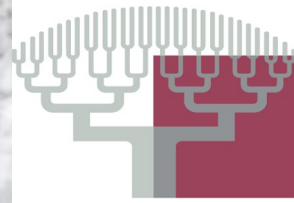


MASTER
INFORMATIQUE



UNIVERSITÉ
PARIS DESCARTES
UFR DE MATHÉMATIQUES ET INFORMATIQUE

Nicolas Loménie

Vision par Ordinateur 3D en Mouvement

L'algorithme de Lucas-Kanade

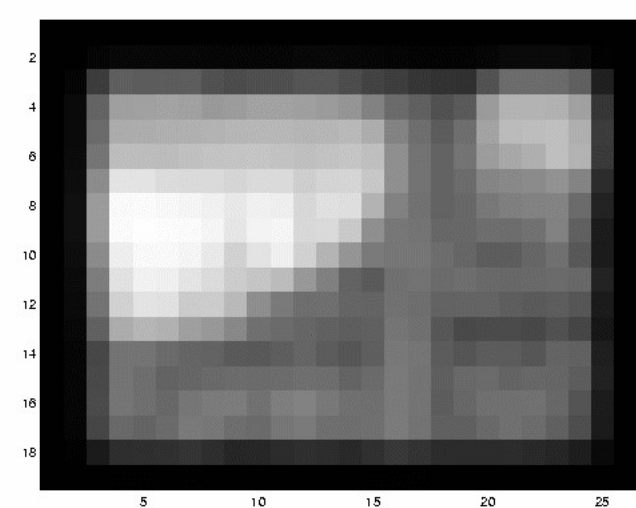
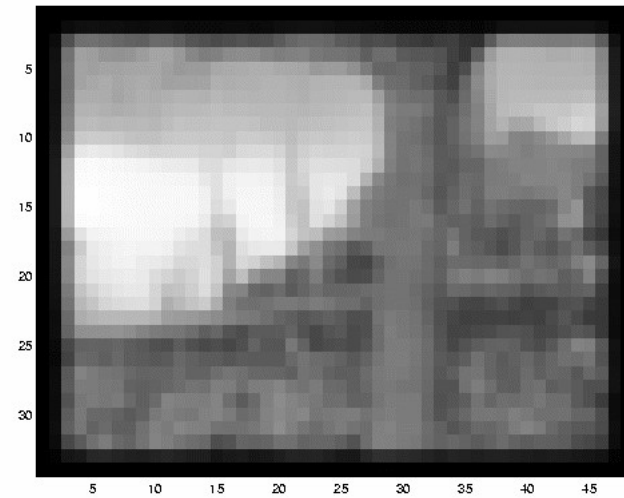
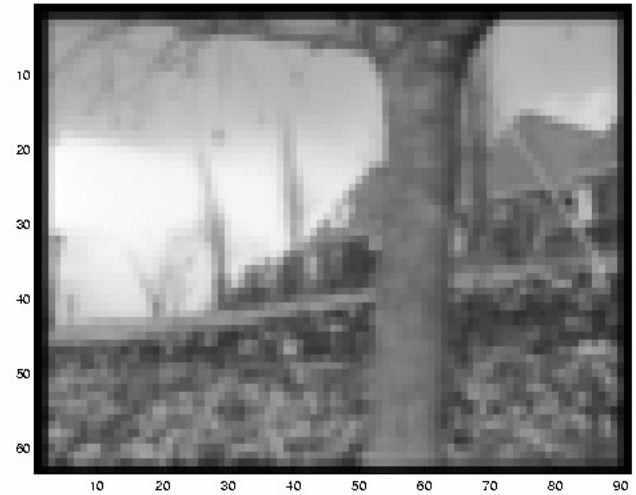
C'est une version de l'algorithme CONST-FLOW.

Deux améliorations notables:

