Surround sensing for automotive through neuromorphic computing

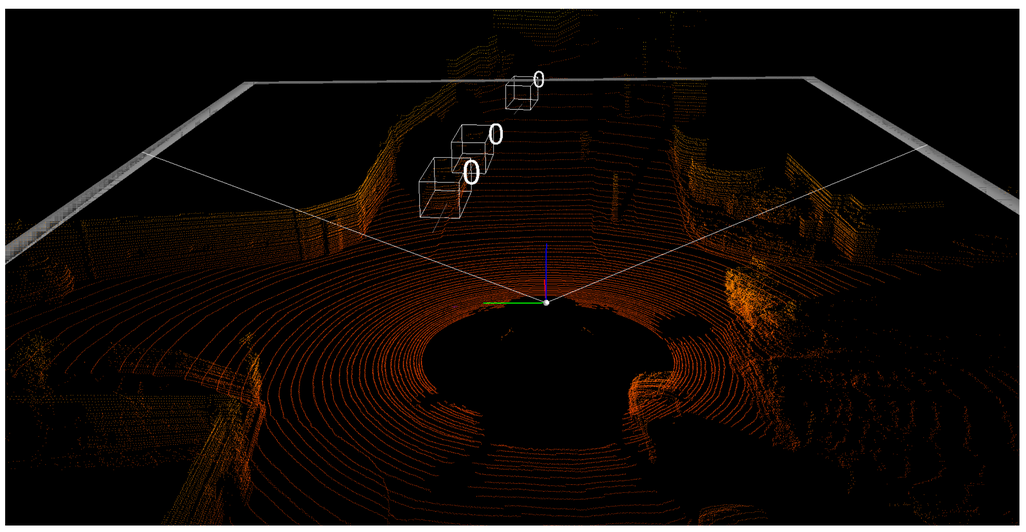
with enhanced energy efficiency, computing speed and smaller footprint

Automotive

Fast and precise assessing of the entities' position around a vehicle is critical for autonomous driving. This can be achieved by mounting a LIDAR on the vehicle and processing its data. LIDAR sensors essentially output a depth image that can be seen as a 3D pointcloud of surfaces surrounding it. AI enables precise detection, classification and location of entities formed by these surfaces.

Within the TEMPO project, the goal of this activity is to

- demonstrate SOTA performances with LIDAR input only for detecting surrounding entities in an automotive context (KITTI)
- demonstrate negligible accuracy loss with quantized Spiking Neural Network (SNN) in similar conditions
- Leverage a non-volatile memory type known as OxRAM as energy efficient parameter storage for SNN, enabling low power computing



SNN computation is particularly valuable in this application as the compute activity can be traded-off against its energy consumption. Activity through the network can be monitored and each subpart of the emulated ASIC can be tuned to best answer the application; to compute faster or save power

OxRAM is non-volatile memory with a voltage-dependent resistance. It may be more energy efficient and compact compared to conventional CMOS-based SRAM memories. By minimizing the write operations of the ASIC implementation, this memory shows to be attractive choice in terms of cost and power efficiency for the targeted application.

The current developments indicate that BevDetNet achieves a high average precision for detecting cars using KITTI dataset while being faster than SOTA solutions. Moreover, we estimate to require less than 1pJ per synaptic operation, and based on the emulated ASIC, it is estimated the sparse and highly parallel operation in the spiking BevDetNet topology will enable lower power and latency than its non-spiking counterpart

Demonstrator partners

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This project has received funding from the ECSEL Joint Undertaking (JU) under grant agreement No 826655. The JU receives support from the European Union's Horizon 2020 research and innovation programme and Belgium, France, Germany, Netherlands, Switzerland

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