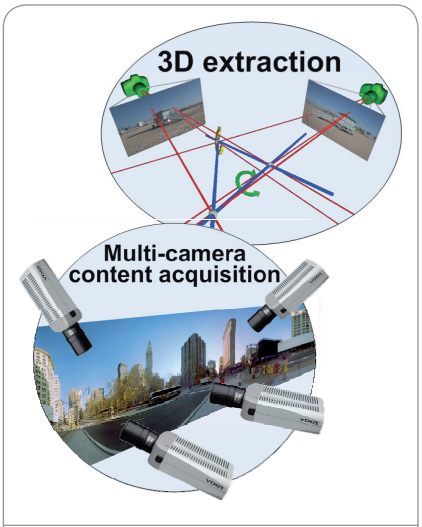
ITEA 2

INFORMATION TECHNOLOGY FOR EUROPEAN ADVANCEMENT

Project Profile

Enhancing video interpretation

Context modelling to improve security and logistics monitoring



High-semantic video interpretation using multiple camera's and modeling of the context

The ViCoMo project is developing advanced video-interpretation algorithms to enhance images acquired with multiple camera systems. By modelling the context in which such systems are used, ViCoMo will significantly improve the intelligence of visual systems and enable recognition of the behaviour of persons, objects and events in a 3D view. The project will enable advanced content and context-based applications in surveillance and security, and transport/logistics with spin-offs in the consumer and multimedia domains.

Electronic appliances, devices and equipment are becoming increasingly interactive and intelligent about the environment or conditions in which they have to operate. Such systems and appliances can relieve humans from onerous work and improve efficiency, security and safety. Examples of advanced intelligent systems performing video and image analysis are widespread in healthcare, lifestyle and surveillance as well as in production and transport system monitoring.

Because of the enhanced interaction with users and the environment, the complexity of such systems is increasing rapidly. Such intelligent complex systems should adapt to internal system conditions and the external environment. However, the amount of information used for this kind of intelligence is in practice limited and system decisions are based on many implicit assumptions. Current intelligent state-of-the-art systems are just not able to match human decision making as the context of information on which the adaptive behaviour is based is completely ignored.

BUILDING REALISTIC CONTEXT MODELS

ViCoMo will focus on visual interpretation and reasoning using context information. It will construct realistic context models to improve the decision making of complex vision systems and produce meaningful behaviour. The general goal is to find the context of events that were captured by the cameras or image sensors, and model the context to establish reliable reasoning about the event.

These goals contribute to improving healthcare, security, safety and the public infrastructure in general. In addition, it supports the development of data storage, efficient retrieval and use for emerging surveillance, healthcare and data mining industries.

A novel aspect is that ViCoMo will merge the information from multiple camera sensors to build an extensive context model of the environment where the visual data was captured. This model can be used to construct a world view with the captured data and extend it with other modelling features such as distances, perspective correction and event indications.

This context model is subsequently usedto derive a more accurate analysis of for example an accident or the behaviour of a group of people. Besides the advances in video content analysis, the modelling

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Vinotion
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Visual Tools
XLight

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also requires a new paradigm on content storage and retrieval. State-of-the-art systems store streams of consecutive video frames with time stamps whereas a ViCoMo system stores information on visual context amongst others events and objects with properties such as location, behaviour, identity and/or colour. Such information is indispensable for fast explicit reasoning about visual context and rapid decision making – and is how humans interpret visual data.

MAJOR IMPROVEMENTS TO VISUALSYSTEMS

Context modelling will lead to major improvements in the technical performance of visual systems, such as higher reliability, safety and processing efficiency. Higher reliability and safety will result in a broad acceptance of intelligent camera systems.

The contextual reasoning will enable sophisticated new applications in surveillance, healthcare, lifestyle, and so on. For example, for surveillance, a system may evaluate group behaviour in a suspicious situation or similarly for the group behaviour during a training session of a medical team. And for logistics, container handling in a harbour may be optimised for better safety and throughput efficiency.

In addition to these direct advantages, non-visual systems can be extended with camera sensors to construct a richer context model. For example, the ambient lighting system in a shopping centre could be adjusted depending on the products, the location of people, their behaviour, their mood and the desired atmosphere to emphasise products, influence customers or, in the case of emergencies, guide people to exits safely and without panic.

MULTITUDE OF APPLICATIONS ENVISAGED

ViCoMo concerns enabling technology rather than an application. It will extend vision systems with context models about the actual conditions and environment, so that significantly more reliable, safe and efficient decisions can be taken. Multiple cameras enable a 3D reconstruction of the environment and provide multiple observations of events from different views. This technology can be deployed for a multitude of applications and can be combined to improve several performance factors simultaneously.

Key innovations will include:

- 3D environment modelling;
- context and metadata centric output results rather than video output;
- high-semantic reasoning ; and
- information filtering significantly improving the information efficiency.

The consortium intends to exploit context modelling in several domains: observation for surveillance and team training; 3D modelling of the real-world environment; observation of human behaviour for system control; and logistics control for traffic and transportation.

Human-behaviour modeling in the context of a 3D environment

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