Cloud LSVA

Large Scale Video Analysis

Project Short Description

The performance of computer vision or video analysis systems is inherently restricted by the quality of the available training data. A key bottleneck in achieving improvements in any application domain – e.g., ADAS, intelligent transport systems, advanced manufacturing, digital cartography – is the availability of labelled realistic video datasets of sufficient size, complexity and coverage (comprehensiveness). However, manually collating and annotating such datasets is either infeasible or impractical. Human annotation is slow, inconsistent and excessively costly.
Further advances require tools that can manage the extremely large volumes of data and provide support in the annotation task. Video analysis technology is required that is capable of exploiting the computing resources and adaptability offered by cloud architectures to create uploading and processing policies for the anticipated data volume and growth.
The capability for efficiently and effectively annotating such data can enable a number of functionalities derived from two main goals:

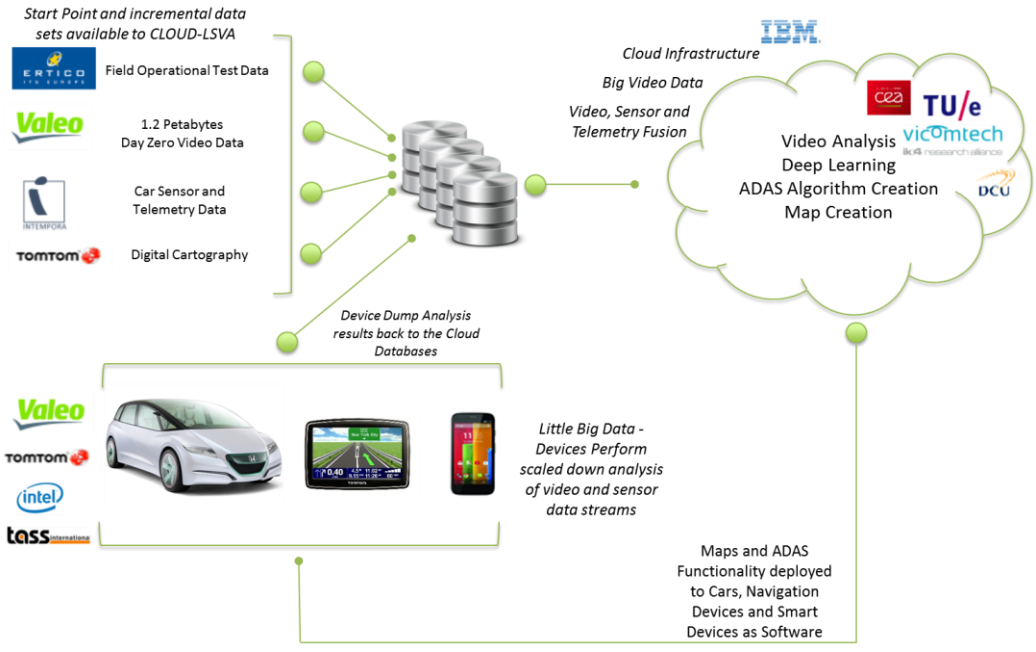
- **Create large training datasets** of visual samples for training models using supervised learning to be used in vision-based detection systems (e.g. models of objects such as pedestrian or traffic signs, or events such as lane departure, overtaking manoeuvres, etc.). An extremely large and sufficiently representative dataset can provide a wide range of trained models according to user specific scenario conditions (e.g. for adverse weather, night-time, urban environment, etc.).
- **Generate ground truth scene descriptions** based on objects (spatio-temporal) and events (temporal logic actions) to evaluate the performance of algorithms and systems that aim to detect or provide such descriptions. More specifically, video-based annotations can help not only to evaluate vision-based algorithms, but other sensors (e.g. Lidar, ultrasonic, radar) accuracy. These metadata can be used for creating public benchmarking tools where different algorithms, systems or sensors are compared.

Aim of the project

The aim of this project is to develop a software platform for efficient and collaborative semiautomatic labelling and exploitation of large-scale video data that solves existing needs for ADAS and Digital Cartography industries. This platform will need to deal with diverse structured and unstructured data sourced from different sensors. The main objectives of the project are to design tools deployed on a Cloud platform that can:

