Title: Optimizing Person Detection with Neuromorphic Vision Sensors

In the pursuit of advancements in surveillance, smart environments, and interactive systems, accurate person detection stands as a critical technology cornerstone. This project proposes leveraging neuromorphic vision sensors for person detection, capitalizing on their unique advantages such as low power consumption, high dynamic range, and privacy preservation. Despite their potential, neuromorphic sensors face challenges like limited detection capabilities for static individuals, the absence of tailored datasets, and the complexity of processing event-based information. This project aims to address these challenges through innovative algorithm development and system design.

Objectives of this project are:

1- Evaluate Neuromorphic Sensor Capabilities: assess neuromorphic vision sensors for person detection, focusing on dynamic range and low-light performance. Understanding these capabilities is essential for tailoring detection algorithms to leverage the sensor's strengths.
2- Tackle Neuromorphic Sensor Challenges: Develop solutions for detecting static individuals, compensate for the lack of specific datasets, and streamline event-data processing. Addressing these challenges will enable the broader application of neuromorphic sensors in person detection.
3- Algorithm and System Development: To create optimized algorithms for event-based data processing and integrate them into a comprehensive person detection system. This involves selecting and refining machine learning models best suited for processing sparse and asynchronous event data.
4- Prototype Testing and Evaluation: The prototype will be tested to evaluate its performance and energy consumption before and after the proposed optimizations. Key metrics for evaluation will include accuracy, detection latency, and power efficiency.

In this project, the student will use a Prophesee GENX320 vision sensor together with an STM32 microcontroller to process the data, chosen for their leading-edge performance in low-power, high-efficiency applications.

Tasks:

- **Survey and Literature Review**: Conduct a survey of existing technologies and literature in neuromorphic vision sensing and person detection algorithms, focusing on identifying gaps and opportunities for innovation.
- **Neuromorphic Sensor Integration**: Experiment with integrating neuromorphic vision sensors into detection systems, focusing on hardware compatibility and data interfacing. This task will explore the technical challenges and solutions in marrying sensor output with processing algorithms.
- **Algorithm Development**: Design and test algorithms specifically for processing neuromorphic sensor data, with an emphasis on machine learning techniques suitable

for dynamic event processing. Potential approaches include convolutional neural networks (CNNs) and recurrent neural networks (RNNs) adapted for event-based input.

- **System Optimization and Testing**: Optimize the entire detection system for energy efficiency and accuracy and comparison with the baseline. This will involve iterative testing and refinement to achieve optimal performance.

Theory: 30%

Coding/implementing: 20%

Evaluation: 30%

Writing: 20%

Contact:

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