ANN based training methodology for solving Linear Programming Problem

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Abstract
Linear Programming Problems are mathematical models which are used to find out the conditions in the way of objective functions and constraint. Nowadays, we have various methods and techniques to find out these problems occurring in the Linear Programming Problem. When developing a Linear Programming model, system and researchers often include all possible constraints although some of them may not be binding at the optimal solution. To achieve optimality in computational effort and also in accuracy, we proposed a hybrid algorithmic structure with training model for optimization of parameters in real time linear programming problem. This algorithm proposes the class based on the environment. It constructs input information using the input parameters and constraints using formal or conventional methods like complex algorithm and/or identifying redundant constraints before the predicted time. It forecasts the appropriate parameters. In case the predicted time or value belongs to any of the conditions, the value of parameters may vary. Forecast the appropriate parameters with the physical sensitivities. This structure improves the accuracy of bounded variables in linear programming problem model by suggesting the training and learning of parameters and constraints. This training is possible in real world application by applying artificial neural network.

Keywords: Linear Programming, Neural Network, Redundant Constraints, Back Propagation, Training Parameters

Introduction:
The Revised Simplex Method (Bharambhe, 1996), bounded complex algorithm (Arvind Babu et al., 2007) load forecasting using the conventional methods such as regression-based method (Papalexopoulos & Hesterberg, 1990) Kalman filter (Trudnowski et al., 2001) concentrated only on achieving best computational effort whereas, accuracy of these systems may go down due to reducing number of constraints and number of iteration. To achieve optimality in computational effort and also in accuracy, we proposed a hybrid algorithmic structure with training model for optimization of parameters in real time linear programming problem. This algorithm proposes the class based on the environment. It constructs input information using the input parameters and constraints using formal or conventional methods like complex algorithm and/or identifying redundant constraints before the predicted time. It forecasts the appropriate parameters. In case the predicted time or value belongs to any of the conditions, the value of parameters may vary. Forecast the appropriate parameters with the physical sensitivities. This structure improves the accuracy of bounded variables in linear programming problem model by suggesting the training and learning of parameters and constraints. This training is possible in real world application by applying artificial neural network.
Proposed work – Developing Hybrid Method

All the above methodologies concentrated only on achieving best computational effort whereas, accuracy of these systems may go down due to reducing number of constraints and number of iterations. To achieve optimality in computational effort and also in accuracy, we proposed a Hybrid Algorithmic Structure. If we reduce number of iterations, the time complexity become optimal, but the accuracy of the system become reduced. To improve the accuracy, we suggested training and learning of parameters and constraints. This training is possible in real world application by applying Artificial Neural Network (ANN). The ANN has been applied for various applications to predict forecasting of parameters, constraints and also to obtain optimality in real world parameters. To proceed further, we consider a real world application, for (eg.,) load forecasting. Load forecasting is essential in the electricity market for the participants to manage the market efficiently and stably. However, the electric power load forecasting problem is not easy to handle due to its nonlinear and random-like behaviors of system loads, weather conditions, and variations of social and economic environments, etc. Many studies have been reported to improve the accuracy of load forecasting using the conventional methods such as Regression-based method, (Papalexopolulos and Hesterberg, 1990) Kalman filter (Trudnowski et al., 2001) and Knowledge-based expert system (Rahman and Bhatnagar,1988).

Proposed Hybrid Method

Complex algorithm / redundant constraints are used to achieve optimal in computational effort whereas ANN is applied to achieve accuracy in any process model. This training is possible in real world application by applying Artificial Neural Network (ANN). The ANN has been applied for various applications to predict forecasting of parameters, constraints and also to obtain optimality in real world parameters.

Figure 1: Hybrid Method

Input Parameters and Constraints

ANN

Trained

Complex Algorithm/Redundant Constraints

Optimal Output
Proposed Hybrid Algorithm:

**Step1:** If the predicted day / time are belonging to class-1 environment, go to step 4 otherwise, it is class-2 environment.

**Step2:** Construct input information using the input parameters and constraints using any formal or conventional methods like complex algorithm and or identifying redundant constraints before the predicted day or time.

**Step3:** Forecast the appropriate parameters.

**Step4:** In case that the predicted day or time belongs to a class-1 situation, the value of parameters may vary.

**Step5:** Forecast the appropriate parameters with the physical sensitivities calculated in step 4. After taking the above steps, the normalized value of parameters is calculated from the data obtained. Thereafter, the parameters for any class of situation are forecasted from the normalized value.

IV Result

The following figure (2) shows the training phase of the network with the help of Artificial Neural Network. The training of the hybrid structure improves the accuracy of bounded variables in linear programming problem suggesting the training and learning of parameters and constraints.

![Figure 2: Shows the Training Phase](image)

The figure (3) shows the plot performance of the training phase, here the performance is (0.0239374 and the goal is 0) between the best and the train values.
Conclusion

The Hybrid Algorithmic Structure that improves the accuracy of bounded variables in Linear Programming Problem model by suggesting the training and learning of parameters and constraints. The Training is possible in applications by applying Artificial Neural Network. We believe, the proposed algorithm shows increased performance in accuracy. The Hybrid Algorithm must be optimal in both computational effort and accuracy. All the above methodologies concentrated only on achieving best computational effort and reduce time whereas, accuracy of these systems may go down due to reducing number of constraints and number of iteration. To achieve optimality in computational effort and also in accuracy, we proposed a structure called Hybrid Algorithmic Structure with training model for optimization of parameters in a real time Linear Programming Problem.

References: