FallCam: Practical Considerations in Implementing a Camera-based Fall Detection System

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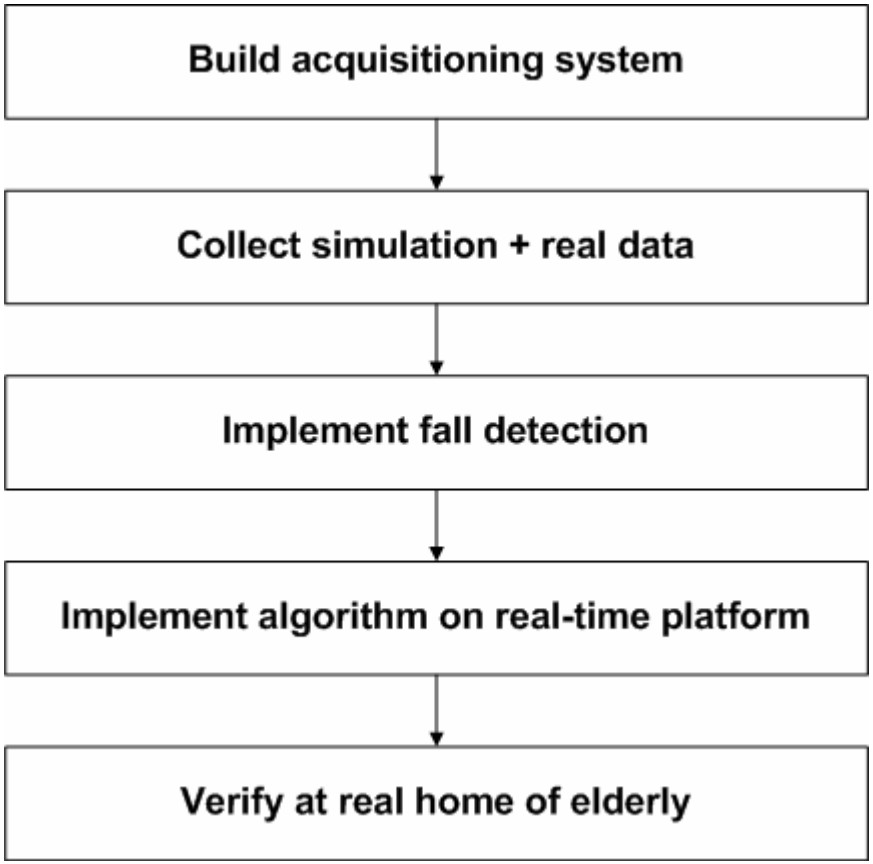
www.fallcam.be

Overview

- FallCam project
- **Different camera's**
- Different processing systems
- Other considerations
- Our chosen solution
- Fall simulations

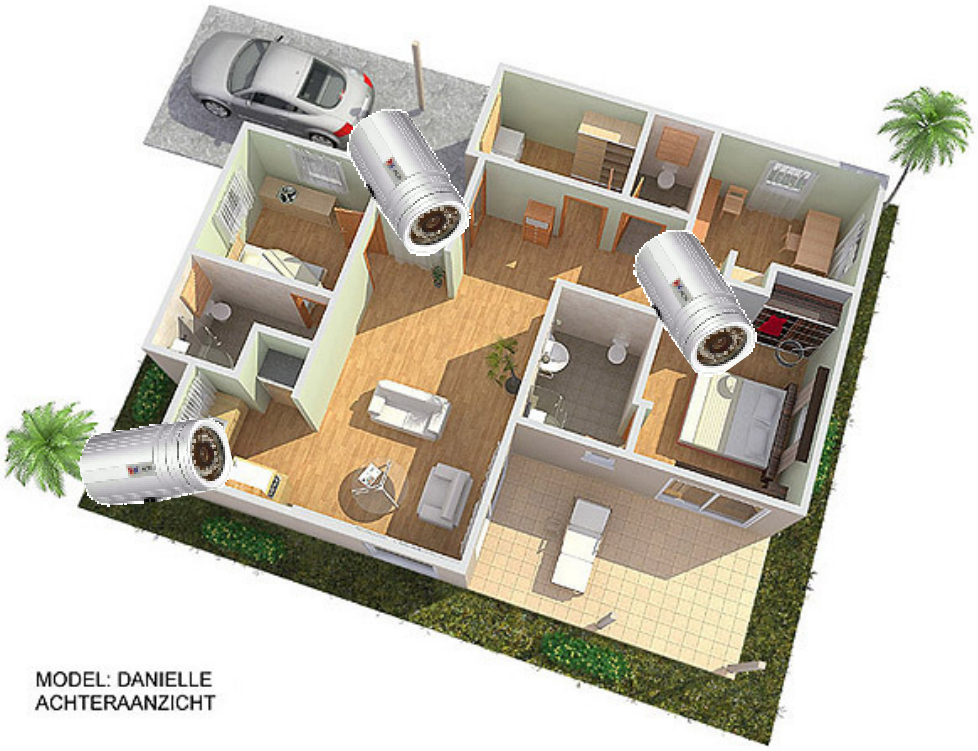
FallCam

- Goal: Building a camera-based fall detection system



Acquisition system

- Goal:
  - record actual fall incidents at a real home



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Omnidirectional camera

- Can capture light from a half sphere
- Different types:
  - the fish eye lens
  - the catadioptric camera
  - the combined spherical lens.









