

RAPID PROTOTYPING OF OVERHEAD CRANES CONTROL PROCEDURES

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Abstract - The paper is focusing on rapid prototyping technique approach used in overhead travelling cranes. The target is to improve crane exploitation process.

Index terms – rapid prototyping, CAM, cranes

I. INTRODUCTION

The subject of the paper is rapid prototyping of overhead cranes control procedures. Overhead travelling cranes are representative of the large dimension rail transport devices WSUT and material handling devices. The issue of crane exploitation rationalizing includes among other formulating the selected nominal values of device exploitation parameters and alarms which are signalling its unfavourable technical state (for example due to the high costs of use) or undesirable (for example possible breakdown, safety hazard).

Practical realisation of the issue requires the work out of decision making procedures within the range of the device's technical state estimation. The decision making procedures must be anticipate by the result – cause type investigations obtained on the group of the same class devices and working in similar conditions or else on investigation results obtained from tests done on crane virtual models.

For WSUT class devices intentional is use of the investigation results done on real devices [Szpytko, 1992]. Integrated system of exploitation investigation of the WSUT class devices is presented in work [Szpytko, 1996], while for the rail vehicles in publication [Uhl et al., 2000].

II. WHY RAPID PROTOTYPING

Construction of the overhead cranes technical condition assessment procedures on the basis of their investigation in real-life conditions is made difficult. First of all because of the device's characteristics features and their utilisation conditions, as well s the unit manufacturing for the needs of diverse users and environmental conditions [Szpytko, 1996]. Therefore to meet the crane user needs, the work based on rapid prototyping approach is indispensable. The device rapid prototyping exploitation investigations are mostly oriented to formulate the rational crane operating and maintenance in specified working conditions.

For the rapid exploitation investigations of overhead cranes the several procedures have been work out. The procedures make possible integrated modelling of selected overhead cranes subsystems: operating subsystem, support subsystem, control subsystem, safety subsystem.

Modelling design is based on the several types of tools like: computer aided design (CAD), multi-body dynamic systems (DADS-Crane), construction fatigue models (FALANCS) and mathematical models (MatlabSimulink). The block scheme of verification system of crane model and dedicated exploitation investigations on device virtual model is presented at Fig.1.

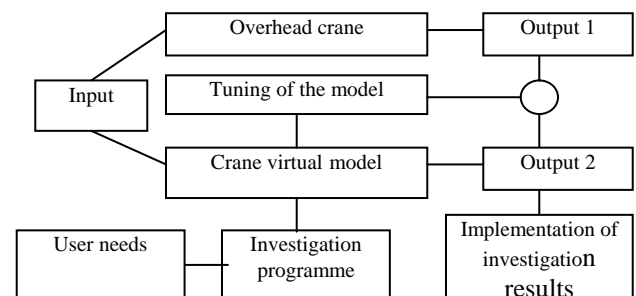


Fig.1. The block scheme of verification system of crane model and dedicated exploitation investigations

For virtual investigation needs the key position is playing the worked out monitoring system of selected crane

exploitation parameters (CraneMonitoring, CraneDBase) together with quality supervision system of exploitation process of cranes (CraneCASIP).

III. FINAL REMARKS

The example investigations have been done on overhead crane with capacity of $Q=12,5$ t and bridge span of $L=16$ m. The results of investigations done both on the real object and virtual model of the device have been presented, as well as their qualitative and quantitative discussion and practical implementation.

ACKNOWLEDGEMENTS

Authors acknowledge with thanks to the KBN for the financially support under the $\Sigma!$ RobCrane Programme.

IV. REFERENCES

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