

## A Virtual Electrode through Summation of Time Offset Pulses

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**Abstract :** Retinal prostheses have been successful in eliciting visual responses in implanted subjects. As these prostheses progress, one of their major limitations is the need for increased resolution. As an alternative to increasing the number of electrodes, virtual electrodes may be used to increase the effective resolution of current electrode arrays. This paper presents a virtual electrode technique based upon time-offsets between stimuli. Two adjacent electrodes are stimulated with identical pulses with too short of pulse widths to activate a neuron, but one has a time offset of one pulse width. A virtual electrode of twice the pulse width was then shown to appear in the center, with a total width capable of activating a neuron. This can be used in retinal implants by stimulating electrodes with pulse widths short enough to not elicit responses in neurons, but with their combined pulse width adequate to activate a neuron in between them.

**Keywords :** electrical stimulation, neuroprosthesis, retinal implant, retinal prosthesis, virtual electrode

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