magnitude of the gain is kept mostly the same for all the neurons, with the results indicating that an inhomogeneous gain yields faster synchronization for various frequency gradients.

It is further observed that the magnitude of gain applied to the integrate and fire neuron model goes high for higher frequency gradients whereas a much lower gain only is needed for cells with low frequency gradients. It is again observed that the process of mutual entrainment (synchronization) requires that there be some phase difference between the cardiac cells/oscillators for proper coordination to be maintained.

The coupled SAN cell pair failed to synchronize despite the coupling efficacy being weak (0.01 µS) Fig's.28 and 36or medium (0.1 µS) as evident from Fig's.23 and 31 which signifies that the value of gap junction conductance (GGJ) can coax the coupled cells to synchronize only to a certain extent [13].

It is observed that the SAN cell pair which fails to synchronize otherwise (Fig's.23,28, 31 and 36) is made to attain synchrony with the additional input applied from the integrate and fire neuron model (Fig's.24, 25,29, 30, 32, 33, 37and 38), regardless of the coupling strength being weak (0.01 µS), medium (0.1 µS) or strong (1 µS).
The simulation results quantify that the adjustable gain value of the externally applied IFN input can better aid the cells to undergo synchronization within the cardiac system. With proper value of gain it is shown that the coupled SAN cells quickly synchronize.

It is thus inferred that for a coupled pair of SAN cells/oscillators, even for sufficiently large differences in their individual intrinsic frequencies regardless of the coupling strength, the external IFN input can coax the cells into synchrony.

V. CONCLUSION

The neuron model considered which when applied appropriately is shown to restore entrainment between the pair of cells regardless of the efficacy of coupling. The results of these simulation studies show that the pair of coupled cardiac cells that otherwise do not synchronize are made to synchronize with suitable neural input and the simulated results presented.The work can be extended to a multitude of SA nodal cells that constitute a one dimensional array with the corresponding IFN input applied.

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