Intelligent Video Surveillance Systems

PhD Student: *Rafael Marcos Luque Baena*
Thesis Directors: José Muñoz Pérez and Ezequiel López Rubio
Computer Science Department, University of Málaga

LENGUAJES Y CIENCIAS DE LA COMPUTACIÓN UNIVERSIDAD DE MÁLAGA

UNIVERSIDAD DE MÁLAGA

Summary

The objective of the project involves to develop **intelligent systems** in order to remotely detect anomalous events from recorded video sequences. These systems have the capacity to answer automatically about a big amount of questions regarding to the scene analysed. The specific objectives focus on the performance of the developed methodology when used in three application domains: **Health, Public Transportation and Road Safety.**
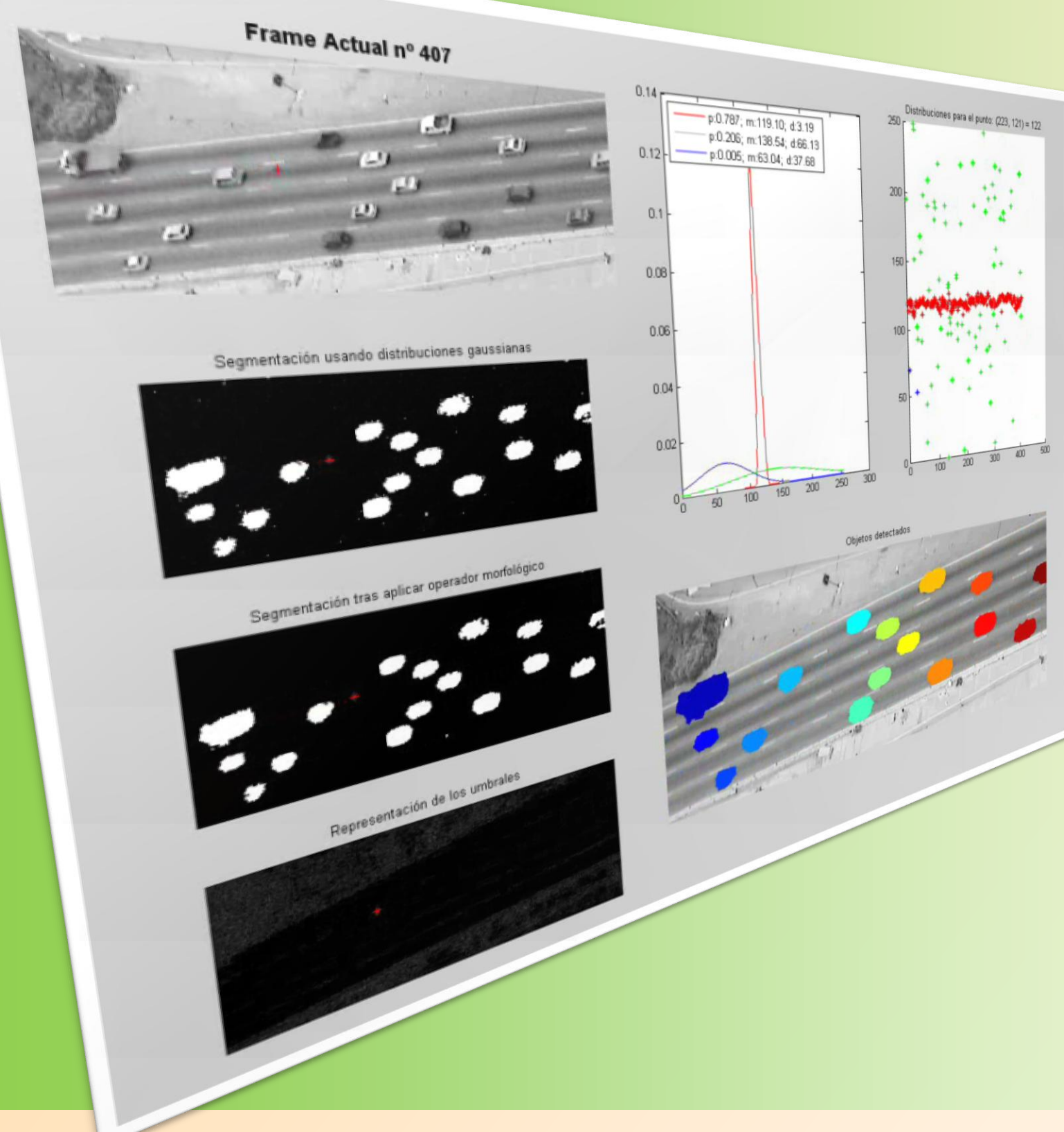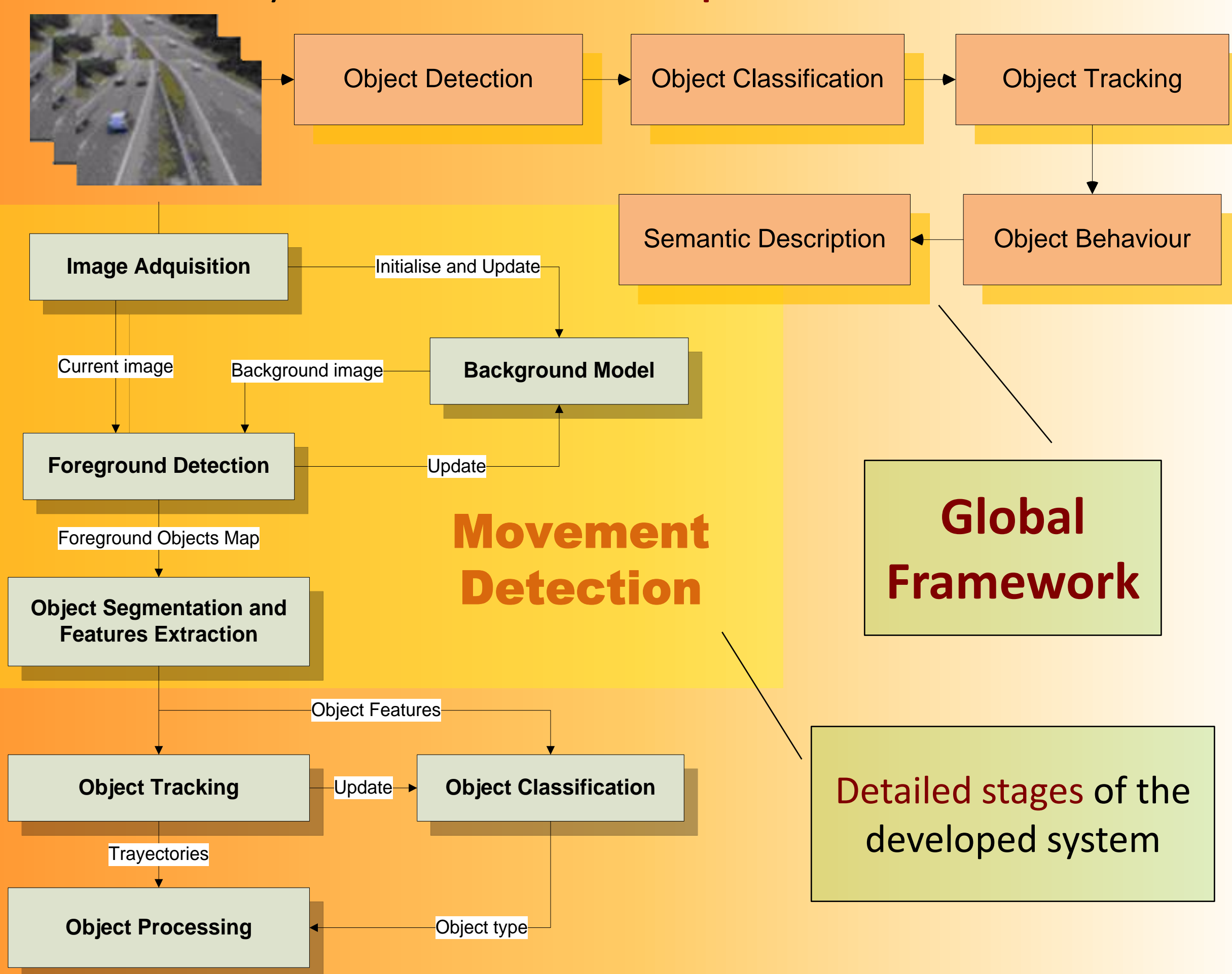
Objectives

