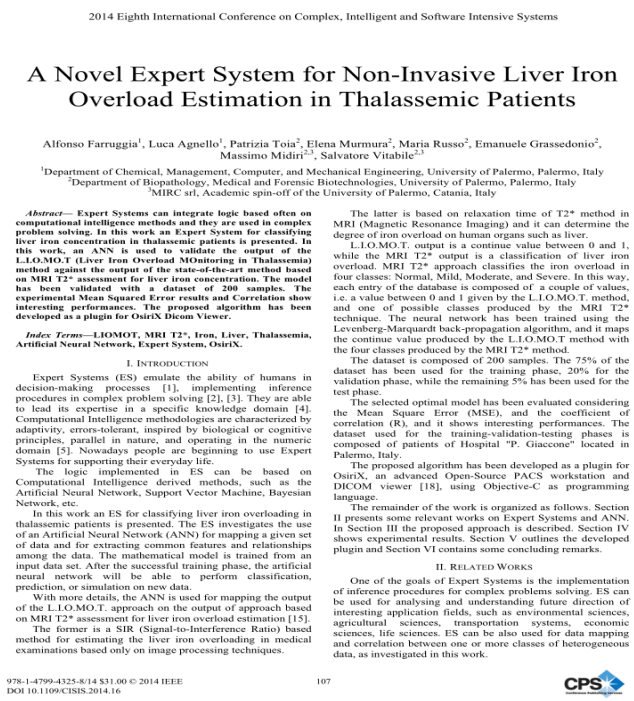
Expert Systems For Transportation Applications



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A Novel Expert System for Non-Invasive Liver Iron Overload Estimation in Thalassemic Patients

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***Abstract*— Expert Systems can integrate logic based often on computational intelligence methods and they are used in complex problem solving. In this work an Expert System for classifying liver iron concentration in thalassemic patients is presented. In this work, an ANN is used to validate the output of the L.I.O.MO.T (Liver Iron Overload MOnitoring in Thalassemia) method against the output of the state-of-the-art method based on MRI T2* assessment for liver iron concentration. The model has been validated with a dataset of 200 samples. The experimental Mean Squared Error results and Correlation show interesting performances. The proposed algorithm has been developed as a plugin for OsiriX Dicom Viewer.**

***Index Terms*—LIOMOT, MRI T2*, Iron, Liver, Thalassemia, Artificial Neural Network, Expert System, OsiriX.**

I. Introduction

Expert Systems (ES) emulate the ability of humans in decision-making processes [1], implementing inference procedures in complex problem solving [2], [3]. They are able to lead its expertise in a specific knowledge domain [4]. Computational Intelligence methodologies are characterized by adaptivity, errors-tolerant, inspired by biological or cognitive principles, parallel in nature, and operating in the numeric domain [5]. Nowadays people are beginning to use Expert Systems for supporting their everyday life.

The logic implemented in ES can be based on Computational Intelligence derived methods, such as the Artificial Neural Network, Support Vector Machine, Bayesian Network, etc.

In this work an ES for classifying liver iron overloading in thalassemic patients is presented. The ES investigates the use of an Artificial Neural Network (ANN) for mapping a given set of data and for extracting common features and relationships among the data. The mathematical model is trained from an input data set. After the successful training phase, the artificial neural network will be able to perform classification, prediction, or simulation on new data.

With more details, the ANN is used for mapping the output of the L.I.O.MO.T. approach on the output of approach based on MRI T2* assessment for liver iron overload estimation [15].

The former is a SIR (Signal-to-Interference Ratio) based method for estimating the liver iron overloading in medical examinations based only on image processing techniques.

The latter is based on relaxation time of T2* method in MRI (Magnetic Resonance Imaging) and it can determine the degree of iron overload on human organs such as liver.

