PATTERN MEMORY AND ANALYSIS IN BAT-INSPIRED ECHOLOCATION SYSTEMS

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THE OBJECTIVE

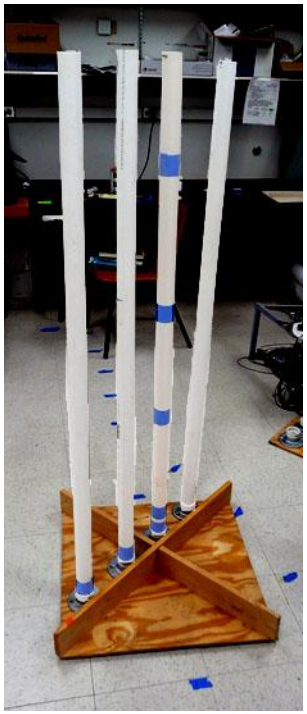
Creating a neural network that uses reflected sonar signals to learn and identify different Objects present in an environment and implementing it on an FPGA.

Object A: 1 Pole

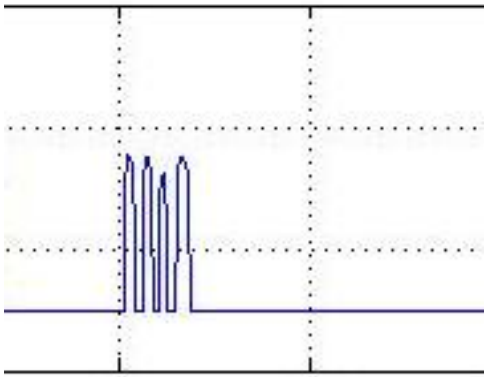
Object B: 2 Poles

Object C: 3 Poles

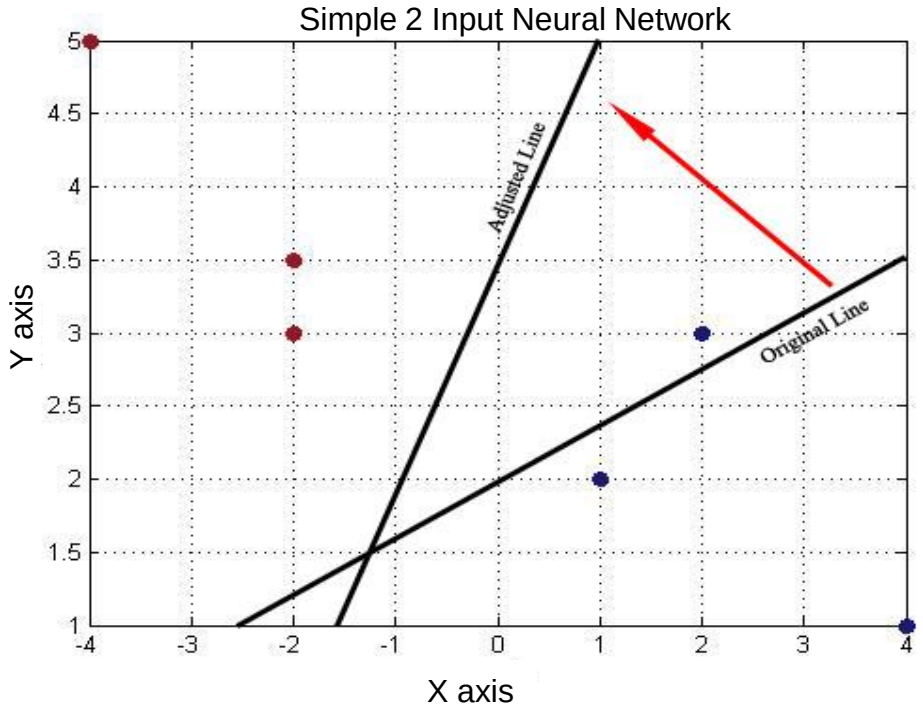
Object D: 4 Poles

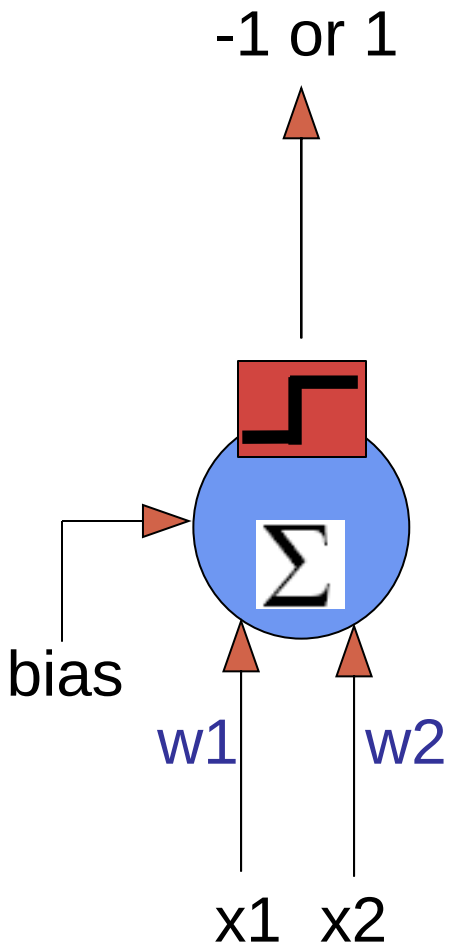


"Object D"



Neural Networks

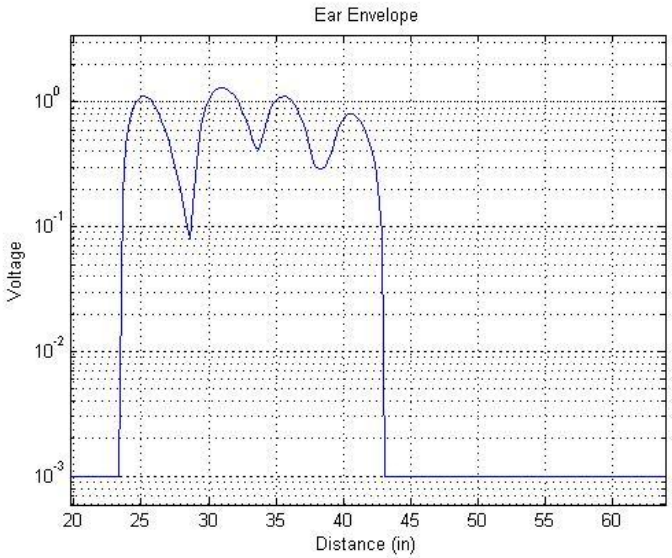




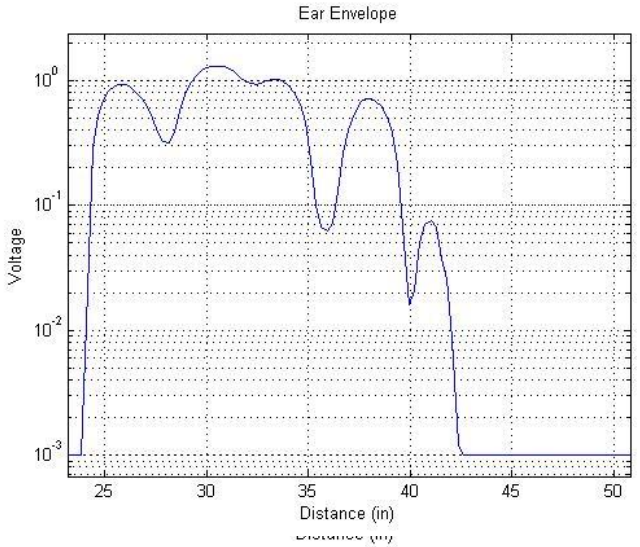
1. Data Collection
2. Training
3. Validation

Why Use Neural Networks?