This project is aim to develop a general framework which improves the performance of intelligent video surveillance systems on any required area, spending the least possible time and without the necessity of restarting the system in order to adapt itself to each analysed scene. Different uses:

- A system for elderly fall detection, which works in real time and for indoor scenes.
- A video surveillance system in **subway stations and railway lines** for the **obstacles detection or risks**.
- A surveillance system to detect **traffic anomalies**, such as retention, detection of accident or reckless driving in the opposite direction.

Methodology

The process of detecting and tracking people and objects for subsequent behaviour analysis is divided into **several phases**:

Object Detection → Object Classification → Object Tracking

Object Tracking → Object Behaviour → Semantic Description

Image Adquisition — Initialise and Update → Semantic Description

Image Adquisition — Current image / Background image → Background Model

Background image → Background Model

Foreground Detection — Update → Background Model

Foreground Objects Map

Object Segmentation and Features Extraction

Movement Detection

Object Features

Object Tracking — Update → Object Classification

Trayectories

Object Processing — Object type → Object Classification

Global Framework

Detailed stages of the developed system

Frame Actual nº 407

Segmentación usando distribuciones gaussianas

Segmentación tras aplicar operador morfológico

Representación de los umbrales

Automatic System for Traffic Surveillance

Developed **prototype**, which covers two of the three parts of the final system

Step 1. *Object Segmentation and Classification*

It is able to recognise objects of interest using **spatial and temporal information** of the sequence frames.

