

Neural Networks Approach in Detection of Object using Radar System

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ABSTRACT: A Neural Network (NN) is a scientific model or computational model taking into account organic neural systems are non-linear statistical information modeling systems. They can be used to model complex relationships among inputs and outputs or for the purpose of finding patterns in data. Neural network optimize the signals for finding the accurate distance of target object. Neural network will speed up the tracing and tracking of object in real time and removes the interference and noise in the path. It predicts the actual distance of the object from the ranging source which provides accurate distance in Radar system which is based on the principle of sound reflection wave. It uses echo signal to calculate distance from an object. Object movement will be calculated in less time.

KEYWORDS: Neural Networks, Radar, Interference, Prediction

I. INTRODUCTION

In the past few years, major experimentations on adaptive control of linear time-invariant systems with unknown parameters have been made. The selection of the controller model is depended on well produced results in linear systems approach and stable adaptive laws which gives the assurity the global stability of the overall system are derived based on properties of those system. In recent years, Neural Network based control strategies have been used much due to their powerful ability to approximate continuous nonlinear functions. In fact, a neural controller with on-line learning can adapt to the change in a system dynamics and hence is an ideal choice for controlling highly nonlinear system with uncertainty. Neural Networks imitates the process of the human brain and can process problems involving non linear and complex data even if the data are not accurate and error prone. For adaptive control purposes neural networks are used as approximation models of unknown nonlinearities. The input / output response of neural network models is modified by adjusting the values of its adjusting the values of its parameters.

Neural networks have been found to be particularly useful for controlling highly uncertain, nonlinear and complex systems. Neural control strategies can be broadly classified into off-line and on-line schemes based on how the parameters of the network are tuned. When the neural controller operates in an on-line mode, it has no a priori knowledge of the system to be controlled and the parameters of the network are updated while the input – output data is received.

II. BACKGROUND

Customary Radar System has very basic way to deal with track and follow the article. The hypothesis of Radar framework is straightforward. The signs are sent from the receiving wire inside of the predefined range, once the item along the way of signs run over it reverberation's back the sign to accepting reception apparatus. The signals are sent from the antenna within the specified range, once the object along the path of signals come across it echo's back the signal to receiving antenna [1]. Signs are handled to discover the separation of item or to track the article. This straightforward methodology works fine until the signs are without clamor or it doesn't have any impedance. Any commotion or obstruction in the sign will lessen the possibility of following or finding the suitable separation of the

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item. Any noise or interference in the signal will reduce the chance of tracking or finding the appropriate distance of the object [2]. Numerous methodologies proposed in radar framework for productive computation of separation and to follow the item and diminishment of commotion and obstructions. Radar signal is shown in the below figure a.

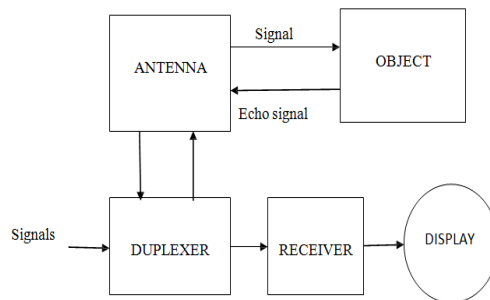


Fig a: Radar Signal Routing

Numerous methodologies proposed by numerous creators to improve the radar framework idea. The signs issues are uncertain in every last proposition. Streamlining decreased the sign issues yet the vast majority of them spotlight on other following improvement. Customary methodology process signals in enormous sum subsequently the commotion and obstruction stay with the signs. In this archive we exhibited the best approach to decrease the vast majority of the commotion and obstruction issues. To diminish the sign issues proficiently the most ideal path is to lessen signal handling. This venture introduces the idea where the preparing of sign will be less to track and hint of any item. Forecast is the method which is utilized to track the article once is followed by the system. Instead of preparing the signs each time the information about the item which is followed can be utilized to anticipate the following area of the article. The put away data gets redesigned when the following data is computed or anticipated by the forecast module. This data additionally utilized for perception objects.