Object D

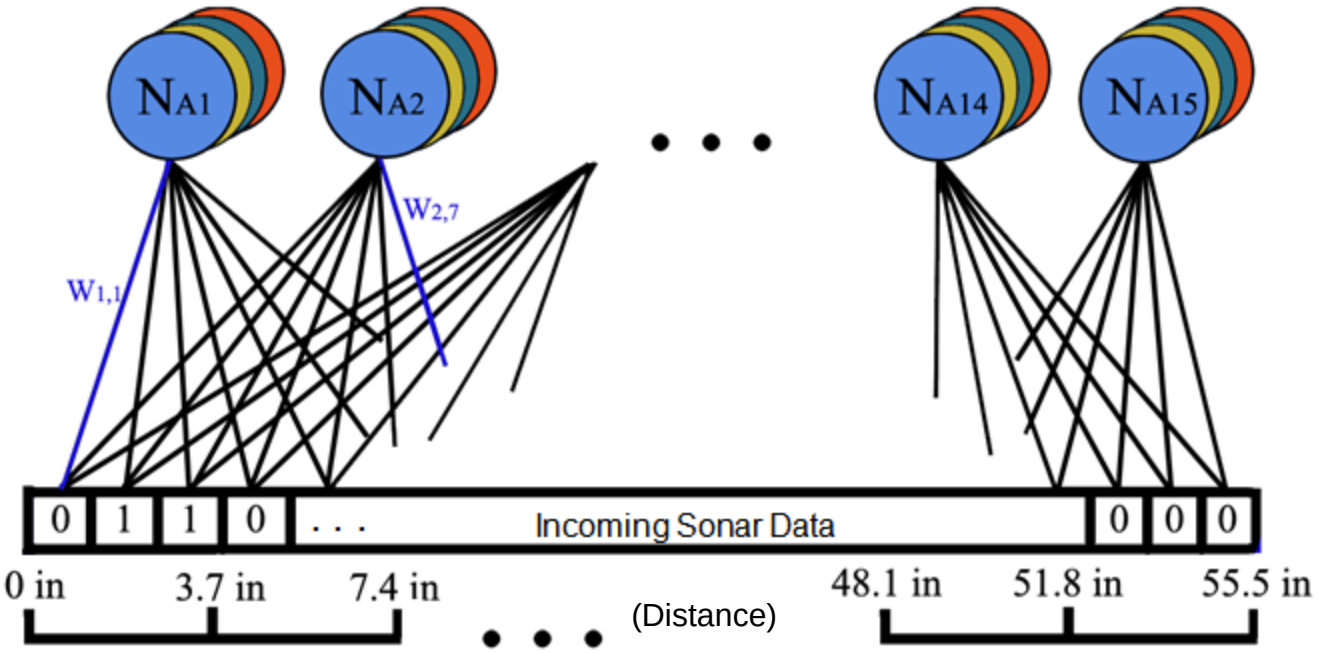


Object D Spun Slightly

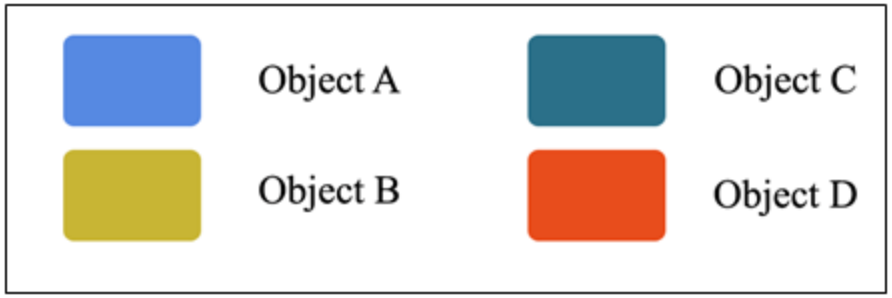


The complexity of the many variables make it difficult to use deterministic and sequential algorithms.

The Built Network



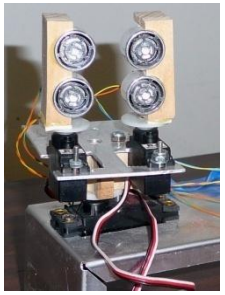
Neuron Guide:

