

# Energy Efficient and Secured Data Fusion for IoT

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# Outline



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- Internet of Things(IoT)
  - Data Fusion
  - Problem Definition
  - State of Art and Objectives
  - Summary

- Things having identities and virtual personalities operating in smart spaces using intelligent interfaces to connect and communicate within social, environmental, and user contexts.
- A different definition, that puts the focus on the seamless integration, could be formulated as “Interconnected objects having an active role in what might be called the Future Internet.”

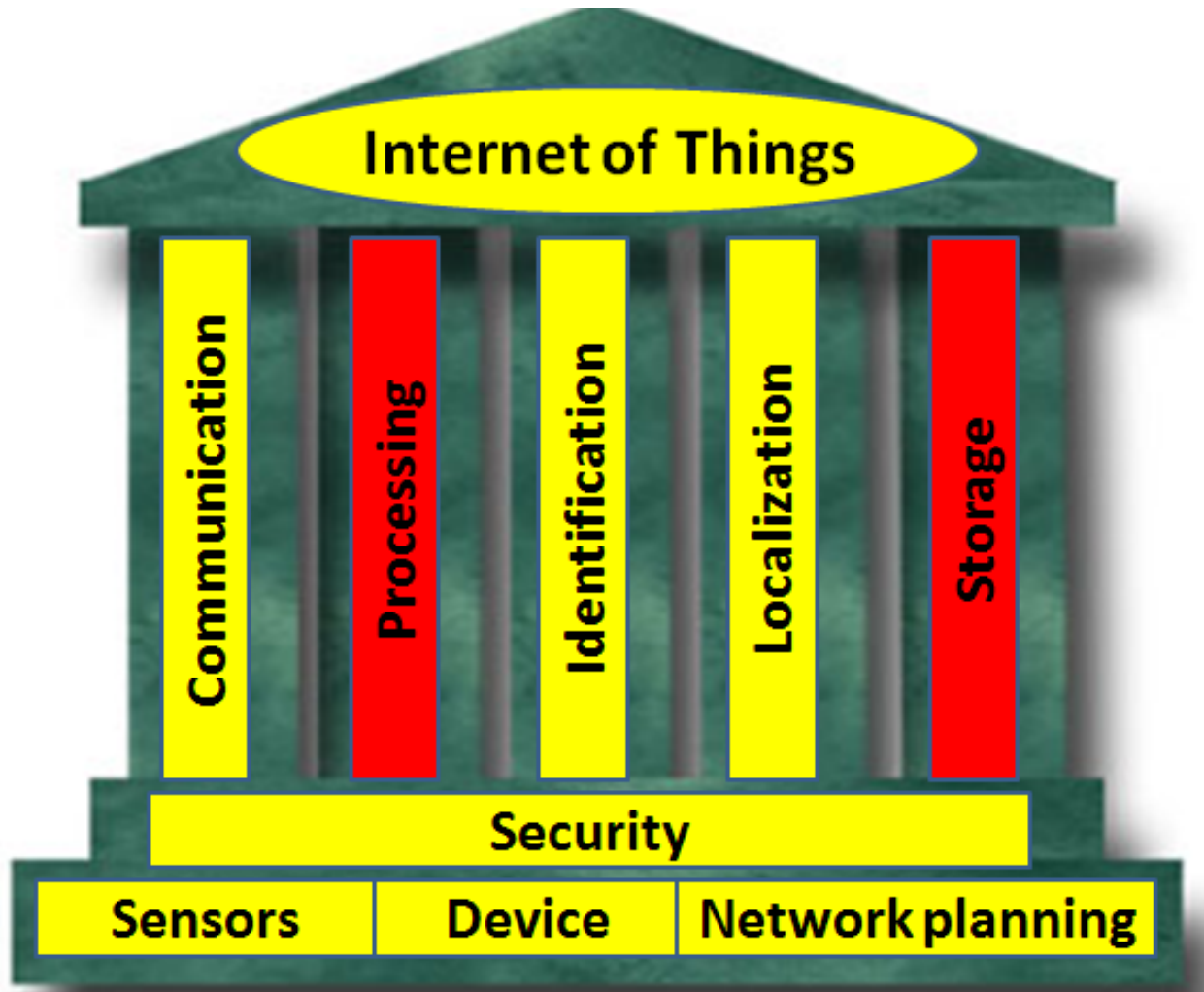
(EPoSS, Sept 2008)

# Challenges and Goal



- Rapid evolution of sensors, wide-band communications & data proliferation provides opportunities and challenges.
- minimize the burden on the network
  - Communication burden (power and Bandwidth)
  - Computational burden (power)