Omnidirectional camera

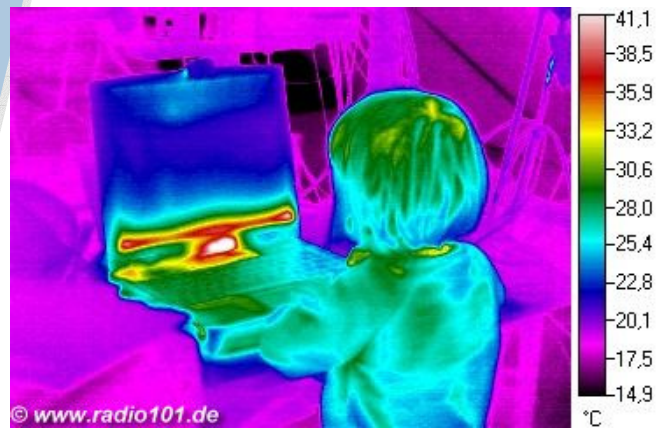


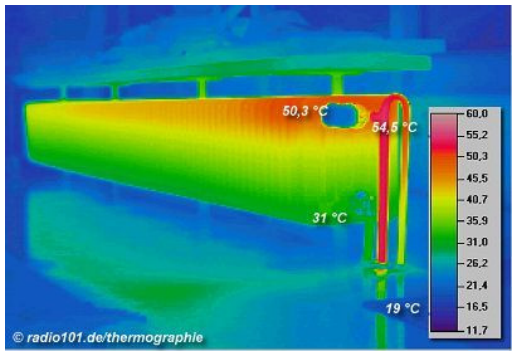
- Complete room with 1 camera
- But,…
- More postprocessing
- Occlusions near objects

Thermal IR camera



- Advantages:
  - No shadow or problems with changing light conditions
  - Possible to detect person more easy
- Disadvantages:
  - Interference of other heating sources
  - Ghosts appear when person stayed in same place for longer time
  - More expensive