- Distinguish, in a robust way, between background regions (static) and foreground regions (dynamic).
- Basic features extraction like bounding box, colour distribution and key pixels from the identified objects in motion in a frame.
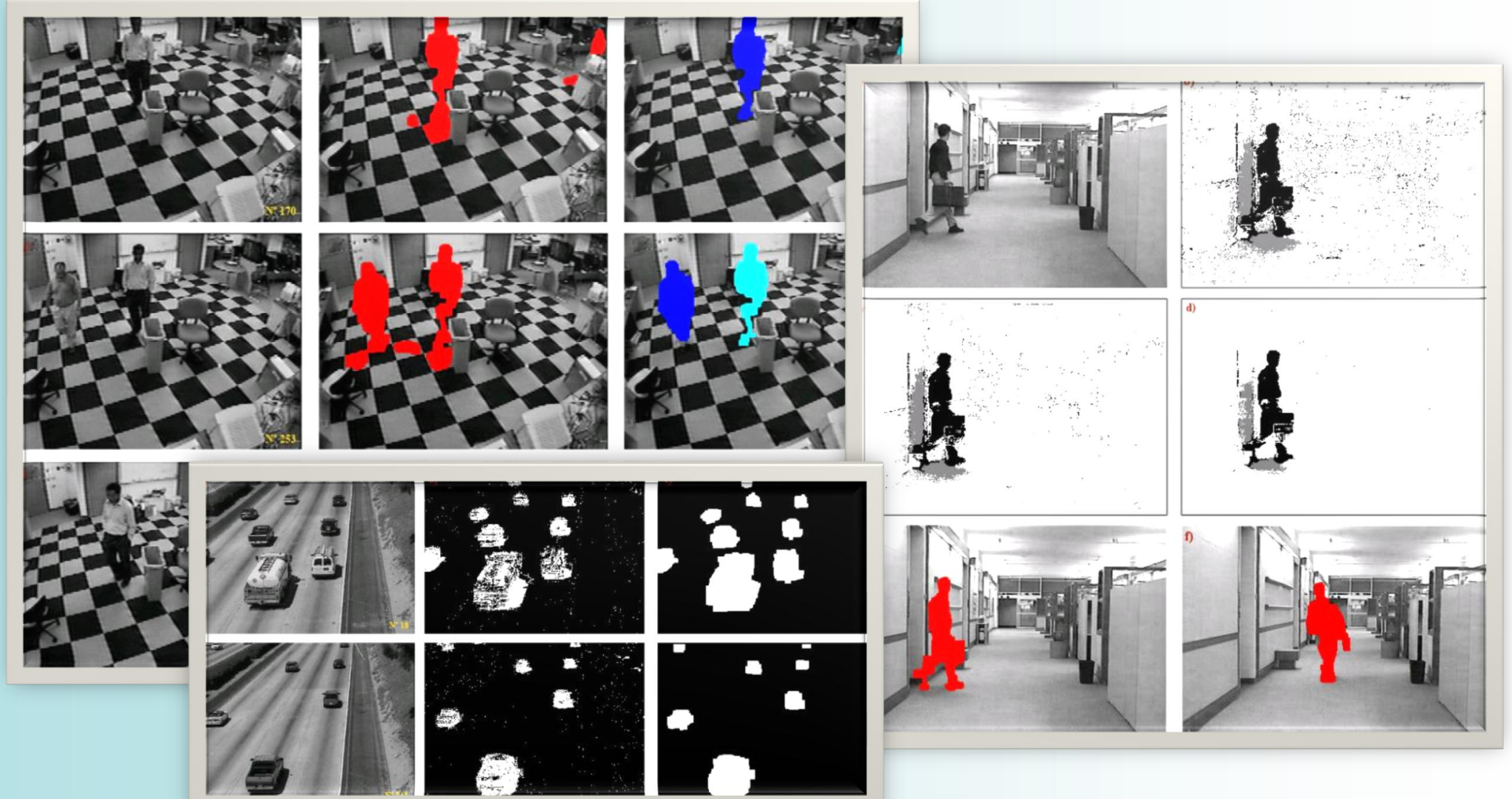
Step 2. *Object Tracking*

This stage involves tracking the objects of interest along the time. It makes possible to get temporal properties from these identified objects (activities). It is necessary to understand the scene structures.

Step 3. *Behaviour Extraction, Reasoning and Analysis*

The interactions between objects are incorporated in its knowledge database and this stage is responsible for checking whether the rules codified in the system are satisfied by the observed objects and the recognized activities. The system will give an interpretation of anomalous activity detected.