The aim of this project is to design an algorithm to estimate gaze direction in real time from a Dynamic Vision Sensor (DVS) event-stream of the eye. As was discussed in the previous literature review, the event-based output of the DVS is asynchronous and therefore has many advantages over traditional, synchronous frame-based recording systems. Namely, massively reduced information redundancy, and extremely high temporal resolution - on the order of microseconds (1). To fully leverage these qualities, subsequent processing steps must also be performed asynchronously, operating on events as and when they arrive. This results in ‘pseudo-simultaneity’, the property that events pass through the processing chain instantaneously and independently, resulting in extremely low response latency (2). Spiking Neural Networks are biologically inspired asynchronous learning algorithms, capable of performing complex pattern recognition tasks on spatiotemporal data (3). They are therefore extremely applicable to this task. The previous review focused on a selection of methods and techniques in this domain; the present review will discuss their implementation in terms of hardware and software.

There are two key features of biological computation in the brain: asynchrony and parallelism. These are particularly crucial for the rapid, feedforward image processing observed in the visual cortex (paper). When analysing a visual scene, incoming retinal data is not accumulated in a buffer before each processing step, nor is it operated on sequentially in a pixel-by-pixel manner. Rather, data is processed in one clean sweep, passing seamlessly and continuously through the network. For this reason, any algorithm that aims to emulate this task must be performed in a highly parallel and asynchronous manner.

**Hardware Implementation**

There are various methods for simulating SNNs. These range from the use of common hardware such as the CPU or GPU of a desktop computer, to dedicated hardware such as analogue circuits, and the SpiNNaker and TrueNorth chips (references).

The most basic of these is the CPU-based method. In this method, simulations are run

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**The SpiNNaker Chip**

References

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