Tracking of Dynamic Objects Based on Optical Flow

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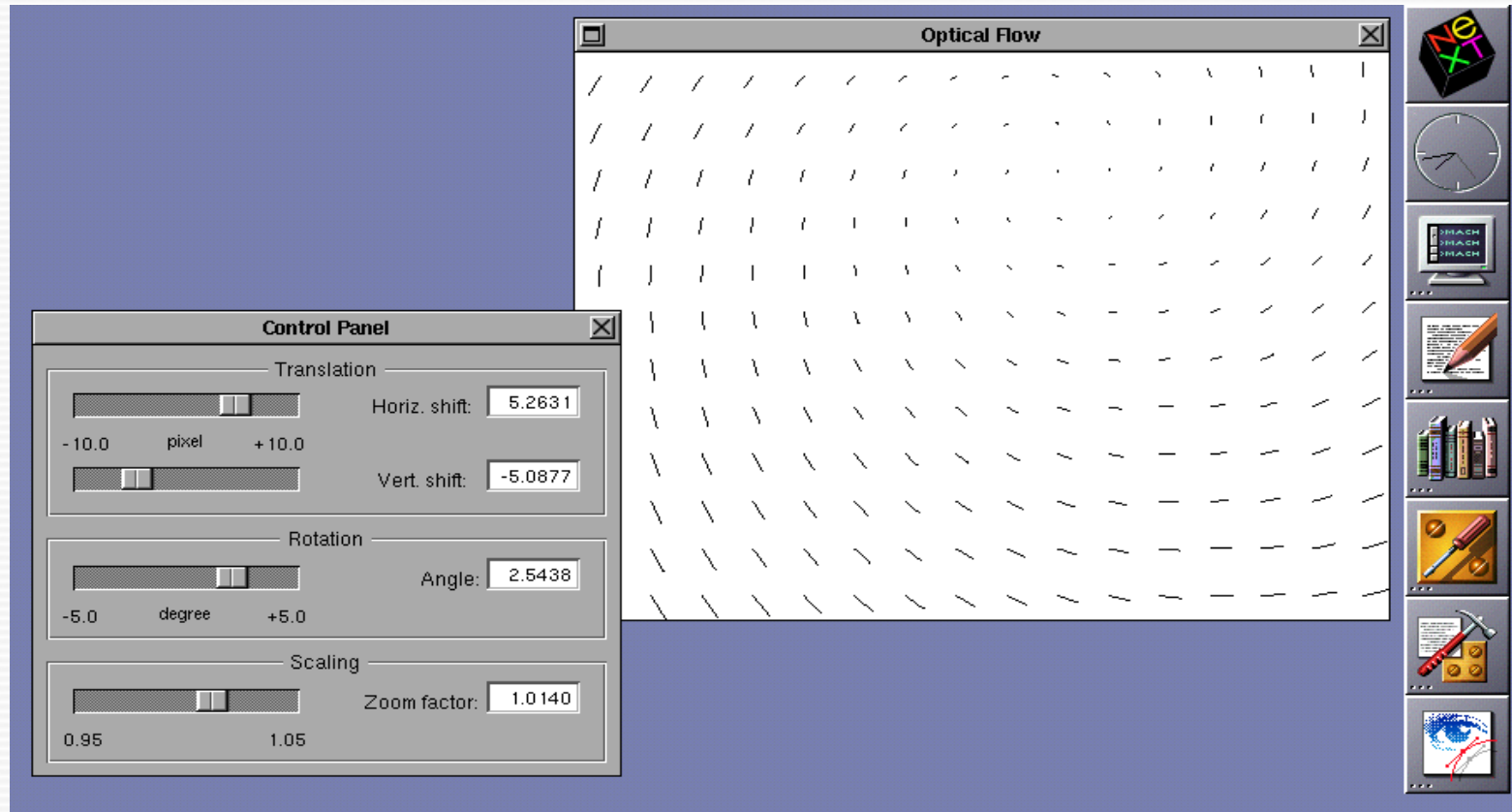Germany

Overview

Problem

Optical Flow

Tracking

Hierarchical Algorithm

Future Work

Problem

- design and implement an integrated navigation and tracking module

- identify dynamic objects with the help of optical flow for tracking

- recover the camera motion (or at least the heading direction) for navigation

Optical Flow

Tracking

- identification of dynamic objects with optical flow
    - non-moving camera (passive tracking)
    - moving camera (active tracking)

- active tracking requires a compensation of the optical flow generated by egomotion

