Better object location in industrial environments with AI

An EU-backed project is using deep learning techniques combined with cloud, edge and far-edge computing to improve the way objects are tracked in factories and warehouses.

DIGITAL ECONOMY

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Indoor positioning technologies are helping to transform the industrial sector. Like an indoor global positioning system, they locate people and objects, enhancing efficiency, security and automation in buildings such as factories and warehouses. The new European project DUNE is now developing novel solutions to improve asset location in indoor industrial environments. Part of the EU-funded VEDLIoT project, DUNE combines deep learning techniques with distributed computing systems that rely on cloud, edge and far-edge computing capabilities to address real-time application needs.

“There are numerous technological approaches today that attempt to exploit the characteristics of radio signals as a tool for obtaining the relative position between objects,” observes Prof. Xavier Vilajosana Guillén of Universitat Oberta de Catalunya, Spain, in a news item posted on the university’s website. “This technological variety and the wide range of situations in which they can be used, with highly diverse budgets and environments for application, means that we need to develop a powerful framework for managing location data from different technologies in real time, which at the same time is able to adapt to multiple industrial needs and is economically appealing.”

To locate an asset in an indoor environment, the receiving device estimates the asset’s position based on the direction that the signal emitted by the asset is coming from. However, the obstacles between the transmitter and the device receiving the signal result in inaccuracies when an object’s position is estimated. To overcome this

problem, DUNE is employing positioning mechanisms aided by deep learning techniques at different stages of the location process.

How the system works

The distributed system consists of a variety of sensor and location devices placed on the objects that need to be tracked. The devices generate raw data that needs to be processed to determine the different objects' positions. As stated in the news item, initial data processing takes place at the "far-edge," near the antennas transmitting the signals. This reduces server response time and bandwidth, while also enhancing data security.

The radio signals emitted by the sensors attached to the objects are received by the locator's antennas. The data then needs to be processed to estimate the angles that determine the direction the signal is coming from, in order to update the data in real time. "In a perfect world, this transformation is a geometric process that depends on the space between the antennas (distance) and the radio frequency (wavelength). However, these environments are subject to noise and irregularities," notes Prof. Vilajosana Guillén. "When addressing these problems, deep learning methods can become a very valuable tool for obtaining accurate estimates of the position of objects."

Other "edge" devices are used to process and aggregate the data in real time, with another filtering step added to improve signal translation and enable the incorporation of different technologies. The estimated positions are then delivered from these edge devices to a cloud infrastructure connected to the factory's information system. In the cloud, advanced AI methods are used to correct, improve, classify and identify anomalies and optimise operations.

The VEDLIoT (Very Efficient Deep Learning in IOT) project is developing an innovative Internet of things platform that will help solve challenging problems in key sectors such as industry and transportation. The project ends in October 2023.

For more information, please see:
VEDLIoT project website

Keywords

VEDLIoT | DUNE | indoor positioning technology | industrial | data | deep learning | object location | edge | far edge | cloud

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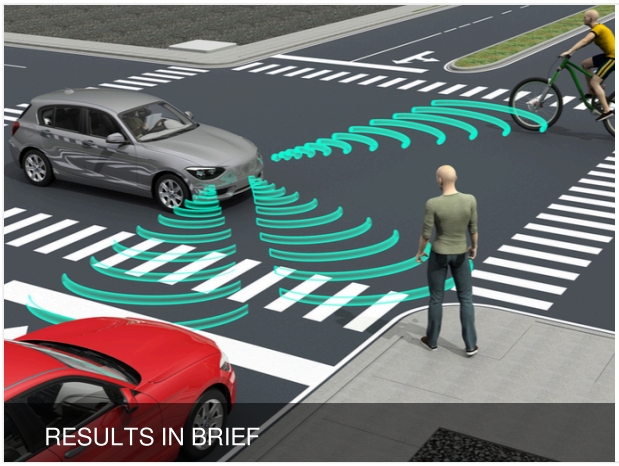

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