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# ITERATED NON-LINEAR REGRESSION

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**Abstract:** The paper presents iterated algorithm for parameter estimation of non-linear regression model. The non-linear model is firstly approximated by a polynomial. Afterwards, parameter estimation based on measured data is taken as the initial value for the proposed iterated algorithm. As the estimation method, the well-known Least Square Estimation (LSE), artificial neural networks (ANN) or Bayesian methodology (BM) can be used. With respect to the knowledge of initial parameters the measured data are transformed to meet best the non-linear regression criteria (orthogonal data projection). The original and transformed data are used in the next step of the designed iterated algorithm to receive better parameter estimation. The iteration is repeated until the algorithm converges into a final result. The proposed methodology can be applied on all non-linear models that could be approximated by a polynomial function. The illustrative examples show the convergence of the designed iterated algorithm.

Key words: *parameter estimation, adaptive systems, dynamical modeling, iterated estimation, polynomial regression, Least Square Estimation, Bayesian methodology, artificial neural networks*

*Received: January 13, 2014*

**DOI:** 10.14311/NNW.2014.24.024

*Revised and accepted: August 20, 2014*

## 1. Introduction

There is a number of problems available to estimate unknown parameters of non-linear models as common statistical methods are primarily designed for linear equations. References [8, 7] speak about a non-correct task referring to parameter estimation of a non-linear regression model. Publications [1, 5] provide a comprehensive reference on non-linear regression and non-linear least squares estimation where unknown coefficients may be estimated from a linearized version of a model. Some other approaches are based on application of kernel density non-parametric estimators [9, 12] with guaranteed statistical features [6].

The main idea of the presented approach is not to change the regression model itself (e.g. its linearization) but to transform the measured data through orthogonal projection. The orthogonal data projection onto non-linear regression function is strongly dependent on unknown parameters. On the other hand, unknown parameters must be estimated from the measured data. This logical circle brings complexity into the designed non-linear estimation algorithm.

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