INTELLIGENT LOGISTICS ZONES: AN ULTIMATE VISION OF EFFICIENT, SAFE, AND TRANSPARENT LOGISTICS INFRASTRUCTURE

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ECITL (23rd -25th Zaragoza Spain)

Source: GettyImages, continuum crowd simulation
OUTLINE

- Fraunhofer IFF
- MFT Focus
- Intelligent Logistics Zone
- Research Taxonomy
- Safety and Security
- Challenges and Limitations
- Current Projects
- Preparation for Horizon2020
- Future Research

Components of IFF-Vision Business Radar (IFF-VBR)

Civil Society

Digital Eye: Computer Vision

Safety and Security
The Fraunhofer IFF

History

Establishment of Fraunhofer IFF, Magdeburg

1992

New Institute at Building Sandtorstr. 22

1998

Established New Center VDTC-Fraunhofer IFF-extension

2001

Foundation of New VDTC-Center

2005

Opening of Virtual Development and Training Centre VDTC

2006

60th Anniversary of Fraunhofer-Gesellschaft established on 26. March 1949

2009

20th Anniversary of Fraunhofer IFF Magdeburg

2012
The Fraunhofer IFF Research Focus

- Logistics
- Automation
- Process and Plant Engineering
- Digital Engineering
The Fraunhofer IFF
Materials Handling Systems: Materialflusstechnik und Systeme MFT

- Exploration, development and integration of radio and image-based technologies for
  - Identification, Localization and Detection of states:
    - Goods
    - Special Equipments
    - People

Intelligente Logistik

- The objective:
  - Research, Design, Develop, and Implement technology in real-world
The MFT: Team Members

MFT Group Head
Prof. Klaus Richter

Otto-von-Guericke University: ILM
- Chair of Logistics System
- Galileo-Testfeld for Logistics and Telematics

Catherine Plate
Olaf Poenicke

Image Processing
Dr. Saira Pathan
Hagen Borstell
Liu Cao
Jewgeni Kluth
Omer Rashid Ahmad

RFID
Martin Krich
Olaf Poenicke

IT
Bernd Gebert
Marcel Jasechke
MfT-vision business radar
Intelligent Logistics Zones

- Intelligent logistics zones: **efficient, safe and transparent flow** of product from **source to sink** through a **multi-modal and multi-disciplinary architecture** aiming to fulfill the objectives of logistics and transportation operations.

- The main highlight: is the inclusion of safety and security as the main components in the traditional logistics frameworks.
RFID Tunnel Gate

- Radio-frequency identification (RFID) technologies allow the seamless tracking of logistics objects and standardization of logistics processes along the transport chains.
- Single parcels containing RFID tagged products to the applications for the identification of complete truck loads
- Patent technology designed by IFF Fraunhofer for RFID applications [3]
Loading Space Monitoring

- Monitoring the loading space in cargo or vehicle is an important research domain to assist the loading and management operations.
- Detection of Free Space
- Detection of good’s structure
Monitoring Operational Activities

- An assessment of operational activities and situation analysis to identify critical incidents in places such as logistics hubs, passenger terminals, and warehouses, is an active research domain [2].

- Virtual Top View (VTV), a aggregated view of multiple image streams is developed to provide a clear, concise and direct interpretation of on-field activities in real-time preserving the spatial relationship.
Fear and Anxiety in Isolated Place

A FRAMEWORK WITH NON INDIVIDUAL ANALYSIS TO PRESERVE PERSON’S PRIVACY RIGHTS

Scene Situation
Crowd Density
Tracking of Individual

Safe ??
poople?
Seeking Help

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CROWD In General

- A group of entities following a directional or undirectional goal

- Directional Goals

- Undirectional Goals
Safety Measures in Isolated Places

- The main motivating factor for developing the algorithms, specifically for crowded scenes → limitations of existing surveillance systems.
- A test situation where a person (a woman) in an isolated environment makes a request (via mobile) and wants to know the situation of the specific scene.
Applications and RESEARCH ASPECTS

- Crowd Behavior Analysis for:
  - Crowd Management
  - Public Space Design
  - Virtual Environment
  - Visual Surveillance
  - Intelligent Environments
  - Planning of Safety Controls
  - Emergency Situation Planning
RESULT

Angstaum: Woman in Isolated Place

Angry Woman in Isolated Place

Crowd and Scene Situation

Abnormal Behavior

Normal Behavior

Visual Analytics

Tracked

Detected woman

Behavior Transition

Behavior Analysis

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Future Research-> Intelligent Environment (Horizon2020)

- Behavior Modeling (psychology)
- Determination of source and sink paths
- Incorporate the scene semantic
- Prior prediction of critical events
- Tracking selected region

Integration of Multi-disciplinary domains for more Immersive Applications
Reality capture with a three layered (for employee safety) framework for intelligent Monitoring of *logistics warehouses (large infrastructures)* with computer and cognitive vision modeling.

- Scene Categorization Agent
- Recognition Agent
- Activities Understanding Agent
Designing Safe, Secure, Smart and Intelligent Logistics Infrastructure (SSILIn) / Intelligent Logistics Infrastructure (IntLog)

Intelligent Logistics Infrastructure:
- Efficient Operational Flow
- Safe Environments
- Management of Critical Incidents or Safety threats
- Interactive Panels (touch, gesture or posture, voice, augmented reality) for assistance, and

Tracking:
- Tracking RFID,
- Data Management (Planning task)
- Monitoring activities

Safety and Security and Context Modeling:
- Detection on Intact Entities
- Forecasting the Critical Events
- Detection of Suspicious Actions

Human Machine Interaction:
- Gestures
- Postures with Display Panels
- Voice Commands
- Smart Interactive Panels
- Augmented Reality → assistance through virtual medium to cope the limitation of physical access.

Data Processing:
- Data Compression,
- Management,
- Processing and Planning
RELATED PUBLICATIONS

- **Journal Publication**
  
  **Saira Saleem Pathan**, Ayoub Al-Hamadi, and Bernd Michaelis: Crowd Behavior Analysis and Anomaly Detection by Statistical Modeling of Motion Patterns, Int. J. Data Mining, Modelling and Management.


- **Conference Publication**
  


  **Saira Saleem Pathan**, Ayoub Al-Hamadi, and Bernd Michaelis: Using Conditional Random Field For Crowd Behavior Analysis, in International Workshop on Video Event Categorization, Tagging and Retrieval (VECTaR 2010) in conjunction with Asian Conference on Computer Vision (ACCV), Queenstown, New Zealand, pp. 370--379.


Thank you for the Attention

For Discussion and Project Collaboration

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