L.I.O.MO.T. output is a continue value between 0 and 1, while the MRI T2* output is a classification of liver iron overload. MRI T2* approach classifies the iron overload in four classes: Normal, Mild, Moderate, and Severe. In this way, each entry of the database is composed of a couple of values, i.e. a value between 0 and 1 given by the L.I.O.MO.T. method, and one of possible classes produced by the MRI T2* technique. The neural network has been trained using the Levenberg-Marquardt back-propagation algorithm, and it maps the continue value produced by the L.I.O.MO.T method with the four classes produced by the MRI T2* method.

The dataset is composed of 200 samples. The 75% of the dataset has been used for the training phase, 20% for the validation phase, while the remaining 5% has been used for the test phase.

The selected optimal model has been evaluated considering the Mean Square Error (MSE), and the coefficient of correlation (R), and it shows interesting performances. The dataset used for the training-validation-testing phases is composed of patients of Hospital "P. Giaccone" located in Palermo, Italy.

The proposed algorithm has been developed as a plugin for OsiriX, an advanced Open-Source PACS workstation and DICOM viewer [18], using Objective-C as programming language.

The remainder of the work is organized as follows. Section II presents some relevant works on Expert Systems and ANN. In Section III the proposed approach is described. Section IV shows experimental results. Section V outlines the developed plugin and Section VI contains some concluding remarks.

II. Related Works

One of the goals of Expert Systems is the implementation of inference procedures for complex problems solving. ES can be used for analysing and understanding future direction of interesting application fields, such as environmental sciences, agricultural sciences, transportation systems, economic sciences, life sciences. ES can be also used for data mapping and correlation between one or more classes of heterogeneous data, as investigated in this work.

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Abstract. The purpose of this paper is to provide a brief overview of expert systems technology and its potential applications. The. Organisation of Economic .Areas of application of expert systems in research and development (R&D) the paper concludes wilh a description of Transport Canada's expert system R&D.Expert Systems: Applications for Structural, Transportation, and Environmental Engineering provides a comprehensive, concise treatment of knowledge-based.This is a repository copy of Applications of Expert Systems in Transport. White Rose Research Online URL for this paper: lemeilleurnettoyantducolon.comBonsall, P.W., Kirby, H.R. and Kwan, R.S. () Applications of Expert Systems in Transport. Working Paper. Institute of Transport Studies.Results 1 - 13 of 13 Concerns the application of expert systems to road accident Travel and Transport), an environment for the development of expert systems.methods. Here the application of artificial intelligence approaches to freight transportation planning is examined. Expert. Systems: A Role in. Transportation.It will help to construct a specialized knowledge on and understand that system in Transportation. Previous applications of Knowledge Based Expert System in.A Knowledge-Based Expert System for Innovative Transportation Financing Techniques for transportation projects by several state and local governments. 6 Harris, R. A., Application and evaluation of an expert system.Urban and regional transportation planners have long used sophisticated computer Expert Systems: Applications to Urban Planning pp Cite as.The first was the "Workshop on the Application of Expert Systems to Transportation," and resultant Proceedings (Transport Canada Report TP- E).Free Essay: Knowledge Based Expert System in Transportation Engineering and the application of Artificial Intelligence, such as Knowledge Based Expert.Read the latest articles of Expert Systems with Applications at lemeilleurnettoyantducolon.com, and delivery of traffic information in intelligent transportation systems.Cover image Expert Systems with Applications Stores clustering using a data mining approach for distributing automotive spare-parts to reduce transportation .problemsis intriguing, and the transportation engineering area is ripe for their For many of the applications to which expert systems are applied, correct.Information is provided on the history of knowledge based expert systems (KBES) , current applications of these systems in transportation departments, potential.Expert systems, a branch of artificial-intelligence studies, is introduced with a view to its relevance in transportation engineering. Knowledge engineering, the.Expert Systems and Applications. Wigan Microelectronics, Image and Video processing, and expert systems in transport: Visit report, October-November .4 Application of expert system in transport engineering. Automated fare. The automated fare collection is introduced by using smart card technology and.

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