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Project Results

INSIST

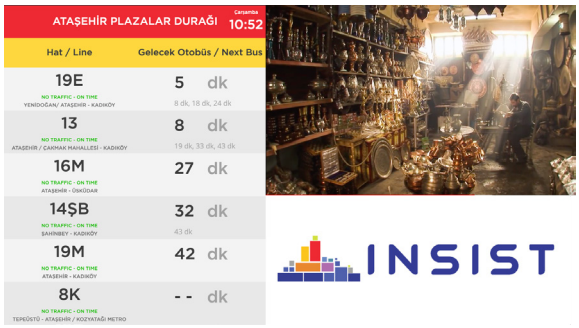
Safety and comfort in the Smart City

EXECUTIVE SUMMARY

By integrating sensor data into a smart, connected ecosystem, the ITEA project INSIST aimed to better manage traffic in cities. Through its interoperable platform, the results can easily be transferred to other domains such as advertising and lighting.

PROJECT ORIGINS

As urbanisation accelerates, a challenge unfolds: how can we provide residents with a high quality of life while keeping expenses manageable at a municipal level? Intelligent systems and smart infrastructure offer a solution, as the falling costs of sensors and storage and the greater maturity of real-time data analysis offer opportunities to create connected ecosystems in public spaces. Through continuous analysis of data from such ecosystems, it becomes possible to transform the ways in which people live in cities.



Bus stop display

The ITEA project INSIST (INtegrated ServIce delivery for citizens' Safety and comforT) has brought together data from multiple sensor systems to create one connected ecosystem. This includes an open database, accessible by traffic management and advertising systems, to collect and share information and events. In terms of traffic, this aims for improved safety and network efficiency. The same technology can also be expanded into new domains within the city, including smart lighting, surveillance and building management. Interoperability is key to this: by successfully integrating the hardware and software infrastructures of different systems, INSIST paves the way for future digital services and new business models that are currently unaffordable or impractical.

TECHNOLOGY APPLIED

INSIST's architecture is a distributed platform built upon Docker, using network interfaces to exchange sensor information from its database. As the system components are loosely coupled, their integrity can more easily be safeguarded. The database also contains historic data, allowing for the swift identification of trends and the automation of several aspects of system configuration. Organisations can communicate through the INSIST management panel, a dashboard which provides access to the underlying service layer. Data is available either merged via the database or individually via the cloud.

The three data sources are visual, social and map sensors. Visual sensors take the form of aboveground smart cameras that use video content analysis techniques to assess the presence of pedestrians and vehicles. Social sensors follow official traffic institutions on social media and use keyword extraction and data mining to find the location of accidents in real-time. Map sensors perform a similar role with public traffic density applications, such as Google Maps, by collecting data application programming interfaces (APIs).

INSIST has also developed several forms of analysis of this data. Social sensor data, for instance, is converted into information lines in the JSON format, which is used to generate coordinates that can be displayed on a web-based map. Map sensors track predetermined coordinates on public transport lines, apply image processing algorithms and estimate the average delay time. The results are shared with Verisun's Smart Bus Station application, which updates in real-time. Visual sensors use the real-time object detection system YOLO to divide images into 13 cells, with each cell responsible for predicting five bounding boxes. This lets it calculate if the number of vehicles is higher than usual or the average speed is lower.

MAKING THE DIFFERENCE

Smart Bus Station is INSIST's biggest success and has been implemented in four municipalities in Turkey. This delivered real-time traffic data to the public and also integrated a city advertisement server to display mobile advertisements.

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Technology-wise, this has improved on the State-of-the Art: social sensors can recognise abnormal traffic conditions in 85% of situations versus a KPI of 80%. Verisun was able to commercialise this application, resulting in a revenue of 80.000 USD. Smart Bus Station is comprised of modules from all INSIST partners, who are now working to commercialise these modules independently.

KoçSistem, which focused on traffic-related data collection, intends to incorporate the technology into its own Smart City product family and use the experience gained in future data science-based R&D. KoçSistem's traffic flow detection algorithm developed in INSIST has been re-used for safety and security algorithms in industrial working areas, like the scenarios developed for pedestrian walk violation detection in factories. KoçSistem aims to develop Intelligent Video Analytics (IVA) Software that enhances safety & security from reactive to proactive and responsive. Their solution avoids work accidents with real-time alerts, detects root causes of safety violations, and takes actions earlier, while decreasing total monitoring personnel costs. In this solution KoçSistem used Mask RCNN to detect workers and custom deep learning models are defined for different scenarios. These custom models work with ~%90 accuracy. KoçSistem predicts a revenue income of approximately 41M TL for the next 3 years.

Gerade has integrated the platform into its MOBIVISOR application for mobile device localisation and sold this to the German cleaning company RP Gebäudereinigung GmbH. It has also sold 2500 licences of the app in Turkey, earning approximately 10.000 Euros per month. Argedor has created two applications to manage traffic in Istanbul and plans to expand these applications to several other municipalities in Turkey. They are currently working on a service model for its Transportation Assistant application. For 2020, Argedor expects a revenue between 500K and 750K Euros. This variety in application domains clearly demonstrates the flexibility of INSIST's technology.

As a Smart City project, INSIST ultimately aimed to improve both the quality of life and connectivity of urban areas. The former is demonstrated by the visual sensors, which use neural network algorithms to detect pedestrians in areas inappropriate for walking. The 100% accuracy rate has the potential to drastically reduce accidents and save lives. In terms of connectivity, INSIST brings small stakeholders together. While current traffic applications rely on data being processed by large enterprises, INSIST software enables anybody with a sensor to participate in this network by feeding data from their cameras, voice sources or social media into the system. This increased accessibility has the potential to fundamentally change the ways in which we communicate within cities.

MAJOR PROJECT OUTCOMES

Dissemination

- 5 publications and several demonstrations/presentations at conferences (e.g. ICAS 2106, ISITES 2016, UZAL 2016, World Cities Congress Istanbul 2019, 2019 Intertraffic Istanbul)

Exploitation (so far)

New products:

- City Ad Server: selects advertisements according to the medium, (audio or video), country, audience (gender, age) and sends media content to passenger/driver client services.
- Akıllı Durak Cepte: as one of Turkey's earliest and most common public transportation application, it shows the nearest bus stops and scheduled arrival times.
- Adapted Istanbul Mobility Coordination Center: IMCC shows all public transportation means of İstanbul, their routes and stations and also traffic related data and warnings.
- Adapted to Istanbul Transportation Assistant: TA provides analysis about the means of public transportation in Istanbul, e.g. distribution of transport usage, passenger density by age range.

New services:

- KNVCity: provides a photorealistic 3D geographical information system.
- Insist Social Sensor: this Machine Learning tool runs through predetermined Twitter Accounts and collects as many tweets as possible at each run according to location info.
- Insist Visual Sensor: by determining number of vehicles and average speed the visual sensor interprets traffic density.
- Insist Map Sensor: using real-time and predictive traffic information it creates traffic density maps and estimates arrival times and potential delays for public transportation.

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VTT Technical Research Centre of Finland

Spain

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ARGEDOR Information Technologies Ltd

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Project start

January 2016

Project end

December 2018

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