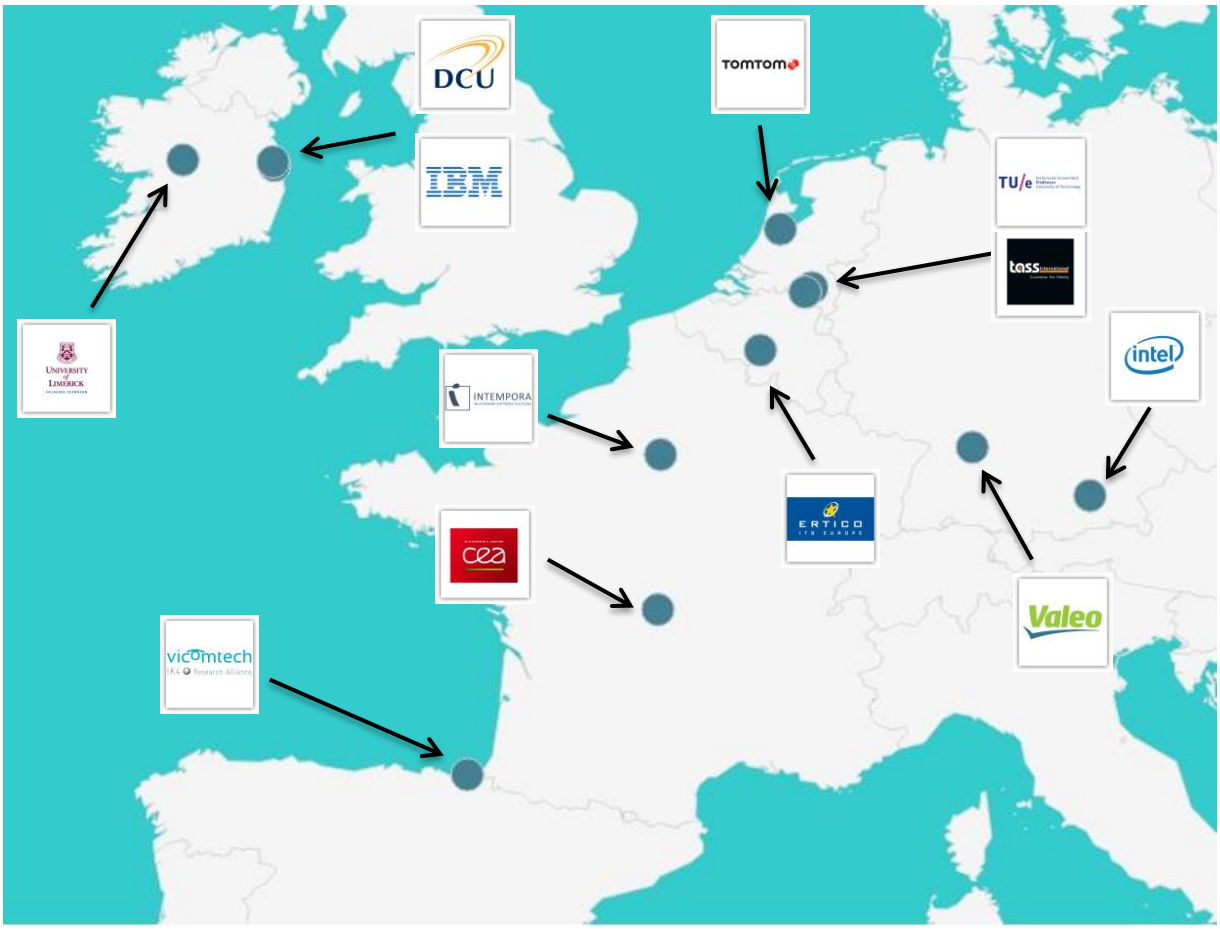
- Effectively handle and exploit large amounts of data to fulfil the ultimate goals of building and validating ADAS systems and creating scene descriptions for system validation and cartography.
- Provide a framework for sharing and combining scene analysis results, including for benchmarking applications, and update capabilities for in-vehicle ADAS systems.
- Fuse video data analysis with data from other sources such that video annotations can integrate with and reference across the entire data corpus.
- Support annotation tools capable of learning from human generated relevance feedback, in the form of corrections, verifications and specializations.
- Automate as far as possible the video annotation process to minimise human workload and improve system scalability and feasibility.
- Apply video analysis as online, efficient, recursive filters with incremental updates that store only the last estimated models (and not entire data subsets).
- Balance the computational and network load of the automatic labelling algorithms so that part of the processing or annotation can be done at the remote data sources (i.e. on board vehicle computers).

