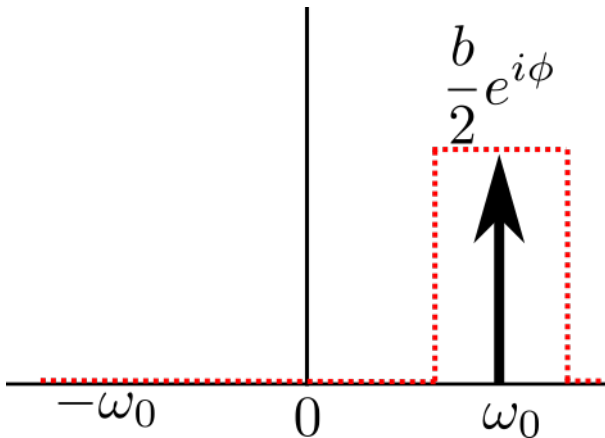
## Algoritmos de Cuadratura

$$H(-\omega_0) = H(0) = 0, H(\omega_0) \neq 0 \quad (3)$$



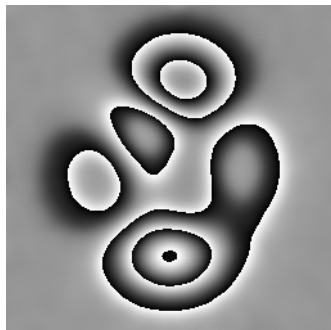
## Algoritmos de Cuadratura

$$I(\omega)H(\omega) = \frac{b}{2}\exp[i\phi] \quad (4)$$



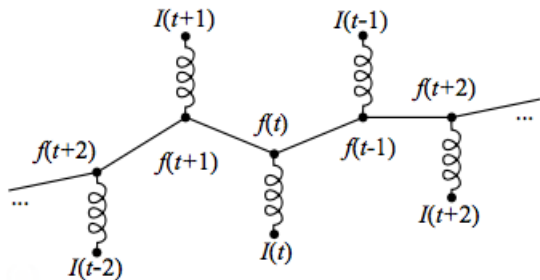
# Algoritmos de Cuadratura

$$\hat{\phi} = \operatorname{atan} \left[ \frac{\operatorname{Im}\{\frac{b}{2} \exp[i\phi]\}}{\operatorname{Re}\{\frac{b}{2} \exp[i\phi]\}} \right] \quad (5)$$



# Filtros Regularizados

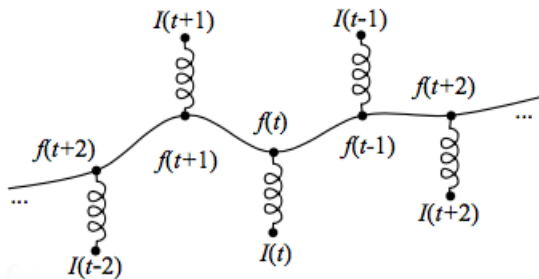
$$U[f(x,y)] = \iint_{(x,y) \in S} \left\{ [f(x,y) - I(x,y)]^2 + \eta \left[ \frac{\partial^2 f(x,y)}{\partial x^2} \right]^2 + \eta \left[ \frac{\partial^2 f(x,y)}{\partial y^2} \right]^2 \right\} dx dy \quad (6)$$





# Filtros Regularizados

$$U[f(x,y)] = \iint_{(x,y) \in S} \left\{ [f(x,y) - I(x,y)]^2 + \eta \left[ \frac{\partial^2 f(x,y)}{\partial x^2} \right]^2 + \eta \left[ \frac{\partial^2 f(x,y)}{\partial y^2} \right]^2 + \eta \left[ \frac{\partial^2 f(x,y)}{\partial x \partial y} \right]^2 \right\} dx dy \quad (7)$$



# Filtros Regularizados

$$U[f(x, y)] = \sum_{(x, y) \in S} \left\{ [f(x, y) - I(x, y)]^2 + \eta R[f(x, y)] \right\} \quad (8)$$

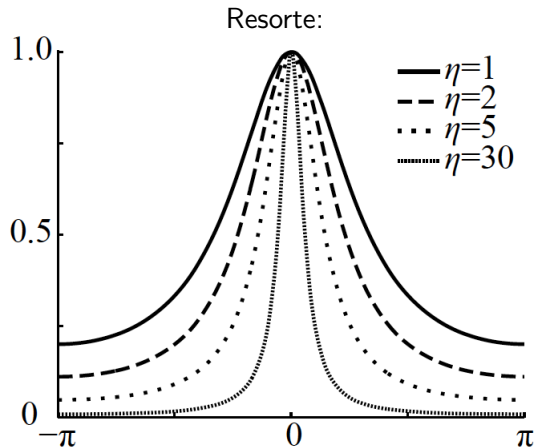
Resorte:

$$R_r[f(x, y)] = [f(x, y) - f(x - 1, y)]^2 + [f(x, y) - f(x, y - 1)]^2 \quad (9)$$

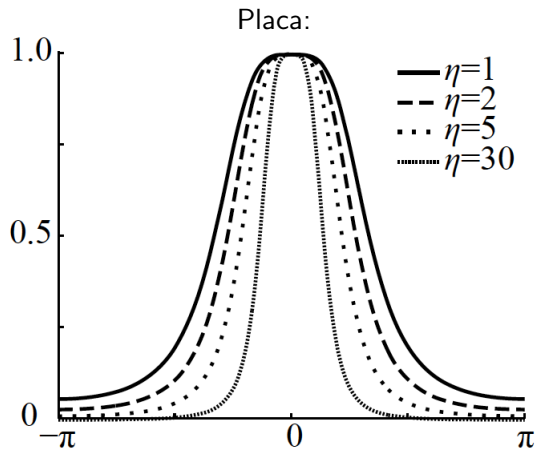
Placa:

$$\begin{aligned} R_p[f(x, y)] = & [f(x + 1, y) - 2f(x, y) + f(x - 1, y)]^2 \\ & + [f(x, y + 1) - 2f(x, y) + f(x, y - 1)]^2 \\ & + [f(x + 1, y + 1) - f(x - 1, y - 1) \\ & + f(x - 1, y + 1) - f(x + 1, y - 1)]^2 \end{aligned} \quad (10)$$

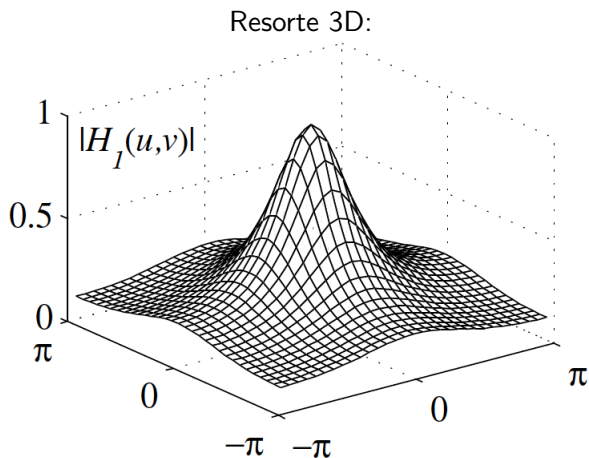
# Filtros Regularizados



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# Filtros Regularizados