# House of IoT



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# Data Fusion

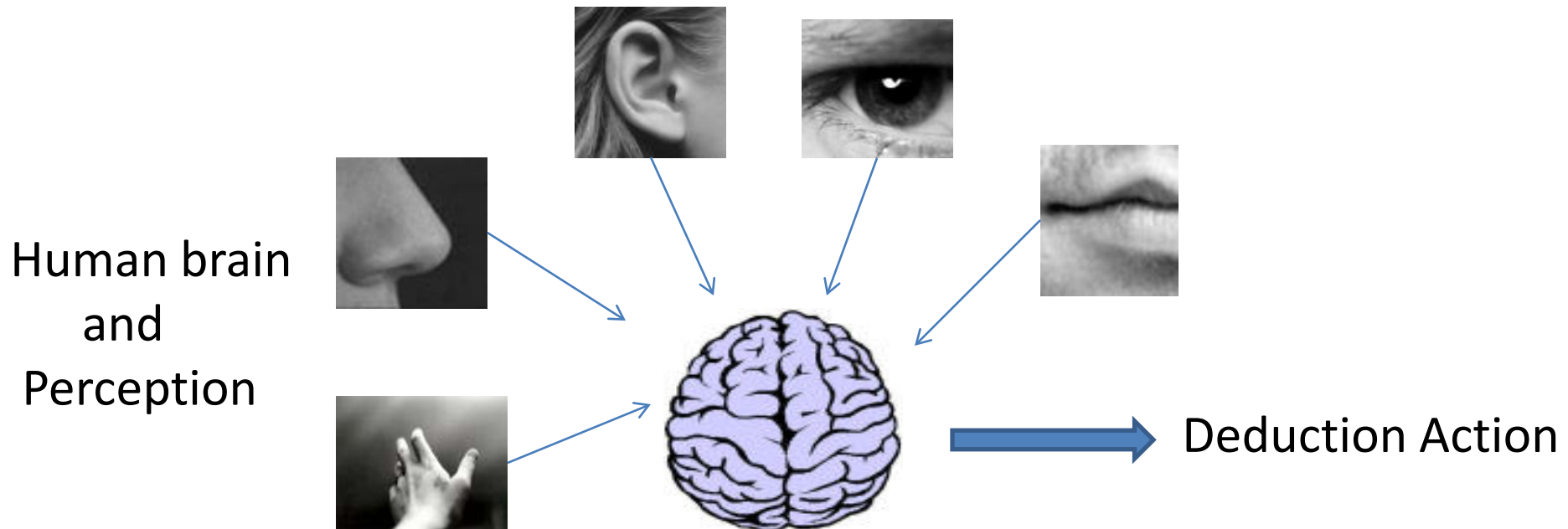
- “Multilevel, multifaceted process dealing with the automatic detection, association, correlation, estimation, and combination of data and information from single and multiple sources”.

(JDL, USA)



"Data Fusion is the process of combining data or Information to estimate or predict entity states"

Steinberg and Bowman (2001)



- Difficult to predict sensor performance
- Efficiency of fusion at various level
- Security in data transfer
- Insufficient training data

# Applications

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- Surveillance sensor networks
- Traffic avoidance, enforcement and control systems
- Advanced health care systems
- Automated assistance for the elderly people
- Environment monitoring
- Industrial Process control

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# Problem Definition

- Video information provides significant benefits to many sensor networking applications, BUT...
  - Complexity of Video data
  - Unable to optimally translate image in time-series data into meaningful symbols
- The goal of visual surveillance is not only to put cameras in the place of human eyes, but also to accomplish the entire surveillance task as automatically as possible.

# Problem Definition..

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- The amount of video generated is huge than their scalar sensor counterparts. As a result, video sensor networks must be carefully designed for low power consumption.

- The processing framework of visual surveillance in dynamic scenes includes:
  - modelling of environments
  - detection of motion
  - classification of moving objects
  - tracking, understanding and description of behaviours
  - human identification
  - fusion of data from multiple cameras

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# State of Art

- Bayesian network to fuse 2-D state vectors acquired from various image sequences to obtain a 3-D state vector
- It is possible to send only a potentially small amount of processed data (key points) instead of transferring raw data
- Change detection algorithm- Pixel change, Object Feature Change, Action Change
- A two window paradigm concept
- Particle filter approach

# Objectives

- The main objective of the research work is to develop a novel concept of energy efficient and secured data fusion algorithm for video based surveillance systems.
- It is proposed to use traffic surveillance in cities or expressways as the scenario.
- This work can be extended/deployed in IoT based application.

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Thank you!