Concept

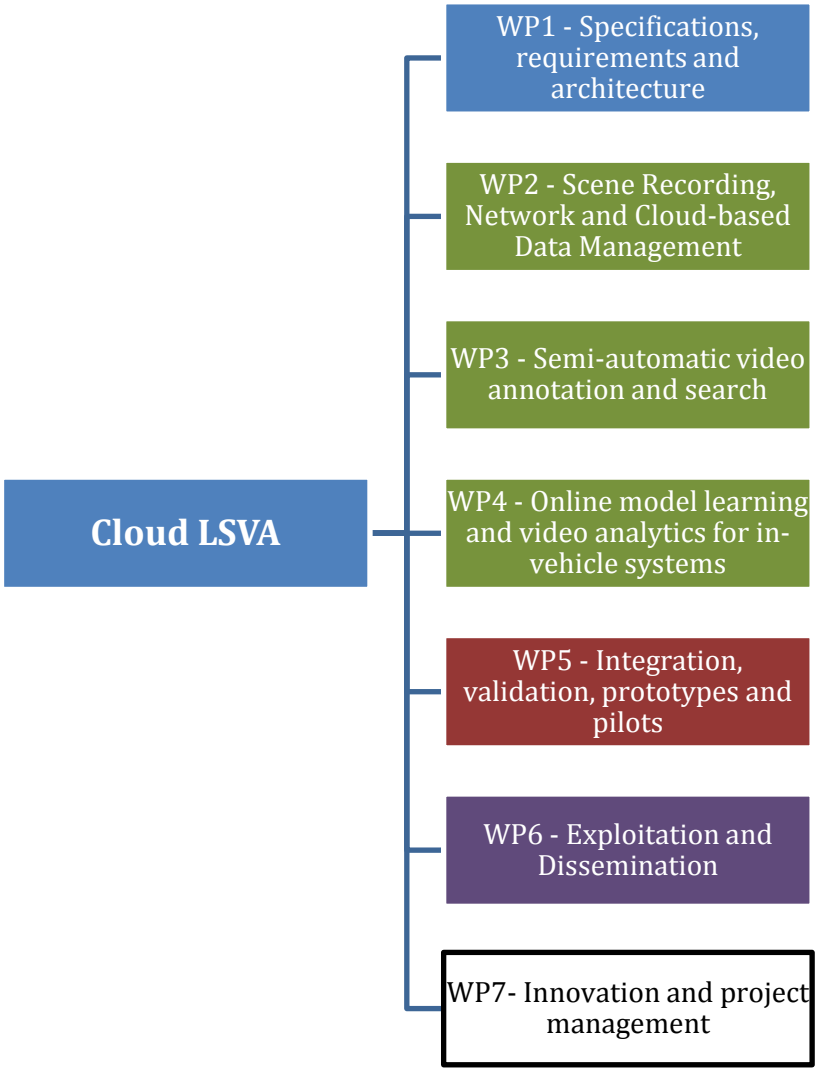


In a nutshell, the Cloud-LSVA project proposes, primarily, the creation of a platform of Big Data Technologies that makes possible the **effective annotation of extremely large video datasets** that are incrementally uploaded to a Cloud infrastructure from heterogeneous data sources. The current unavailability of such datasets presents a critical bottleneck for disruptive innovation in the automotive sector. Cloud-LSVA also proposes the scaling down of these technologies to on-board vehicle computers, consumer electronics devices and Smartphones to facilitate the investigation of the potential role ad benefits of Edge Computing.

Partners



Work Plan



Cloud-LSVA has been organised into seven work packages (WP), five of them (WP1-WP5) are dedicated to research and innovation activities; WP1 will focus on the definition of the specifications of Cloud-LSVA system. Various technological solutions will be analysed as well as key parameters affecting the platform, WP2, WP3 and WP4 are dedicates to the development of intelligent modules that will be put together to build Cloud-LSVA solution. These deal with the three main technological pillars of Cloud infrastructure, Video annotation tools and interfaces, and Video and

Semantic Analytics. WP5 aims to test and demonstrate the solution in real conditions and with end-users. This will test the new Cloud-LSVA tools, video annotation capabilities, and feedback to in-vehicle systems. WP6 consists of pushing the business plan and the pre-commercialisation aspect of the solution. Finally WP7 will del with the project management. This structure responds to the needs of the project and assures an efficient coordination of the work and an adequate distribution and organisation of the Consortium expertise.

The entire work plan is **structured in a cyclical approach**, each cycle starting with a short definition stage (in cycle 1 corresponding to WP1), followed by the core RTD activities, and a final short period of integration and testing. Each cycle ends up with an evaluated prototype. The obtained results can be feed back to the definition stage of the next cycle (WP1-WP2-WP3 for cycles 2 and 3 where specifications are revised according to the test reports).
The project will push to have a first (Alpha) prototype for quick testing and concept validation. Functionalities and services will gradually be built into this Alpha prototype, in a second (Beta) and final (Gamma) cycles. The methodology is designed to reach market quickly and help the exploitation of the solution.

The Role expected from the AB

The role of the advisory group is to complement the technical and user requirements and the architecture, and to participate in project dissemination and communication tasks
The Advisory Board will consist of representatives and organisations aligned with the different fields of expertise related to Cloud-LSVA

More information at: http://cloud-lsva.eu