

State of the art in video analytics

Introduction

CCTV evolution:

- 1980's: analog cameras, videotape recording.
- 1990's: analog or digital cameras, digital video recorders
- 2000's: IP cameras, network video recorders
- Today: ever-larger IP camera networks plus **intelligent video analytics (IVA)**.

The IVA market is rapidly growing:

- 2011: estimated at \$180.0 million worldwide
- Current growth at 34% per year (data from Technavio)
- by 2018: over \$1 billion worldwide

More on IVA

Primary tasks:

- Identify defined events of interest in video stream and raise **alerts**
- **Annotate** video streams with metadata used for later search and retrieval

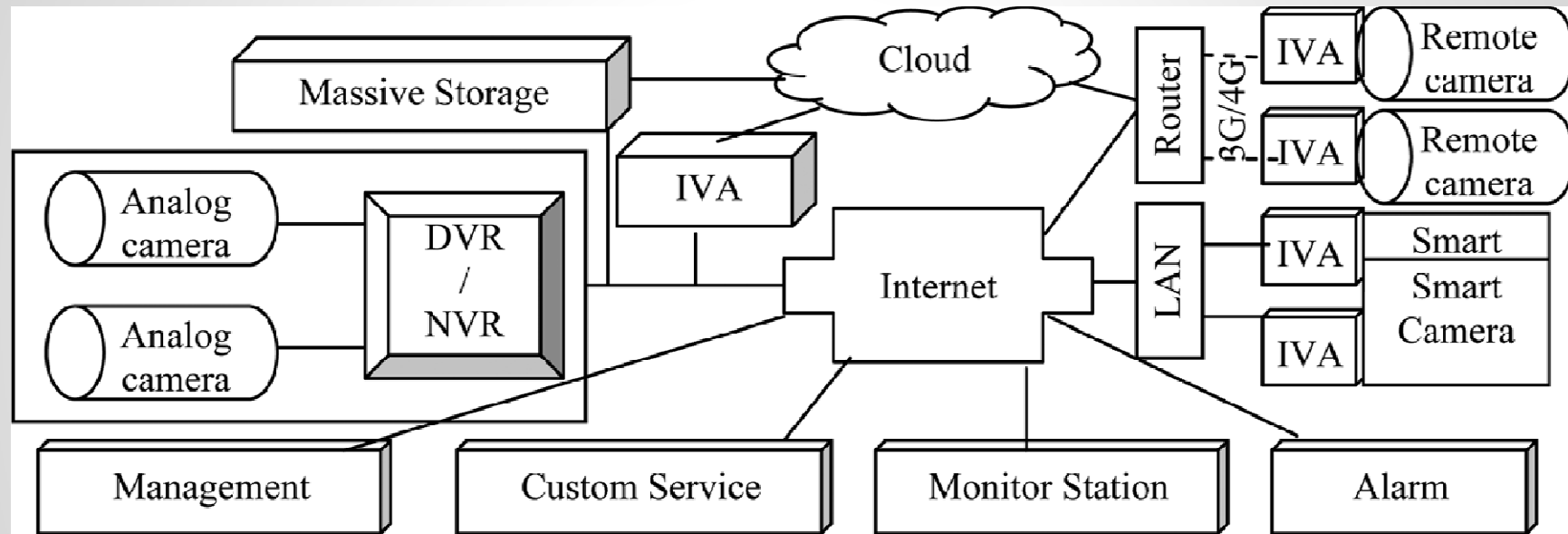
Primary domains:

- Premises security
- Transportation
- Health care

Primary users (in order of market share)

- Border control and perimeter security
- Retail stores/malls/shopping centers
- Transportation and logistics
- Maritime ports
- Urban security/public safety
- Airports
- Entertainment/casinos
- Banking/financial sector
- Healthcare
- Infrastructure protection (power plants, etc.)
- Sports
- Factories/industrial plants
- Housing and residential
- Commercial, office, and government buildings

General IVA system architecture



(Liu et al, 2013)

Steps in IVA processing

Almost all applications share the same basic steps:

1. Background subtraction
2. Moving foreground segmentation
3. Object/shadow classification
4. Object classification and tracking
5. Event recognition

Each application requires solutions to basic computer vision problems:

1. How to represent and detect target objects?
2. How to track target objects?
3. How to characterize local motion patterns?
4. How to recognize events (complex sequences of concurrent local motions)?

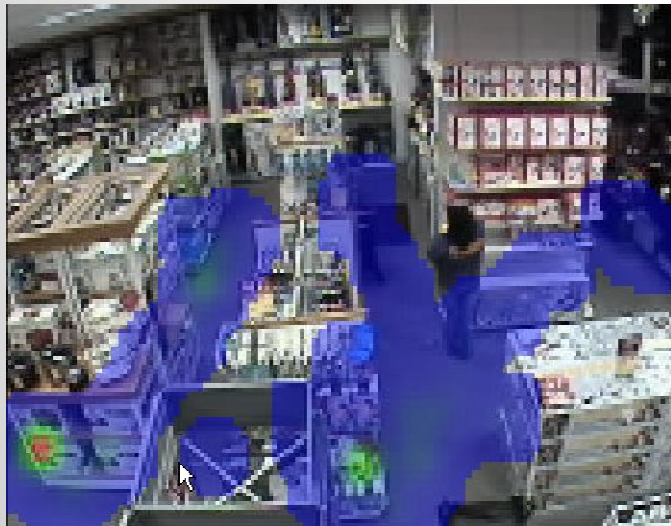
Applications

Applications of IVA break down roughly into a few major categories (Liu et al., 2013):