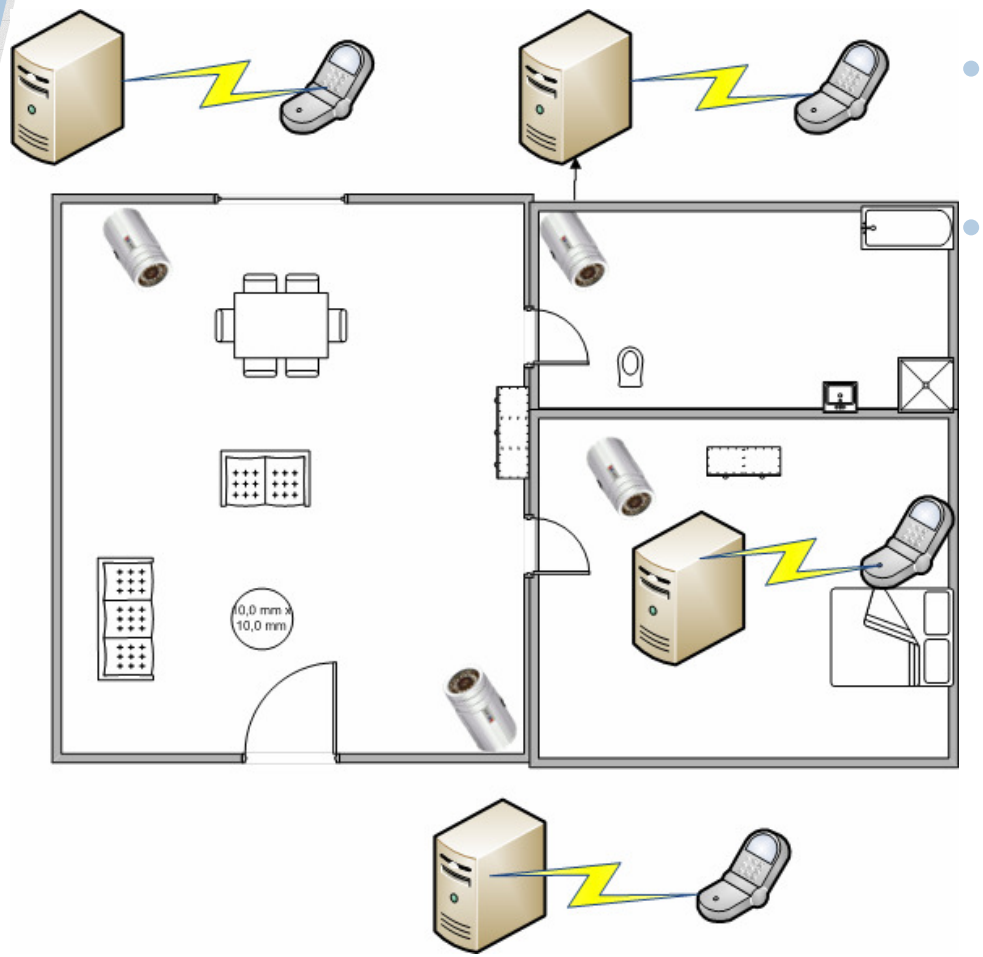
Classic camera

- Advantages:
  - Cheaper
  - Whole range of camera's with different specifications available
- Disadvantages:
  - More camera's needed.
- Most important specifications:
  - Lens: viewing angle of almost 90 degrees is desirable
  - Interface: USB, firewire or ethernet
  - Image quality: resolution, framerate ...
  - Compression: configurable compression of different types

Overview

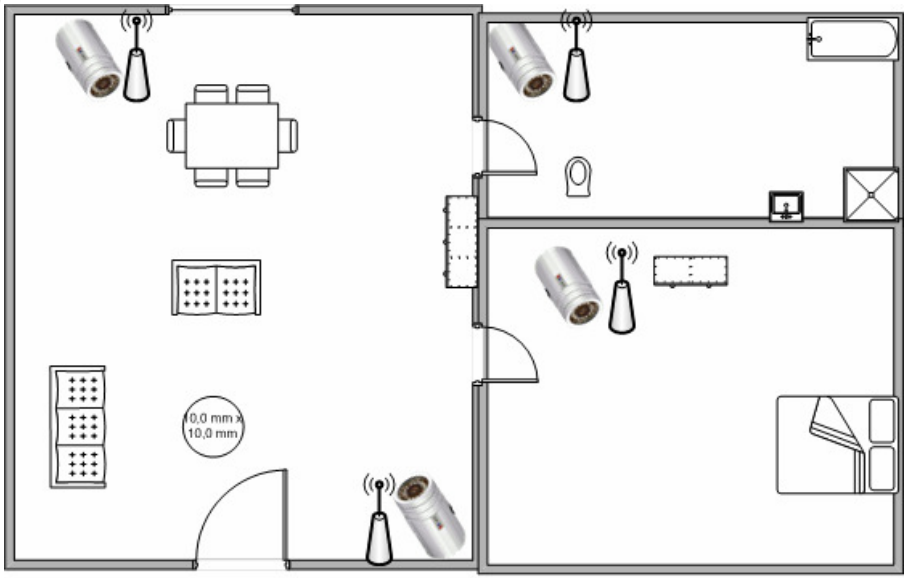
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Decentralized Processing Unit

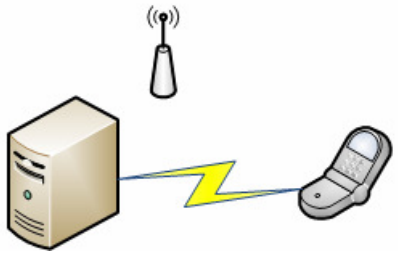


- No network
- Possibly more expensive
- No interaction between cameras

Centralized Processing Unit



- Combine cameras
- Track between rooms
- Network needed
- Compression needed



- Hybrid solution:
  - The captured data is partly processed or interpreted before it is sent to the central processing unit

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Other considerations

- Privacy:
  - In our test system, the video is stored. To allow the users still some privacy, a control panel to stop the system is provided.
- Network and Security:
  - Most secure is a dedicated wired network, but this needs a lot of structural changes.
  - Wireless: this is secure (if installed correctly), but it still gives people an unfounded feeling of insecurity.
  - Ethernet over Power: Uses also AES128 for encryption, and is harder to detect since it uses the power grid inside the house.
- Power consumption:
  - The system is running 24/24, so power consumption should be taken into account.

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Our chosen solution

- Hybrid solution:
  - only motion detection is used on the camera to minimize the network traffic.
- Camera:
  - multiple classic IP cameras
  - 2 cameras per room
  - Ethernet-over-Power adaptors



- Central Processing Unit: Server / desktop (x86)
  - Rather inexpensive
  - Short time to develop
  - Different libraries are available

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Fall simulations

- We simulated different kinds of falls:
  - Backward, foreward, sideward
  - Without support, with knee, elbow, or bottom support
  - Fast or slow
  - With or without objects (chair, table, rollator, …)
  - Also non-falls (picking something from the floor, …)
- Demo videos

