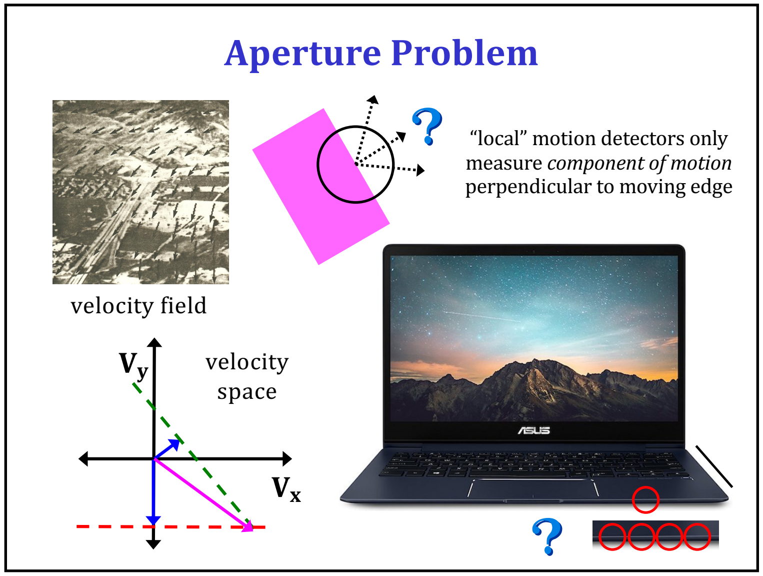
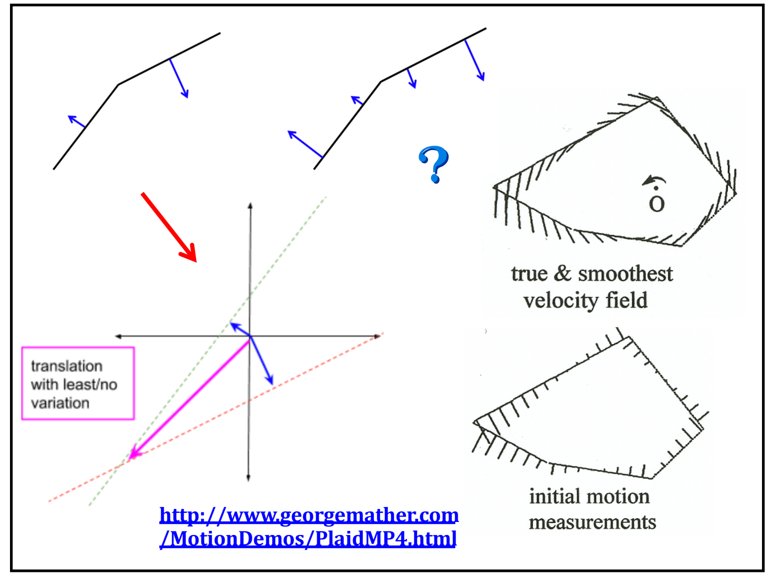
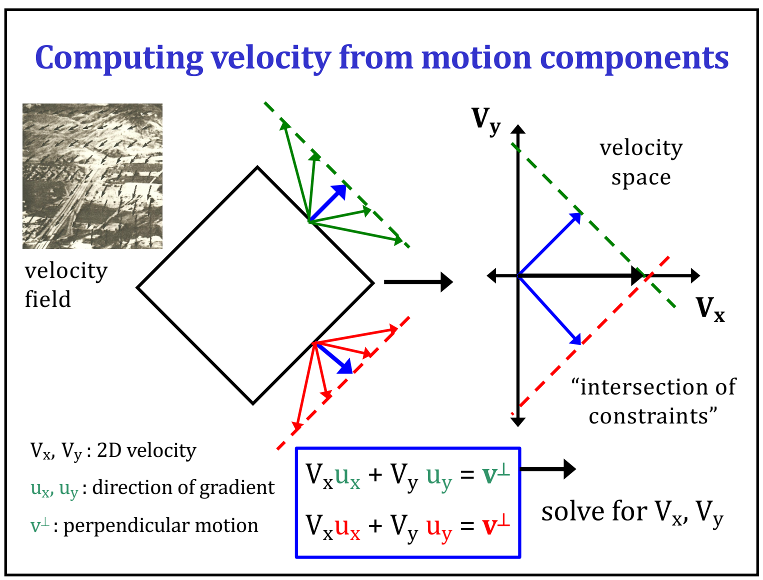