1. Management
2. Traffic control and transportation
3. Intelligent vehicles
4. Healthcare
5. Security and military

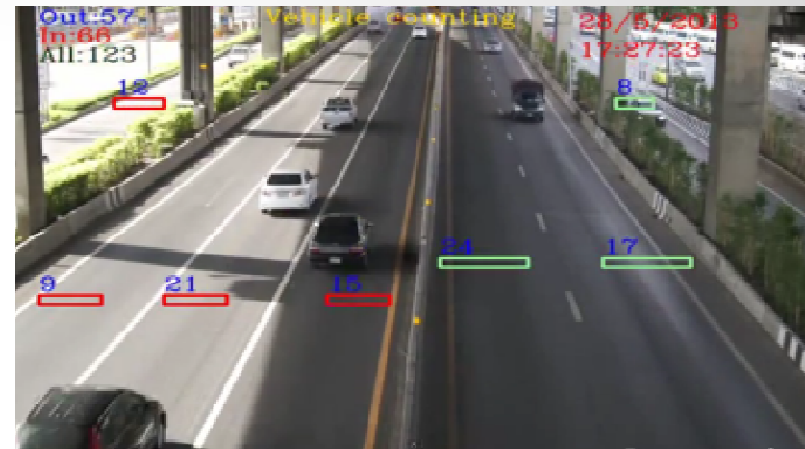
Management applications

People counting
Access control
Flow control



Traffic control and transportation applications

- Lane traffic counts
- Illegal U-turn
- Illegal lane change
- Wrong way driving
- Stopped vehicle detection



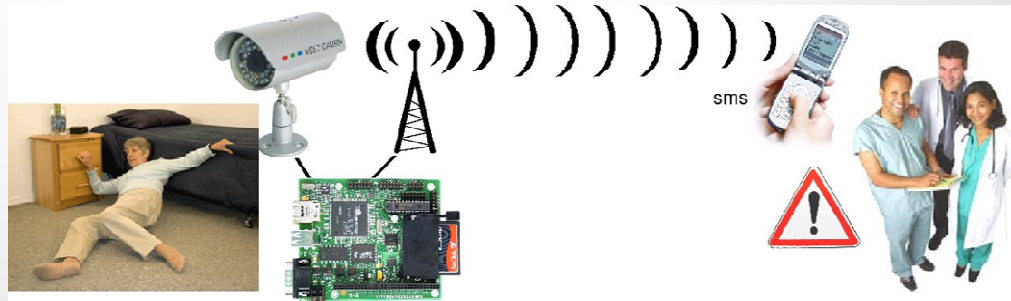
Intelligent vehicle applications

- Pedestrian detection
- Lane departure warning
- Collision avoidance
- Autonomous driving
- Traffic sign detection and recognition



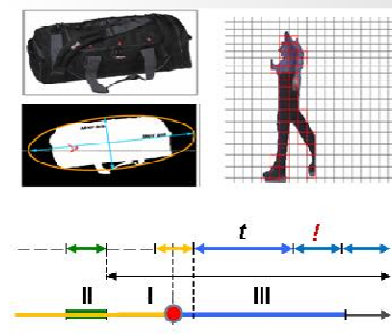
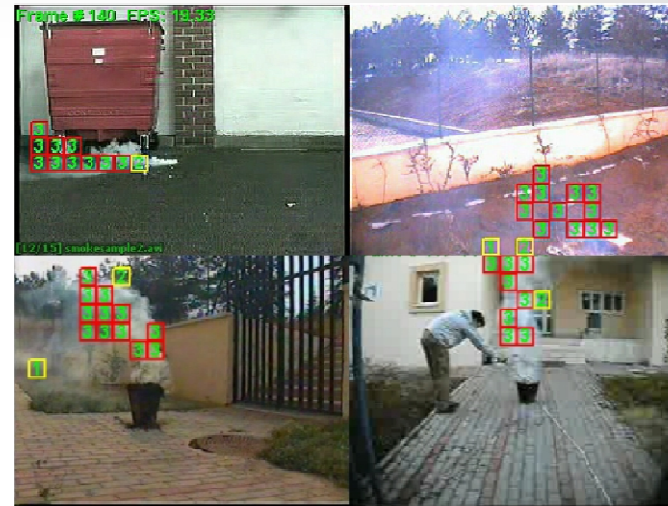
Healthcare and personal safety applications

Posture and gait analysis
Assisted living for elderly
Safe navigation for the blind



Security and military applications

- People detection and tracking
- Perimeter intrusion detection
- Abandoned object detection
- Unauthorized access detection
- Fire and smoke detection



Summary: state of the art

The worldwide market for intelligent video analytics (IVA) is strong and growing, driven by:

- Low-cost, high-quality IP cameras
- Low-cost, high capacity NVR storage

Commercial video management systems (VMS) and standalone analytic systems already incorporate many IVA features.

Other IVA features are still in the research stage.

Technology transfer from the lab to commercial products is an ongoing process.

Challenges for Thailand

Enterprises in Thailand are increasingly installing IP cameras, NVRs, and VMSs.

IVA adoption is currently low, but there is strong interest, and adoption is on the rise.

Many sophisticated IVA features are commercially available, primarily from foreign vendors:

- Prices of foreign products are high for many local enterprises
- Local expertise in IVA customization is low
- Local expertise in IVA system integration is low

Close cooperation between academia and industry can bridge these gaps.