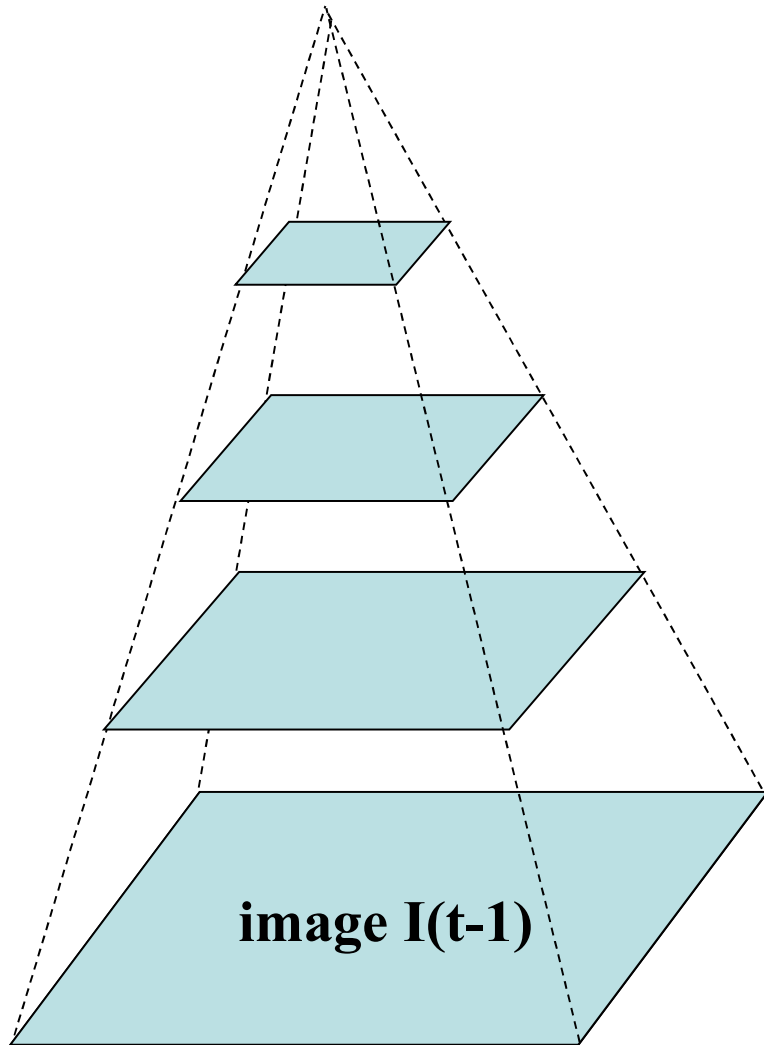
- raffinement itératif de type descente de gradient Newton
- gestion des mouvements plus amples par une approche multi-échelle