Global Flow Field Parameters

translation in horizontal direction $\qquad t_x$

translation in vertical direction $\qquad t_y$

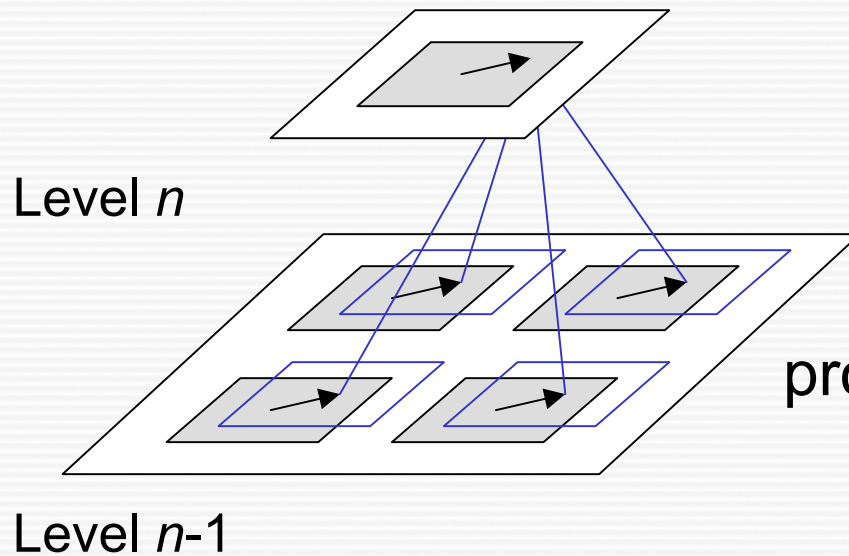zoom factor $\qquad z = \dfrac{\sum xm_x + \sum ym_y}{\sum\left(x^2 + y^2\right)}$

rotation angle $\qquad \alpha = \dfrac{\sum xm_y + \sum ym_x}{\sum\left(x^2 + y^2\right)}$

Limits

- a single flow region can detect movements up to 2 pixels/frame

- using an image hierarchy we can measure
  - translation at 48 pixels/frame
  - zoom at 5 percent/frame
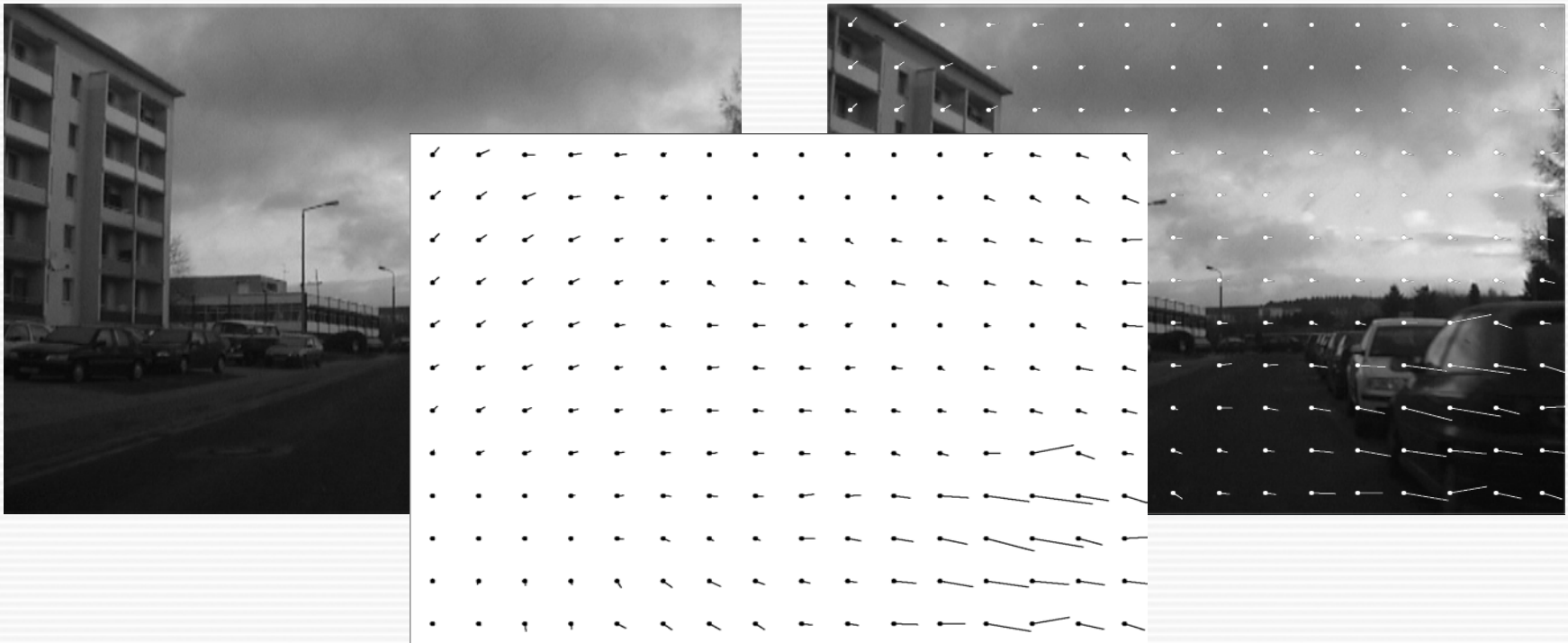 - rotation 5 degree/frame

Hierarchical Algorithm

Level *n*

Level *n*-1

flow vectors at
a given level are
projected to the next lower
level to reduce the
remaining flow there

Example

Future Work

- integration of other sensors (sensor fusion)

- more accurate estimation of the egomotion

- possibility to map the surrounding terrain

Are there any questions?