III. EXISTING SYSTEM

One such mechanism which incorporates noise detection is matched filter. Many evolutions took place till date but the basic concept behind the radar system is same as was before [3]. Matched filter is a template based technique which can be used to detect noise using a reference template signal. This variant of noise detection, sends a signal and waits for the reflected signal to be detected. Once the reflected signal is received, it is compared with the template signal for similarities and references with the sent signal. If a complete match is found, it means that the data is not corrupted by the atmospheric noise. This mechanism can only be used for noise detection and has to be carried out manually each and every time a noise has to be detected. In this process the processing of signal is less hence avoids the problem related to the signals like noise and interference [4]. This is not a recommended mechanism to compute the crucial SNR(Signal to Noise Ratio).

The other alternate implementation in an attempt to detect noise and eliminate the same is wavelet denoising. This methodology adopts the mechanism in which, the signal received is subjected to a denoising filter. This filter is fabricated in a manner to detect noises above the threshold level. Every time a signal is received, it is subjected to the denoising filter for measuring variances in the noise level. This filter is calibrated in advance by the organization using it. The main drawback of incorporating this filter is the monetary investment and the low tolerance credentials associated with the filter. These features make the filter less desirable for making accurate recordings and calculations for the same. Hence this method of computing SNR is not cost effective and also not the most efficient technique

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IV. PROPOSED SYSTEM

To overcome the above mentioned problems, the neural network approach is introduced. This approach effectively and efficiently reduces the noises derived by the underlying environment. To receive clear signals, elimination of the directional noise was necessary which was achieved with the proposed approach. The solution to this real time scenario is provided by the back propagation algorithm which effectively handles both the suppression of noise in a signal and an accurate location measurement of a moving aircraft. The main reason of usage of neural networks is to produce high performance throughput in tracking and tracing of aircrafts. This approach adopts wave filters, whose mechanism can be manipulated by making changes to the input weights and thus making it appropriate for noise detection and reduction.

Neural systems are built with layers of units, and along these lines are termed multilayer NNAs. A layer of units in such an NNA is made out of units that perform comparative assignments. To start with layer of a multilayer NNA comprises of data units. These units are known as free variables in measurable writing. Last layer contains yield units. In measurable classification, these units are known as reliant or reaction variables. Every single other unit in the model are called shrouded units and constitute concealed layers. There are two capacities representing the conduct of a unit in a specific layer, which typically are the same for all units inside of the entire NNA, i.e.

- Data Capacity
- Yield Capacity

The neural network cycle can be showed as in the figure b.

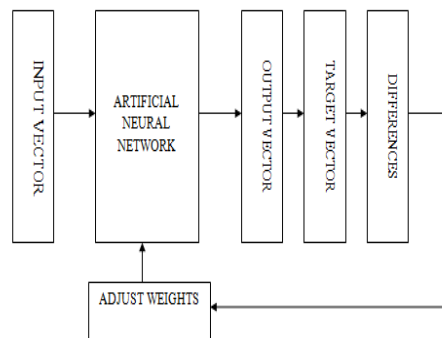


Fig b: Neural Network Cycle

A neuron can have any number of inputs from one to n, where n is the aggregate number of inputs. The inputs might be spoken to accordingly as $x_1, x_2, x_3 \dots x_n$. What's more, the comparing weights for the inputs as $w_1, w_2, w_3 \dots w_n$. Presently, the summation of the weights increased by the inputs we discussed above can be composed as $x_1w_1 + x_2w_2 + x_3w_3 \dots + x_nw_n$.

So, $a = x_1w_1 + x_2w_2 + x_3w_3 \dots + x_nw_n$.

$$a = \sum_{i=0}^{i=n} w_i x_i$$

Thus, this can be summarized in the diagram as:

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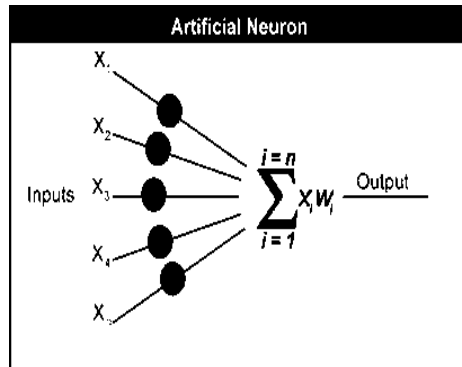


