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Affecting exploration and research of process method to CAD/CAM numerical control surface machining quality and efficiency

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ABSTRACT

With the continuous development and progress of industry, numerical control technology and processing products have obtained considerable attention. Relative to the general technology, the quality and efficiency of numerical control surface processing, determines the level of industrial development, and related work in the field of progress. From the perspective of an objective analysis of the CAD/CAM surface Numerical Control machining, it is the mainstream of the current Numerical Control machining, the machining method. In particular, each big industrial companies have tried to through the optimization of the processing method and to promote the efficiency of equipment. To strengthen and improve the CAD/CAM Numerical Control surface machining quality and efficiency, in order to obtain greater economic benefits and social benefits. In the future can broaden the research scope, and use the relevant technology of the computer, in-depth analysis of the key points and difficulties of technology, improve the level of processing.

KEYWORDS

CNC processing; Three coordinates; Surface processing; Quality; Efficiency.

INTRODUCTION

According to the analysis of the present research results of processing parameter line processing surface quality is higher. The section line processing of machining efficiency is higher. The projection process convenient and has higher comprehensive advantage. If it can be a combination of the above three kinds of processing method is effective, and obtain larger breakthrough on the various data and standard. The CAD/CAM NC (Numerical Control) surface processing will have more broad space for development. At this point, this article mainly processing method of CAD/CAM NC machining quality and efficiency of surface about the impact of inquiry.

THEORIES ANALYSIS

Analysis according to past experience, CAD/CAM NC surface machining quality and efficiency, and the correlation of trajectory calculation method. Therefore, the staff developed a variety of calculation method, through the optimization of the accumulation of time and work experience. Now commonly used three kinds of calculation method of parameters respectively line method, cross section line method, projection method. Each method has its own advantages, its concrete application way is different. Parameter line method is mainly based on parameters as a tool of the curved surface processed according to the contact path to generate tool path. Application parameters line method has the advantage that can obtain precise processing, but may affect the processing efficiency. Section line method is also known as surface area method, this method is mainly used a set of cross section cut to be processed surface, which can generate a series of intersecting line, staff deliver these lines as a knife contact path to generate tool path. Come up from theory analysis, the cross section line method can objectively to improve work efficiency, but relative to the parameter line method, the quality of work fell. Projection method and the former two methods are different, the method mainly is to design a good in advance a set of guide tool by using the dynamic curve, then conducting dynamic curve projection to be generated on a curved surface machining tool path, finishing processing. Projection of the comprehensive strength is stronger, but for the moment requires both quality and efficiency of the industry, the ascension of projection space is larger. It should also be better in the future on the efficiency and quality.

THE SURFACE ANALYSIS

Single surface analysis

Among CAD/CAM NC surface processing, can be divided into single surface combination processing and surface processing. At this point, this paper discusses the single curved surface machining. Figure 1 represents a single curved surface machining spherical surface and three kinds of cutter path chart. We can see clearly from the table, the Figure of (a) is spherical, Figure (b), (c), (d) is respectively the three different methods of tool path. Application parameters for machining line method, the tool path is meticulous, and looks relatively uniform, while the Figure (c), (d) of the tool path is not Figure (a) clear, on the whole, the tool path of showed the uneven state. This article will spherical article processing three methods of the tool path generated by the number and distribution of made statistics, specific see TABLE 1.

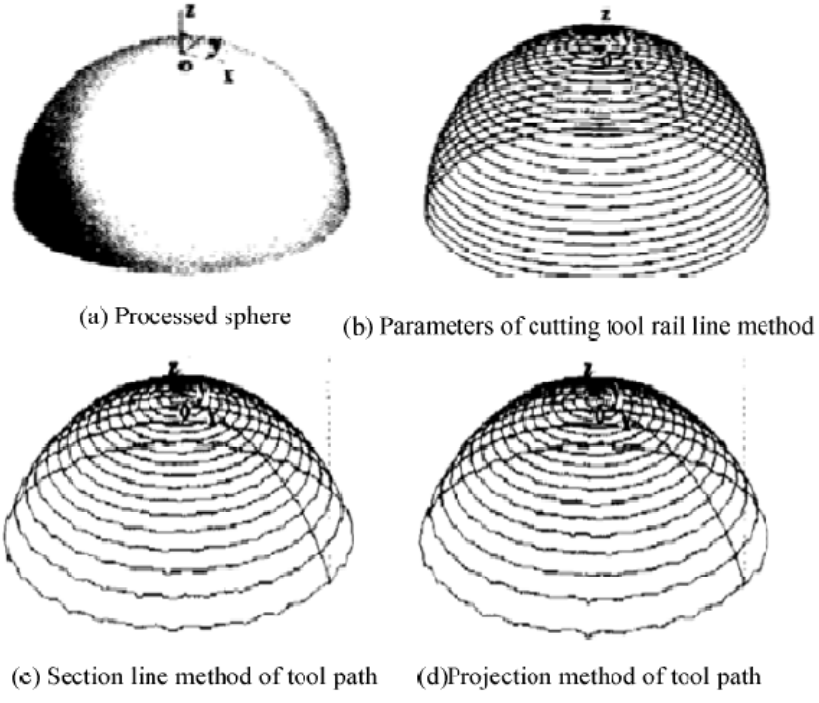

Figure 1: Spherical and three props

TABLE 1: Spherical processing three ways to generate the props trajectory of the number and distribution

computing method	Parameter line method	Section line method	projection method
Number of separate loci	23	16	16
Trajectory distribution	More uniform	Non-uniform	Non-uniform