On réduit la résolution



Coarse-to-fine optical flow estimation



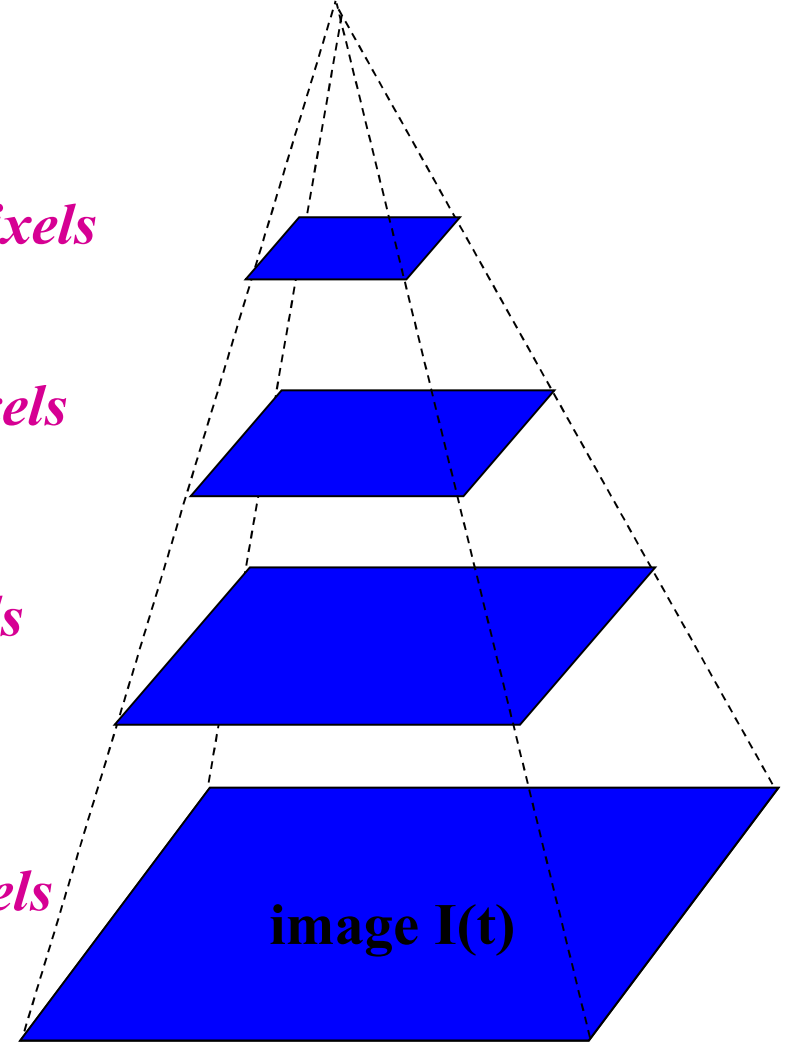
Gaussian pyramid of image $I(t-1)$

$u=1.25$ pixels

$u=2.5$ pixels

$u=5$ pixels

$u=10$ pixels



Gaussian pyramid of image $I(t)$

Tracking results



With and without pyramid

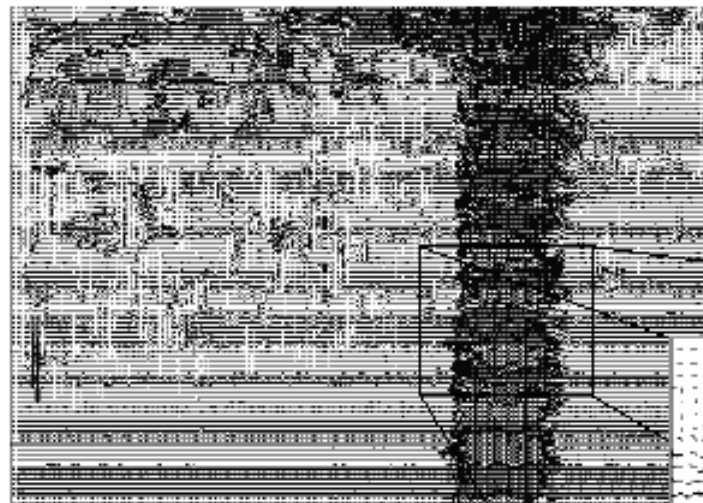


Multi-resolution Lucas Kanade Algorithm

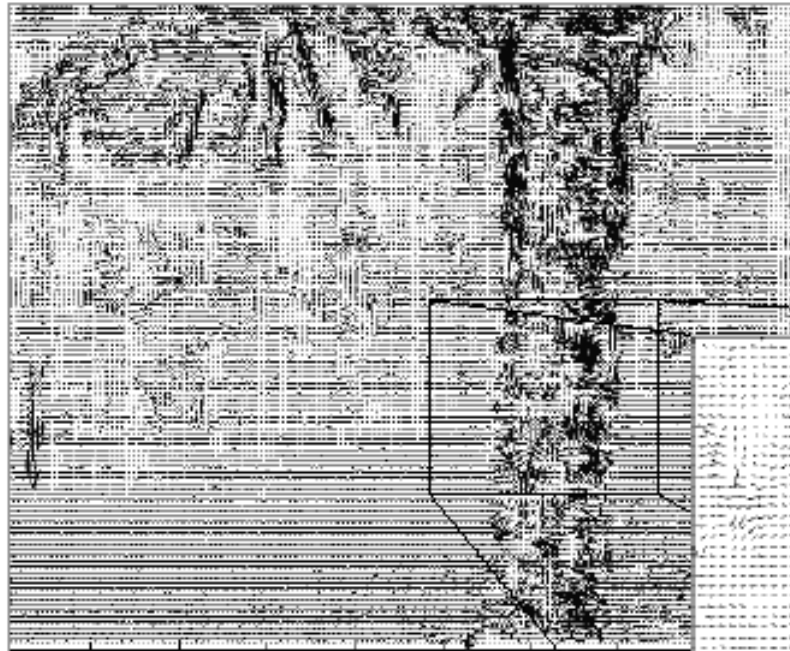
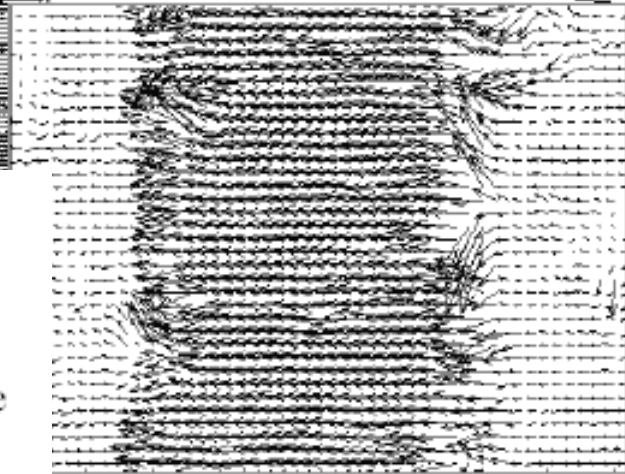
Compute Iterative LK at highest level

For Each Level i

- Take flow $u(i-1)$, $v(i-1)$ from level $i-1$
- Upsample the flow to create $u^*(i)$, $v^*(i)$ matrices of twice resolution for level i .
- Multiply $u^*(i)$, $v^*(i)$ by 2
- Compute I_t from a block displaced by $u^*(i)$, $v^*(i)$
- Apply LK to get $u'(i)$, $v'(i)$ (the correction in flow)
- Add corrections $u'(i)$, $v'(i)$ to obtain the flow $u(i)$, $v(i)$ at i^{th} level, i.e.,
 $u(i)=u^*(i)+u'(i)$, $v(i)=v^*(i)+v'(i)$



Lucas-Kanade with Pyramids



Lucas-Kanade
without pyramids

Fails in areas of large
motion