Fig c: Neuron Structure

If the activation > threshold a 1 is outputted and if the activation < threshold a 0 is outputted. It provides a potential cost savings associated with sending less data over switched telephone network where cost of call is really usually based upon its duration. It not only reduces storage requirements but also overall execution time. It also reduces the probability of transmission errors since fewer bits are transferred. It also provides a level of security against illicit monitoring

V. SIMUALTION AND RESULTS

This section consists of the simulation of the radar and neural network system. The following figures shows the wave generation, detection and tracking of an object in radar system and the details of the target object.

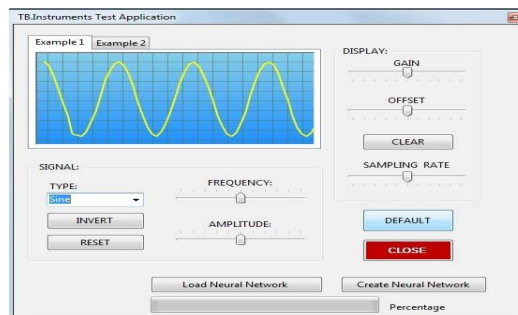


Fig d: Signal Generation

The above figure shows the generation of the signals and setting the amplitude and frequency of an environment. It supports various numbers of waves.

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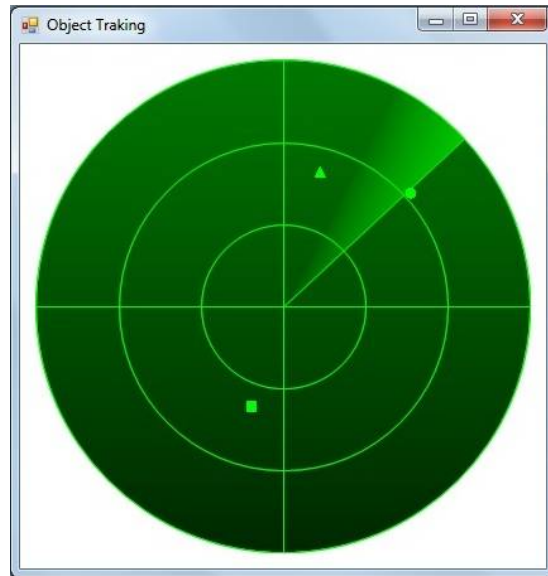


Fig e: Object Detection

The object within the radar system is detected and tracked as shown in the above figure. Neural network approach calculates the distance from the target object which is shown in the figure f.

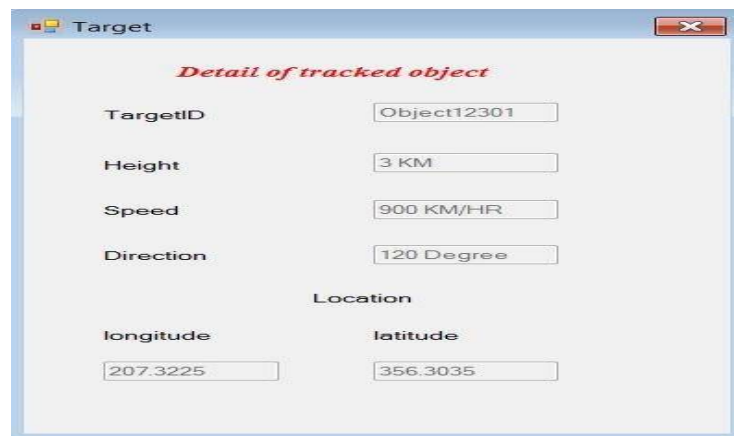


Fig f: Tracked Object Detail

VI. CONCLUSION

This paper presents the overview of Neural Network approach, Radar system and their working. It shows how Neural Network approach is advantageous than the methods like Wavelength denoising and matched filter in evacuation of the problem which was associated with the signals like noise and interference. This paper shows Neural Network approach not only resolves the problem associated with the signals but also optimized the tracking process of radar system. The calculation of the distance is much faster as compared to the traditional approach with the prediction technique.

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