Networked Security Camera System for Parking Spaces

Muneyuki SAKATA

Image Processing Lab.
muneyu-s@is.naist.jp

2005/09/29

Motivation

- Security cameras are increasingly used for crime prevention.

  - Monitoring from control room
  - Recording on video tape or disk devices
- Looking over their images takes a lot of time and costs.

  Security camera system using image recognition
  - Automatic surveillances
  - Improves the efficiency of browsing
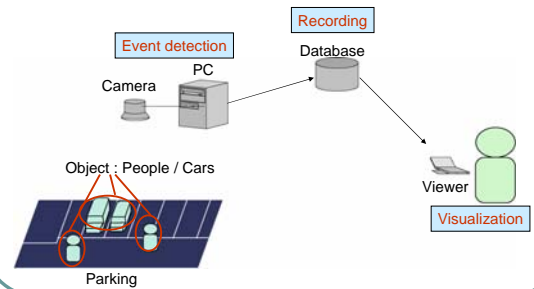
MITUBISHI DX-TL5000

Objective

- Security camera system for parking spaces
  - Automatic detection of events
    - Events : People / Cars are coming / going.
  - Search for events using some parameters
    - Parameters : Time …
  - Using wireless network
    - For easy to setup

- Collaboration with Sharp, Inet-lab. (NAIST)

System overview

Event detection

Recording

Database

Camera

PC

Object : People / Cars

Viewer

Visualization

Parking

Prototype and basic experiment

- Implementation of framework
  - Automatic detection of events
- To specify the problems about object extraction for outdoor scene
  - Basic technique for object extraction
    - Background subtraction – fixed background
    - Inter-frame subtraction

Background subtraction

Difference image

Inter-frame subtraction

- All events are detectable without omission
  - Robust to changes in environment
    - Lighting condition (day←→night)
    - Shine ←→ Cloudy (in a short time)
    - Movement of shadow

Speed of background movement≪ Speed of object movement

Problems(1/4) : Noise

- Shadow movements by shaking of the trees

- ○Filtering of events
  - Movement distance ≒ 0
  - Movement in a short time (~ few seconds)

Problems(2/4) : Lights of cars

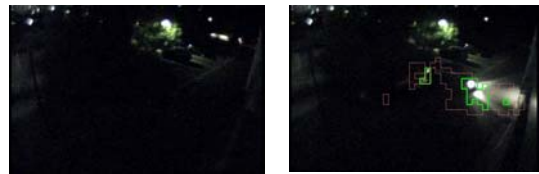- Error detection of illuminated objects

- △Filtering of events
  - Movement in a short time
- △Other image-processing technique

Problems(3/4) : Late at night

- Street lights were shut off.
  - Cars can be detected.
  - People can't be detected.

- △Adopting new cameras
  - Wide dynamic range camera
  - Day-night camera

Problems(4/4) : Dividing and joining events

- Dividing by temporary stopping of object

- Joining by contiguity of objects

- ○Analyzing event information
  (staying information, direction of movement)

Future work

- Object extraction
  - Higher accuracy of extraction → measuring their height
- Analysis of event data
  - Direction, Speed
  - Parking information (parking lot, time)
  - Getting on / off the car
- Using wireless network
  - Limited band-width
    - Recording and transmission of recorded images

Summary

- Our prototype of event detector only uses basic image processing technique, but it can automatically detect cars and people coming and going without omission.
- However, the object extraction and the event recognition have some problems to solve.
- In future work, I will try to get more higher accuracy of object extraction, and analyze the event information.