Address Event Representaion

Paper For OpenROAD

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***Abstract*—The AER is a circuit which is used to interface asynchronous events and prioritize them on a first come basis. It is a protocol which uses a four-phase hand- shake with a request line driven by the sender, an acknowledge line driven by the receiver and a set of address lines driven by the sender. It's a close representation of the human brain's neural network.**

I will be using this model in OpenROAD to minimise the delays and the area taken by this circuit in an efficient manner.

***Index Terms*—component, formatting, style, styling, insert**

I. Introduction

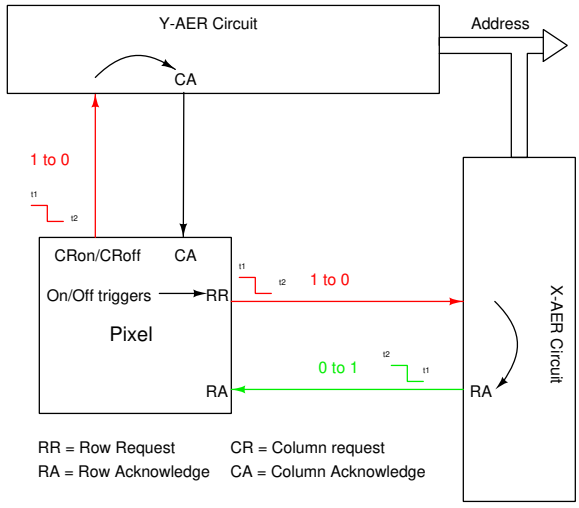
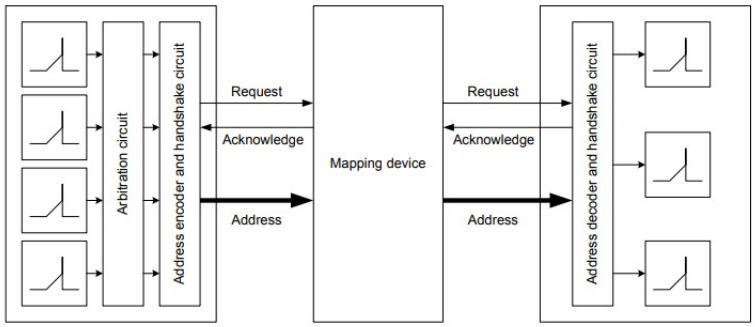


Fig. 1. Communication between the Blocks

The asynchronous communication of an event to a rece chip works by three sequential four-phase handshaking cyc shown in flow diagram 2

1) Row Handshake: When an event is detected then a p sends the row request RR. When the X-AER cir acknowledge the signal RA signal is sent back to the pixel.
2) Column Handshake: When a row receives acknowledge- ment in the form of RA, all the pixels that have crossed the ON or OFF threshold become active and trigger their respective column requests, CRon or CRoff, depending on the event's polarity. The column arbiter then selects a column and encodes its address. The corresponding column acknowledgement, CA, is then activated. If a pixel receives both RA and CA, it will be reset.
3) Chip Handshake: Activating a column that's active trig- gers the chip request, REQ. The combination of the row and column address encodes the location of the pixel without any ambiguity. Once the off-chip receiver activates the chip acknowledge, ACK, the logic circuits for the row and column arbiters are cleared. If there are still active pixels in the same row, the row arbiter will remain on that row while the column arbiter selects a different column. However, if there are no more active pixels in that row, the row arbiter will choose a different row. [2]

The Verilog code for the same has been taken from the link [2] https://spinnakermanchester.github.io/docs/fpga_aer/



(a) AER concept. The sender encodes the address of the firing neuron, an optional mapping device can modify the address and the decoder of the receiving device sends the spike to the correct neuron.

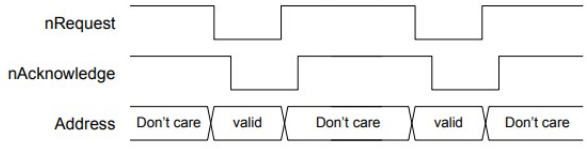


Fig. 2. Communication between the Blocks

References

[1] berner2011building, title=Building-blocks for event-based vision sen- sors, author=Berner, Raphael, year=2011, school=ETH Zurich
[2] Github dominic-meads, Verilog/switch debounce.v, 14 Jun 2020 https: //spinnakermanchester.github.io/docs/fpga_aer/