Cercetări științifice întreprinse


Abstract:
The paper is presenting a method for online identification of the dimensional dynamics to be used for dimensional control of reconfigurable machining systems. The dimensional control is a key action in order to achieve quality desired for finite product. As diminishing deviation is accompanied with high costs: deviation compensation seem to be a better control of the process.


Abstract:
The paper presents a new method for online identification of the dimensional dynamics to be used for the dimensional control of reconfigurable machining systems. The dimensional control is designed as adaptive and predictive.

The dimensional control of the reconfigurable machining system is a key action in order to achieve the quality desired for the finite product. As a diminishing deviation presents the disadvantage that reducing deviations are accompanied by high costs, the deviation compensation implies a better control of the process.

The deviation compensation emerged during the working process requires knowledge of a model which describes the dimensional dynamics of the machine tool, which is the relation between the dimensional changing of the processed part and the parameters of the process. On the other hand the behavior of the machining system evolution changes significantly in time even during the processing of a small number of parts processed. This is the reason that dimensional dynamics must reveal the changing in time of the relation between dimensional variation of the parts and the process parameters.

Keywords: reconfigurable machine tools, online identification, dimensional dynamics, dimensional control.


Abstract:
One of the main research directions in CAD/CAM machining area is the reducing of machining time. The feedrate scheduling is one of the advanced techniques that allows keeping constant the uncut chip area and as sequel to keep constant the main cutting force. They are two main ways for federate optimization. The first consists in the cutting force monitoring, which presumes to use complex equipment for the force measurement and after this, to set the feedrate regarding the cutting force variation. The second way is to optimize the feedrate by keeping constant the material removal rate regarding the cutting conditions. In this paper there is proposed a new approach using an extended database that replaces the system model. The feedrate scheduling is determined based on the identification of the reconfigurable machine tool, and the feed value determination regarding the uncut chip section area, the contact length between tool and blank and also regarding the geometrical roughness. The first stage consists in the blank and tool monitoring for the determination of actual profiles. The next stage is the determination of programmed tool path that allows obtaining the piece target profile. The graphic representation environment models the tool and blank regions and, after this, the tool model is positioned regarding the blank model according to the programmed tool path. For each of these positions the geometrical roughness value, the uncut chip area and the contact length between tool and blank are calculated. Each of these parameters are compared with the admissible values and according to the result the feed value is established. We can consider that this approach has the
following advantages: in case of complex cutting processes the prediction of cutting force is possible; there is considered the real cutting profile which has deviations from the theoretical profile; the blank-tool contact length limitation is possible; it is possible to correct the programmed tool path so that the target profile can be obtained. Applying this method, there are obtained data sets which allow the feedrate scheduling so that the uncut chip area is constant and, as a result, the cutting force is constant, which allows to use more efficiently the machine tool and to obtain the reduction of machining time.

**Keywords**: reconfigurable machine tool, system identification, uncut chip area, cutting conditions scheduling.


**Abstract:**

The potential chaotic character of cutting processes was already confirmed by calculated values of Lyapunov exponent in the case of time series including cutting force values during manufacturing by turning. To consolidate this assumption, other instruments offered by Chaos Theory are available; among them, Poinace map is a significant one. In this paper are presented Poincare map type diagrams, drawn based on time series including cutting force values during manufacturing by turning, by using a dedicated soft; a comparison between them and chaotic phenomena phase portraits existing in dedicated literature is also made.

**Keywords**: cutting force, Poincare map, time series, cutting process.


**Abstract:**

This paper proposes a modular manufacturing system structure. The key concept is to modularize the machines, the auxiliary equipment and finally the plant. In architecture, each module had a set of configuration parameters used by the main module of each sub-structure. The multi processor structure allows the production facility to adapt itself to the production task.


**Abstract:**

“Chaos Theory” application when analyzing and identifying cutting manufacturing processes could bring new and very interesting elements, with direct application in conceiving manufacturing systems with high performances. To reach this goal, first of all evaluation of a certain process chaotic character must become possible (and easy) to be done. This paper intends to suggest a method, by using a special dedicated soft and files including cutting force values (measured during a cutting test), as time series, to evaluate chaotic or non-chaotic character of analyzed process. Concrete samples are also included.


**Abstract:**

During the last years, many researchers tried to apply “Chaos Theory” to explain phenomena from various domains, starting from medicine and weather prediction and going up to manufacturing by metal cutting. The main sign that characterizes the chaotic character of a certain process is “the largest Lyapunov exponent”. To calculate it, more methods were already suggested, but this paper covers a less tackled field – time series case. Examples of application are presented and results quality is analyzed by comparing them to accepted reference cases.

Abstract:
After reconfiguration process the new hardware architecture implies also software architecture changing. Reconfigurable machine tools performance is determined most by ramp-up-time. O important part of this is the time needed for software reconfiguration. This paper presents a reconfigurable interpreter, developed as new software approach, which provide a fast software reconfiguration to be operated by the user of the machine. The interpreter design methodology and corresponding software presented in the paper was developed at the "Dunarea de Jos" University – Galati. Results achieved confirmed the efficiency of this approach.