Aperture Problem
velocity field
"local" motion detectors only measure *component of motion* perpendicular to moving edge
velocity space
V_y
V_x

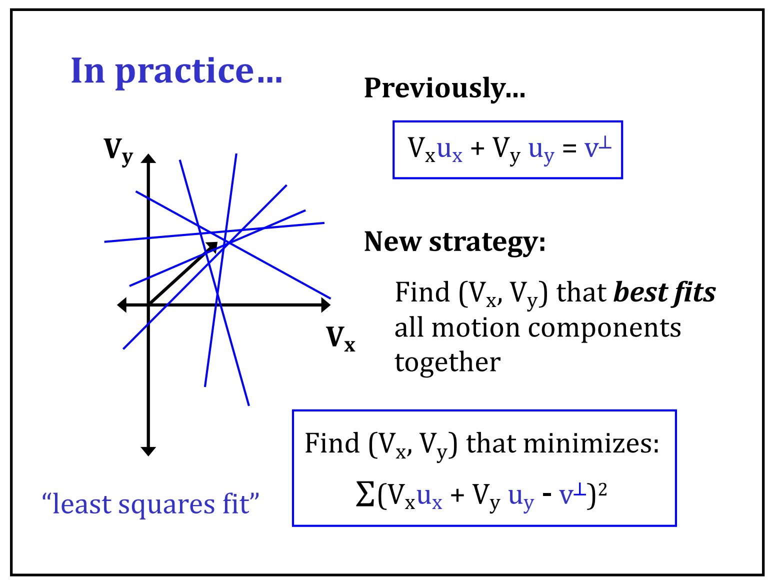
1


true & smoothest velocity field
translation with least/no variation
initial motion measurements
http://www.georgemather.com/MotionDemos/PlaidMP4.html

2

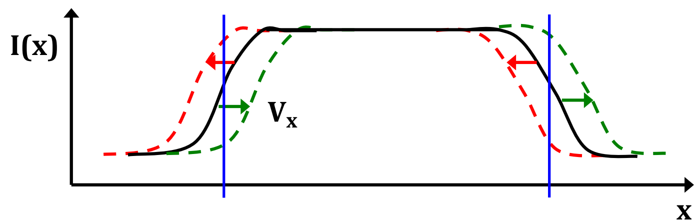

Computing velocity from motion components
velocity field
V_y
velocity space
V_x
"intersection of constraints"
V_x, V_y : 2D velocity
u_x, u_y : direction of gradient
$v^\perp$: perpendicular motion
$V_x u_x + V_y u_y = v^\perp$
$V_x u_x + V_y u_y = v^\perp$
solve for V_x, V_y

3


In practice…
Previously…
$V_x u_x + V_y u_y = v^\perp$
V_y
V_x
New strategy:
Find (V_x, V_y) that ***best fits*** all motion components together
Find (V_x, V_y) that minimizes:
$\Sigma(V_x u_x + V_y u_y - v^\perp)^2$
"least squares fit"

4

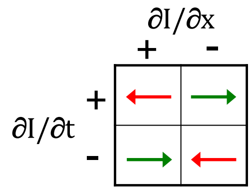
Measuring motion in one dimension



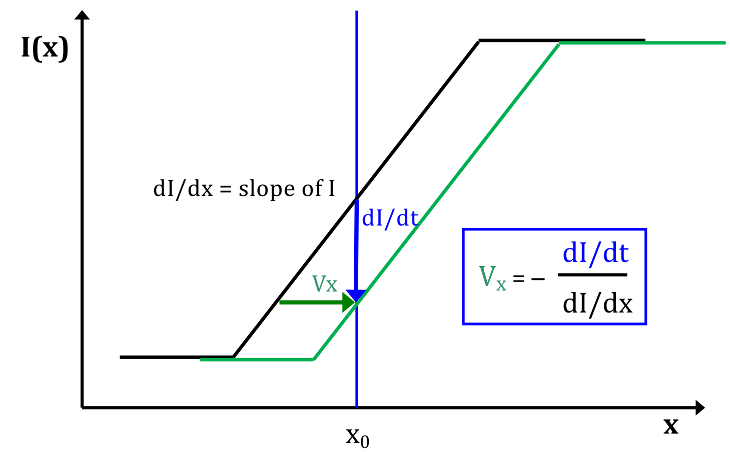
V_x = velocity in x direction

- rightward movement: $V_x > 0$
- leftward movement: $V_x < 0$
- speed: $|V_x|$
- pixels/time step

$$V_x = -\frac{\partial I/\partial t}{\partial I/\partial x}$$



5



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