The analysis of surface combination

Figure 2, Figure 3 and Figure 3 are made up by 54 surface using method of parameter line model plane surface and cross section line method and projection method to generate tool path. From the figure, the three methods to generate the trajectory in the difference on the quality and efficiency has a bigger change: in terms of article track number still line up, for a parameter distribution but also the most uneven, with the former two single curved trajectory distribution has changed a lot. The reason for this is that part of the surface uneven distribution of the parameters of the line and make the uneven distribution of trajectory, leads to the combination of surface processed with parameter line method is not only the lowest efficiency and surface quality is the lowest. Article and section line method and projection trajectory is more close to the number and distribution. In terms of shape precision, from the end of the model plane surface after local watch carefully, such as the shape precision of parameter line is best, second projection method, cross section line method is the worst. Or use parameter line method processing the surface shape, the most close to the theoretical surface because of the tool path is strictly in accordance with the distribution of the parameters of surface.

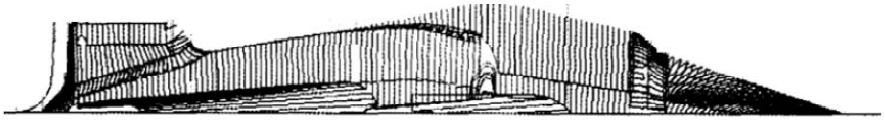

Figure 2: Generate the trajectory parameter line tools

Figure 3: Section line method of tool path

Figure 4: Projection method of tool path

MACHINING EXPERIMENTS

Spherical surface processing

In order to gain more data and information, this study according to the present CAD/CAM NC surface processing characteristics and processing methods, made some processing. The first is spherical surface processing. The experiment selected equipment for three coordinate NC milling machine, the NC machine tool has strong representative. Milling machine related data is as follows: ball head is Φ6 mm, spindle speed n of 1000 r/min, feeding speed v is set to 300 mm/min. In the process of test, with the method of ring feeding, row spacing is set at 1 mm. Precision step definition, value is 0.1 mm. In order to ensure the experimental effect is more realistic, select paraffin as specific test materials, the application of CAD/CAM integrated computer aided system establishment process accordingly. Specific results are shown in TABLE 2.

The combination of surface processing

Combination of surface processing conditions and parameters, the same as the spherical surface processing. Specific results as shown in TABLE 3.

According to the analysis of test data are the obvious advantages and disadvantages of three kinds of processing methods. Line method of the parameters in spherical surface processing, high machining quality, machining time although it took 5.2 min. It is higher than that of projection 3.4 min, but in the standard of the quality first, or ideal. And section line method and projection of achievement is not ideal, the surface quality is not able to reach the ideal standard, general programming time and processing time is not stable, lead to the final quality did not pass. In the combination of surface

processing, the performance of the projection is ideal. Parameter line method and the cross section line while on the shape precision and surface quality were located in the forefront. But comprehensive, there is no more than the projection method. So, try in the future through some effective way for the parameter line method combined with the advantage of the projection, consolidate quality at the same time, improve the efficiency of processing, and to increase the comprehensive strength to a new level.

TABLE 2: Spherical processing experimental data

processing method	The degree of processing lines/segments	G code of storage space /kB	Programming time /min	processing time /min	surface quality
Parameter line method	584	12.7	3.0	5.2	best
Section line method	454	9.8	3.0	4.2	middle
projection method	431	9.0	4.0	3.4	Worse

TABLE 3: Composite surface processing experimental data

processing method	The degree of processing lines/segments	G code of storage space /kB	Programming time /min	processing time /min	surface quality	form accuracy
Parameter line method	7261	137	189	96	worst	best
Section line method	5463	99	6	60	best	worst
projection method	5455	90.7	7	62	middle	middle

THE PROCESSING METHOD OF CAD/CAM NC MACHINING QUALITY AND EFFICIENCY OF SURFACE

Under the same process of contrast

Integrated the above theoretical results and experimental data research, found that the parameter line method of processing quality in the first place, the cross section line method, the machining efficiency of ideal, and projection with perfect processing method of the comprehensive advantages and scope of services in one of three ways with strong pertinence. First of all, the parameter line method is suitable for small factories, factory need to rely on the quality of this type to gain recognition in the industry, after constantly improve efficiency and other aspects. Second, the section line method is applicable to medium type of the factory. Efficiency is higher, in section line method is suitable for medium type transformation of the factory and production, in the face of the vast market and the increasing social demand, sectional line method to create economic benefits and social benefit is ideal, but should pay attention to grasp the quality problem. Third, the projection method are common in large enterprises in our country. Contrast, projection fully combined the section line method and some advantages parameter line method, the improvement of comprehensive strength means of CAD/CAM NC surface machining quality and efficiency be guaranteed at the same time, although there is no particular in a single field, but provides a very solid foundation for future development.