Keywords: reconfigurable machine tools, open-architecture, interpreter, condition instructions set


Abstract:
There are many situations when a cutting tool profile or a curve characterizing a surface generated by wrapping cannot be found by their analytical expressions; The solution is, after using specific numerical methods, to obtain the profile through a file of points co-ordinates. The paper suggests an algorithm to calculate with higher accuracy, the maximum distance between two curves, each one given by a file of points. Applications solved by an original dedicated soft are also included.

Keywords: profiles given through points, errors evaluation


Abstract:
During the last years, many researchers tried to apply “Chaos Theory” to explain phenomena from various domains, including manufacturing by metal cutting. The main sign that characterizes the chaotic character of a certain process is “the largest Lyapunov exponent”. To calculate it, more methods were already suggested, but there are differences between results. By using an original dedicated soft, this paper tries to find the influence of specific parameters with effect onto time series Lyapunov exponents calculation (reconstruction delay, embedding dimension, etc) in the final results.

Keywords: largest Lyapunov exponent, time series, reconstruction delay, embedding dimension.


Abstract:
The retrofitted machines used in steel construction industry for punching and drilling of the steel beams generally have problems with the positioning precision of the movement axes. The axis used for the longitudinal displacement of the profiles presents the largest position errors. This paper presents a practical method for compensating the position errors of this axis.

12. Cioca L., Breaz R.E., Racz G.S. Fuzzy Logic Tehniques used in Manufacturing Process Reengineering, Proceedings of the 6th WSEAS International Conference on Simulation,
Abstract:
In the paper there are presented some peculiar items of manufacturing there duced-sized inner spherical surfaces. It is presented an original designed process of such type of the surfaces. There are underlined the characteristics of the presented process, the details of the tool used as well as the main advantages offered by them.

Keywords: tool, spherical surfaces.


Abstract:
This paper deals with the develop the finite element modelization of the re-drawing process in order to create his virtual model. The finite element is a method that permits to reduce the time and the cost in the designing. Then in a second time a good finite element model permit to avoid or complement laboratory characterization of material for re-drawing, methodology for developing a laboratory inverse re-drawing device. The drawing process is performed in two phases: a direct drawing of a circular blank followed by a second reverse re-drawing phase on the same device.

A work is also done on the finite element model for the single deep drawing. This single deep drawing is used to validate the parameters of the numerical model. The main goal of this simulation is to define geometrical parameters of the process, in order to design a reverse re-drawing machine, and have the possibility in the future to compare experimental results and finite element results. The second goal is the estimation of the blank reaction (ability to support the process), and eliminate as well the default obtain during the simulation.

Key words: finite element simulations, inverse re-drawing, strain path.


Abstract:
This paper deals with the methodology for developing a laboratory inverse re-drawing device. The drawing process is performed in two phases: a direct drawing of a circular blank followed by a second reverse re-drawing phase on the same device.

Finite element simulations are carried out in order to i). define geometrical characteristics of the modular re-drawing device and to ii). estimate the punch force evolution for different dimensions of punch, die and blankholder and for a large class of materials. Based on such FEM simulations, springs for the developed reverse deep drawing device are dimensioned. The use of springs gives the possibility to deform the material with an imposed blank-holder force. Finally, a draw of the designed modular device is presented considering all the results of the finite element simulation.

Key words: finite element simulations, inverse re-drawing, strain path, modular device.


**Abstract:**
The study of machine-tool dynamic is realized here as “monitoring”, meaning checking and improving the functioning of the machine. The state of processing is followed by certain sensors whose signs are processed inside the computer and then it takes the decision of monitoring, meaning the identification of a class from the set of classes (process conditions). In this part of the paper there are presented recordings spectral analysis and use of ANN on monitoring of the tool wear.

**Keywords:** monitoring, lathe, spectral analysis, ANN.


**Abstract:**
The study of machine-tool dynamic is realized here as “monitoring”, meaning checking and improving the functioning of the machine. The state of processing is followed by certain sensors whose signs are processed inside the computer and then it takes the decision of monitoring, meaning the identification of a class from the set of classes (process conditions). In this part of the paper there are presented statistics, monitoring and fuzzy c-means method.

**Keywords:** monitoring, lathe, ANN.

Abstract:
The study of machine tool dynamics is performed here as “monitoring”, which involves the checking and improving of machine functioning. Signals collected from certain sensors are processed by a computer. These data then lead to the monitoring decision, which is to associate the current state of operation with one of the classes from a set of known classes. For monitoring in turning, the classes (tool conditions) are shown.

The experimental setup, experimental results and data processing are presented. For the monitoring of the tool wear, an artificial neural network (ANN) is used.

