Building a Case Base for the Non-Conformance Problem Solving in the Aluminum Extrusion Process

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This work proposes the application of Case-Based Reasoning (CBR) to build a knowledge base system for seeking and providing solutions for non-conformances that take place in the aluminum extrusion process. CBR is an important area of Artificial Intelligence (AI) that is used to solve problems based on the knowledge accumulated previously from known scenarios, providing a solution to both recurrent and new problems. The CBR cycle is characterized by having four stages known as: retrieval, reuse, revision and retention. These stages interact with the knowledge base in order to seek one or more solutions to the problem. The steps for the development of the relational model of the knowledge base according to CBR are as follows: (a) identification and classification of the non-conformances, (b) information gathering of situations that result in non-conformances, which include: records of non-conformances, experience of operators with non-conformances, literature on non-conformances in the aluminum extrusion process, (c) the structure definition for the diagnosis of cases of non-conformance and support in decision-making. The final step consists in storing the cases in a relational database, which will correspond to a knowledge base. New cases may be added in the knowledge base, as they occur. The structure of the cases in the knowledge base will be important for its provision for decision-making in the aluminum extrusion process. In a further work it is intended to implement a web-based distributed system to support the inclusion of new cases (that may occur in different geographic locations and company conditions) as well as a fast search for solutions to non-conformances that occur in the aluminum extrusion process.

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Real-time Tracking System for a Moored Oil Tanker: a Kalman Filter Approach

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This paper presents a tracking system developed to study the behavior of an oil tanker moored at the Berth "A" of the Leixões Oil Terminal, Porto, Portugal. A brief description of the local environmental conditions and the existing operational conditions at that oil terminal are presented. Due to extreme outdoor working conditions a Kalman filter was implemented to ensure the robustness and realiability of the obtained measurements. Tests were performed in laboratory on a physical model of a moored oil tanker at a scale 1/100. The results were compared with a commercial motion capture system installed in laboratory. The presented measurement system was developed as part of the DOLPHIN project that aims to study the behavior of moored ships in harbors.

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Electrode Wear Estimation and Compensation for EDM Drilling

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Electric discharge machining (EDM) is commonly used to machine precise and tiny parts when conventional cutting methods face difficulty in meeting productivity and tolerance requirements. Die-sinking EDM works well to machine micro-parts and perpendicular walls of die and molds, whereas EDM drilling is excellent for machining deep and narrow holes regardless of material hardness and location. However, EDM electrode wear is rapid compared to conventional cutting and makes it difficult to control the electrode feed and machine precisely. This paper presents an efficient method to estimate electrode wear through a hole pass-through experiment while a stochastic method is adopted to compensate the estimation model. To validate the proposed method, a commercial EDM drilling machine was used. The experimental results show that the electrode wear amount can be predicted acceptably.

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Statistical Process Control Methods as an Essential Tool for Modelling and Improvement of Diagnostic Processes

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The paper deals with modelling and improvement of diagnostic processes. The aim is to develop a new methodology which could be used as a tool for modelling and improvement of diagnostic processes. This paper is firstly focused on evaluation of SPC methods and their possible usage for modelling, measurement, controlling and following improvement of diagnostic processes. Seven basic methods were evaluated according to few basic criteria which are important in the field of diagnostics. The Ishikawa diagram was chosen as one of the suitable tool and was used for setting of Key Performance Indicators. Then, the results were applied on specific diagnostic process and their behaviour was analysed and evaluated. The research was mainly focused on time and quality measurement because they play very important role in the final product evaluation and tell us which parts has to be optimized.

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