The processing method of the technology

CAD/CAM surface NC machining for our country's industry made great contributions to the development of the processing method has been diversified, the mutual influence of both the deepening. This article research results to analyze, for the single parameter line distribution more uniform surface or less curved surface on the surface of the composite processing, can choose parameter line method processing. For more than a complex combination of curved surface composite processing, should choose projection or section line method. For different surface, especially for more complex combination surface may be have more change. Therefore, we should, according to the specific circumstances of the curved surface processed by comprehensive analysis to choose the most suitable after CNC thr.ee-dimensional curved surface machining method, on the premise of guarantee the quality of surface processing, improve efficiency, reduce the cost.

EFFORTS TO IMPROVE THE MACHINING QUALITY AND EFFICIENCY

Combined with objective reality

CAD/CAM NC surface processing in the current development, to create a lot of benefits for the economic development of our country. Relative to general work. CAD/CAM NC surface processing on our country's industrial development and the progress in the field of, has a decisive influence. In the future to improve the quality of CAD/CAM NC surface processing, must be combined with the reality to choose suitable processing method. In previous work, a lot of

factory is "follow suit" processing method, and not with their own work, leading to a lower CAD/CAM NC surface processing quality, product market, the economic loss and social credibility loss is bigger. This paper argues that, in combination with the choice of objective actual machining method, should try from the following aspects: first, the investigation and analysis of the current market conditions. CAD/CAM surface NC machining to produce the social demand of products, differences between different areas of the product requirements. The market carries on the summary analysis, and data as the standard of CAD/CAM surface NC machining and guidance, can improve the quality of the product from the subjective. Second, parameter line method, the cross section line method, the projection method, a single application method, is fit for the start stage in the factory. In to have a certain market, CAD/CAM NC surface should try to two or more than two kinds of processing methods used in combination, its aim is to consolidate the processing quality in full. And with the accumulation of time, gradually improve the processing quality, enhance competitiveness.

Choosing the appropriate feeding direction

Parameter line method, section line method, the projection method of processing effect is not the same, is very different because the feeding direction. Machining spherical surface, because of the three methods of feeding in a different direction, the article number of the path and trajectory distribution is different also, eventually led to the different machining quality and efficiency. Feeding direction and processing direction has a great relationship, this paper argues that in the future of CAD/CAM NC surface processing work, set of feeding direction should follow the following two criteria: first, should be able to meet the requirements of parts machining accuracy and surface roughness. Say milling closed contour surface, if the promised epitaxial contour curve, should be cut into cut out along the tangent direction. If the outline curves do not allow extension, cutter can only along the contour curve method to cut into cut out, the tool cutting into cutting out point should try to choose two geometrical element contour curve intersection point. When the internal geometry element tangent no intersection point, in order to prevent the knife repairing cancel leave a gap on the corner profile when, cutting into cut out point should be away from the corner. Thus, CAD/CAM surface NC machining, the machining accuracy and surface roughness must pay full attention to the problem, a single execution of a standard, and can't get the ideal effect, can be to get quality or poor quality of the products in general. Second, machining process, should make the feeding line the shortest, sufficient to reduce tool empty travel time, improve the machining efficiency. From the perspective of an objective analysis, the longer the feed line, representing the influence factors of machining, the more will ultimately lead to processed products is not ideal. Cutter, on the other hand, air travel time is inevitable, through a series of effective methods is the focal point in the future, reduce tool empty travel time, so as to ensure the accuracy of the product is higher, the quality is good. Cutter, on the other hand, air travel time is inevitable. Through a series of effective methods is the focal point in the future, reduce tool empty travel time, so as to ensure the accuracy of the product is higher, the quality is good. In summary, CAD/CAM nc surface machining method, the quality and efficiency is very obvious, the influence of the technical personnel should work closely with staff. From product market, product requirements, product quality, processing methods, processing pattern and so on more than one direction, only in this way can have on the efficiency and quality.

CONCLUSION

In this paper, the processing method of CAD/CAM NC machining quality and efficiency of surface spread to explore the influence of the current processing method is diverse. Most factories are based on product requirements to select the suitable processing method. Using CAD/CAM NC surface at the same time, also in actively exploring new processing mode. In the future work, we should rich processing method, avoid parameter line method, section line method, projection assumes the trend of the "three pillar". The CAD/CAM nc surface processing, is not much profit.

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