**Keywords**: monitoring, turning, ANN (artificial-neural-network).


Abstract:
The study of machine-tool dynamic is realized here as “monitoring”, meaning checking and improving the functioning of the machine. The state of processing is followed by certain sensors whose signs are processed inside the computer and then it takes the decision of monitoring, meaning the identification of a class from the set of classes (process conditions).

In this part of the paper we continue the presentation of the experimental setup (cutter holder accelerations, cutting temperature, surface roughness, power), of the cutting working conditions and of the tool wear.

**Keywords**: monitoring, lathe, experimental setup.


Abstract:
(Li, 1997) uses the coherence function between two crossed accelerations to identify chatter in turning. In a frame of an experiment we registered the accelerations of the cutter-holder, for different cutting wear classes (c1 ÷ c6), where c6 means “Chatter”. 12 monitoring indices were calculated, among which: \( X_5 \rightarrow F_z \) variation range; \( X_6 \rightarrow \) number of intersections of oscillogram \( F_z \) with its average value. The histograms of the column matrices corresponding to the monitoring indices \( X_5 \) and \( X_6 \), shown for each class, underline the accurate use of these indices values for chatter detection. The coherence function between the accelerations in the directions Y and Z was calculated. The class recordings c6 falls (with an exception) under the criterion from (Li,1997), but it can be seen that 75 % from the c2 class recordings takes maximum value of the coherence function equal to or greater than 0.91. The first 6 monitoring indices were calculated for these recordings. According to a new criterion (which operate with the monitoring indices \( X_5 \) and \( X_6 \)), these recordings are not within the class c6, but class c2. As a conclusion, we believe that the new criterion is much more efficient than those at (Li, 1997).

**Keywords**: turning, chatter detection, coherence function.


52. Breaz R.E., Bologa O., Racă G.S., Oleksić V., Motion control with fuzzy controllers - a study by means of simulation, WSEAS Transaction on Systems, ISSN 1109-2777, (indexată BDI).


**Abstract:**

Multiple representations forms for profiles and surfaces are known: in analytic form using equations in explicit and implicit form, in vector form, parametric. Also approximate representations are used but this satisfied only if it’s considering a level of accuracy knowledge of these surfaces: shapes as discrete representations, by a finite points cloud, polyhedral representation, by pole. The last one has the advantage of a condensate representation of the surfaces with respect an imposed accuracy. In this context, the paper presents the problem of elementary shapes (line segment, arc) using the representation by pole knowing that these are the based elements for the composite profiles, generated by wrapping in rolling method.


**Abstract:**

Modelling surfaces generated by wrapping, by using the rolling method supposes to know a rack-tool profile numerical model together to a specific algorithm to study the enwrapped of a profiles family discreetly expressed. On this way, a specific algorithm —“Tangents method”— was created, in order to allow enwrapped surfaces study, when profile to be generated is discreetly represented. The quality of this method was proved already known by comparing the results from its application to the solutions given by already known methods. Examples when generating by using a rack-tool an elementary profile are presented. The results obtained shows the quality of suggested algorithm to study enwrapped profiles.
associated to a couple of rolling centrodes.


Abstract:
“Tangents Method”, as algorithm used to profile a rack-type tool, to generate by wrapping elementary profiles (in the presented case – a circular profile) it is proved to be, as results, comparable to the theorems and methods already accepted. Numerical examples are exposed, realized when generating a circular profile, associated to a circular centrod by Rrp radius, obtained by using the new algorithm and also by using algorithms specific to “Willis Method” and “Plain Generating Trajectories Method”.


Abstract:
Based on the enwrapping conditions expressions specifically to “tangents method” were elaborated dedicated software suits, in java programming language, for rack-gear profiling generating an ordered profiles curls, associated with a couple of rolling centrodes, as so as for the determination of axial section form of worm cutter reciprocally enwrapping, with point contact between the same curl surfaces. The software, made as applet, allow the numerical and graphical representation of enveloping surfaces assemblies: rack-gear tool and axial section of primary snail of worm cutter tool. The applets are made by object oriented programming in java programming language.


Abstract: In the present, there are studies to forming thin steel plates with special equipments based on the “discrete die-punch” reconfigurable tooling concept. To study applicability of this forming process to cylindrical thick steel plates, the present simulation is carried out. The numerical study is made using FEM soft LS-DYNA. The geometrical modeling of the die-punch tool requests calculations for the characteristic profiles coordinates of working surfaces. A series of conclusions obtained from the numerical simulation are shown at the end.

Abstract: One of the methods for increasing the degree of deformation in the deep drawing of the cylindrical parts is the method with the combined restraint. The deep drawing process has two stages that take place on the same die. This combination assures a better control of the material flow. In the paper are presented the numerical simulations of this deformation technology using DYNAFORM software. The numerical results are compared with the ones obtained in the real case of deformation. The thickness distributions and the height of the products are the parameters used for comparison. It has been concluded the importance of the deformation method and of the simulation tool in terms of quality, development and production costs and time saving.

Key words: deep-drawing, simulation, FEM, quality, virtual processing, sheet metal forming

