

# ELECTROLOCATION

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SUPERVISORS

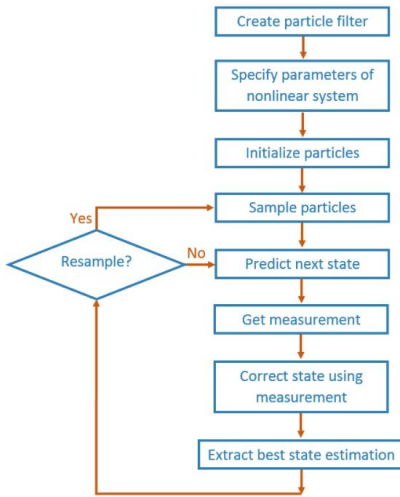
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## INTRODUCTION

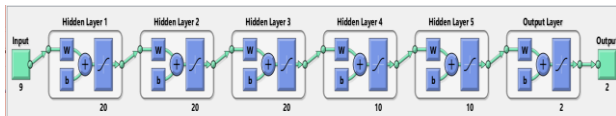
- Weakly electric fish generate a discharge that is typically less than one volt. These are too weak to stun prey and instead are used for navigation, object detection (electrolocation) and communication with other electric fish (electrocommunication).
- The goal of this project is to detect and track the movements of electric fish underwater using their electric organ discharge. The electric fish has an electric organ and by using it, it continuously transmits electric current to the water. The fish can sense the environment even in the absence of visual information using the amplitude and phase changes in its electric field.

## SOLUTION METHODOLOGIES

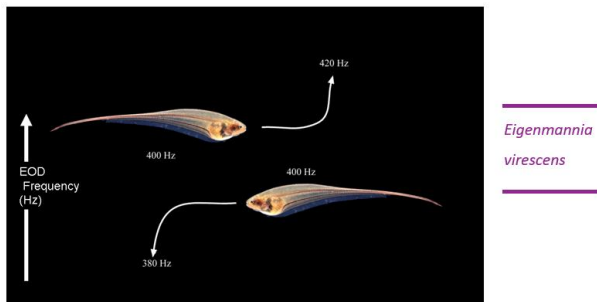
### 1. Particle Filter



### 2. Neural Network

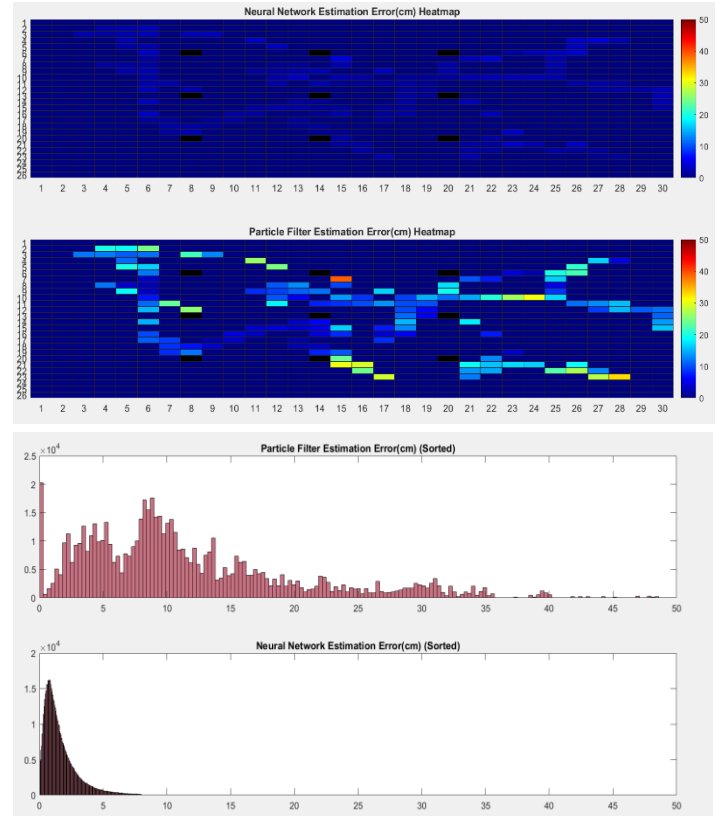


- We have used 6-layer neural network structure with the training function LM (Levenberg-Marquardt optimization).



## RESULTS AND DISCUSSION

### Estimation Error Comparison of Particle Filter and Neural Network



- We have achieved an average of 23cm error by using Particle Filter and 2cm error by using Neural Network.
- Estimation Error Comparison of Particle Filter and Neural Network in the Tank is given in the Heatmap above. The black boxes in the heatmap indicate the electrode locations. The tank used in the experiments has a size of 130cmx150cm.
- All the estimations are in 2D cartesian coordinate system (i.e. x and y).
- The most evident outcome of this project is that, neural network estimations are more precise than particle filter estimations.

## REFERENCES & ACKNOWLEDGEMENTS

- This project was completed within the context of ELE401-401 Graduation Project courses in Hacettepe University, Faculty of Engineering, Department of Electrical and Electronics Engineering.
- Manu S. Madhav, Ravikrishnan P. Jayakumar, Alican Demir, Sarah A. Stamper, Eric S. Fortune & Noah J. Cowan, "High-resolution behavioral mapping of electric fishes in Amazonian Habitats", Mind/Brain Institute, Johns Hopkins University, April,11,2018