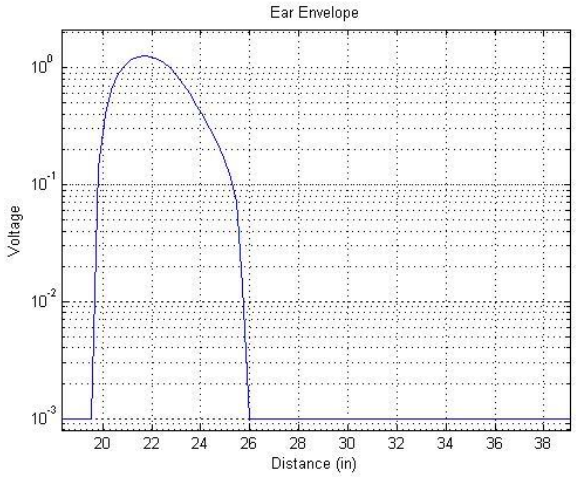


MATLAB

Object A

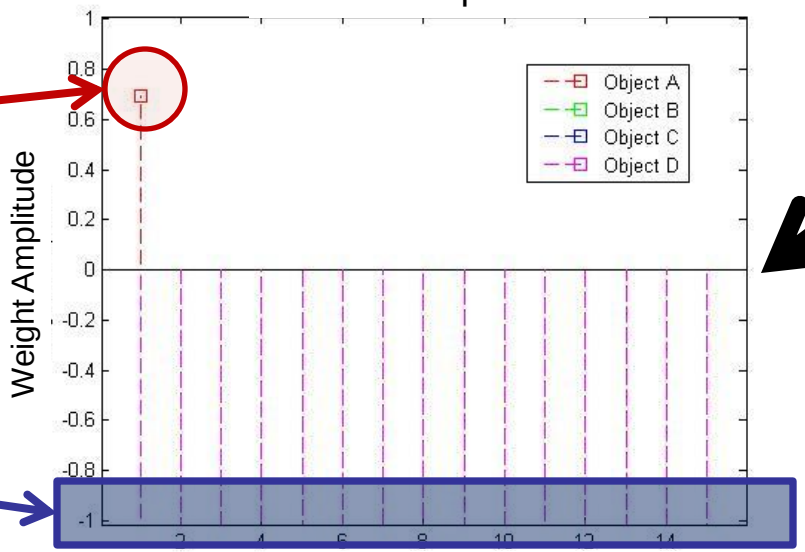
Sonar





MATLAB

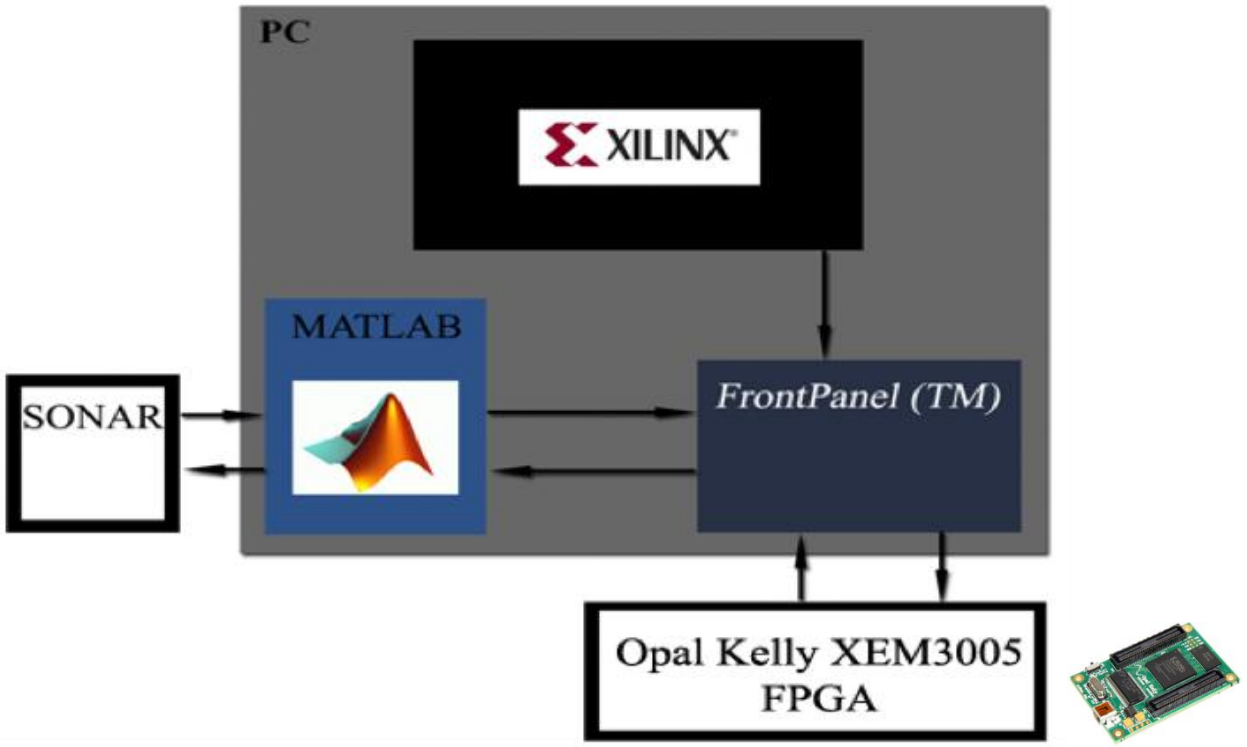
Neuron Output Chart



Object A, from Neuron 1 is identified.

All other Neurons do not fire.

FPGA IMPLEMENTATION



1. Worked on interfacing communication with the FPGA
2. Successfully loaded all the Parameters.
3. Full functionality reached

Conclusion

Completed at This Time

- Full Functionality reached in MATLAB and FPGA

Future Work

- Consider one of two things:
    1. Optimization of coding for synthesis
    2. Getting a larger FPGA
- Entire System on FPGA

Thank you!

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