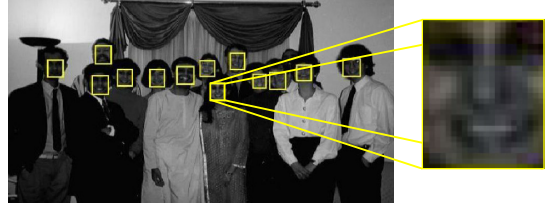


# Networked Active Camera Platform for Monitoring Applications

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## Motivations

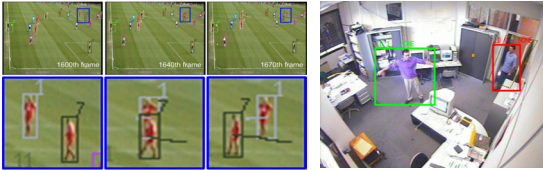
- Security concerns are rising in our society
- Need to handle routine scrutinizing tasks
- Need to cope with security in crowded public places



[Hadid 2005]

## Related research

- Common approaches:
  - Motion modeling
  - Appearance modeling

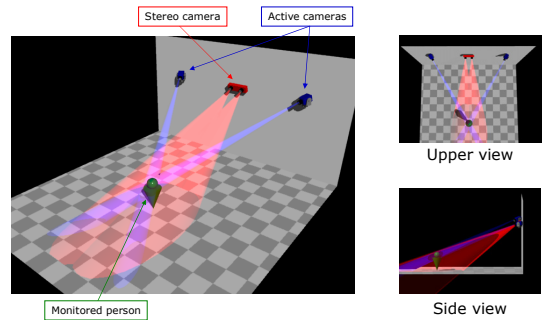


[Kang 2003]

[Boulay 2003]

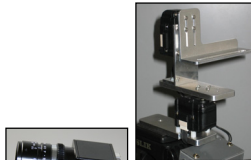
- Common short comes:
  - Detected result is of low resolution

## Proposed system



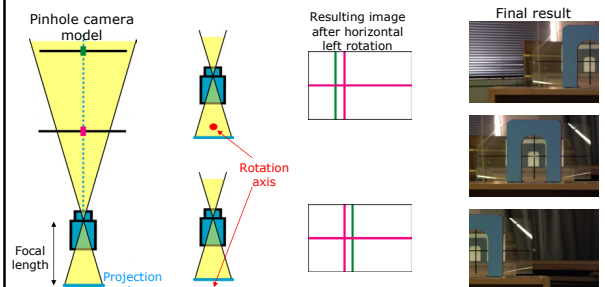
## Hardware details

- Pan-Tilt unit:
  - Self designed to allow fix viewpoint calibration.
  - Speed: 70 [rpm]
  - Resolution: 0.37 [deg]
- Narrow field of view cameras:
  - PtGrey FLEA XGA camera.
  - Lenses of 50[mm]
- Wide field of view camera:
  - Videre Design wide base MEGA-D camera.
  - Lenses of 16[mm]



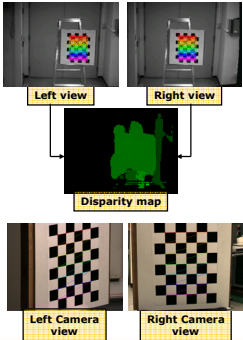
## Beforehand preparation(1)

- Fix viewpoint calibration:



## Beforehand preparation(2)

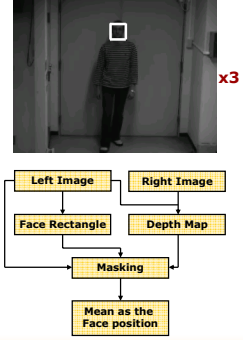
- Preparation:
  - Stereo camera calibration:
    - Calculate fundamental matrix to be able to compute 3D position of points in an image.
  - Fix-view point calibration:
    - Make sure that the rotation axes of the active camera are on the projection plan.
  - Overall system calibration:
    - Determine the relative position and orientation between cameras as well as their lenses distortions.



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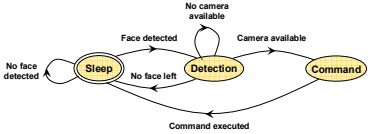
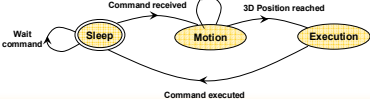
## Software details (1)

- Online processing:
  - Face detection:
    - Viola-Jones classification using a learned database of face appearances.
  - Face position estimation:
    - 3D position estimated using depth map generated by the stereo calculation.



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## Software details (2)

- Command formulation (Stereo Camera):
 
- Command execution (Active Camera):
 


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## About precision

- What is the optimal precision for the system to work?



Moving around a rectangle

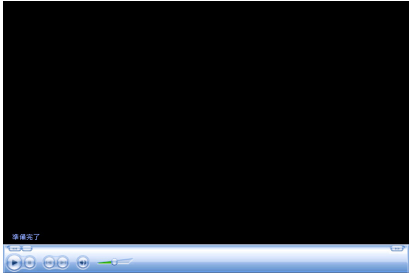


Estimated 3D face positions:

Upper view Side view Another view

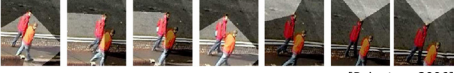
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## Preliminary experiment



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## Future work

- Face orientation estimation from low resolution images.
 

[Robertson 2006]
- Active camera selection algorithm based on the estimated face orientation.
- Analyze the scalability of the system.

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