ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 7, Issue 9 , September 2020

Automation of removing the coordinates of the work piece nodal points, for further production of parts on CNC machines.

RAHMONKULOV R., MANSHUROV SH.T.,TASHKULOV A.A.

Almalyk branch of Tashkent state technical university named after Islam Karimov, M.Ulugbekst-45, 110100, Almalyk, Uzbekistan,

ABSTRACT: The article deals with the problem of removing the workpiece nodal points using programs written in the "Delphi" 7 language to automate the movement of the cutting tool of a CNC machine. This allows the operator to control cutting the machine tool during manual programming. This is useful when the products are small-scale or frequently changing by the demands of the national economy.

KEYWORDS: CNC (computer numerical control) machines, cyclic processing, personnel, technical drawings.

I. INTRODUCTION

For small businesses that use the processes of machining parts, the tasks of reducing the labor intensity of operations and the cost of manufacturing parts while maintaining the specified quality indicators are urgent. Therefore, the management is constantly looking for ways to improve technological processing processes, taking into account the opportunities provided by the tool and modern information and software.

Features of the modern stage of development of mechanical engineering are characterized by the significant distribution and use of CNC machines. The use of this type of equipment can significantly increase processing productivity and improve the quality of manufactured parts. The main feature of this equipment is that the movement of the tool relative to the workpiece being processed is pre-programmed and recorded in numerical form.

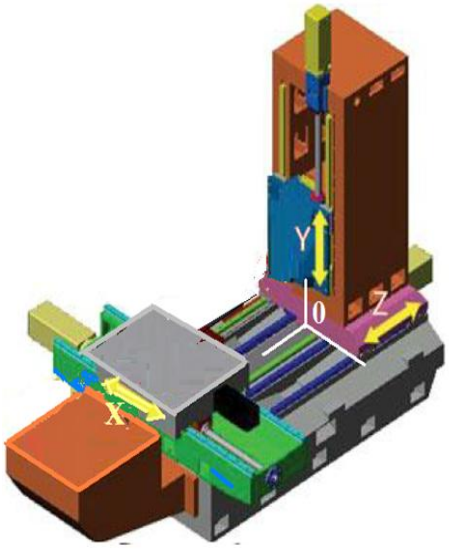


Figure 1: General view of a modern 3-axis CNC machine.

Nowadays, numerically controlled machines are widely used in small businesses. It is difficult to find an area of mechanical engineering that does not use the unique capabilities of such equipment. Therefore, every specialist in the field of mechanical engineering should have a good idea of what the use of this high-tech equipment gives to

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 7, Issue 9 , September 2020

production. There is no secret that all the workers of this enterprise are not trained as highly qualified specialists. Based on this, this article discusses a programming problem for CNC machines[2].

II. GEO SCATTERED TYPE BIG DATA IN APPLICATION

This article presents one of the algorithms for programming the paths of the cutting elements of the machine. In this case, the case of the Cartesian coordinate system X, Y, Z is considered.

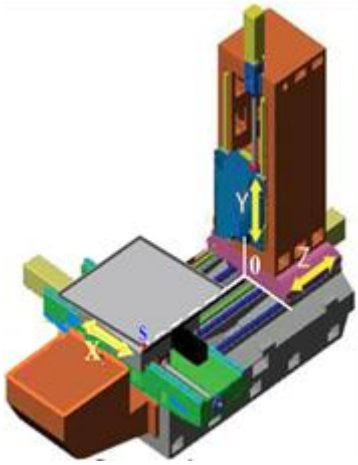


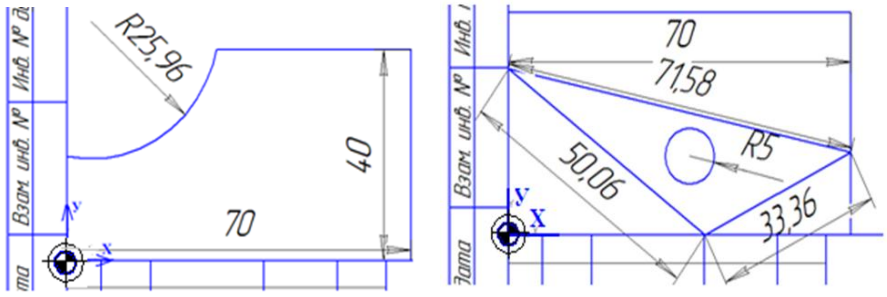
Figure 2: The origin of the processing coordinates S (Start).

Some notions of the origin of coordinates: a right-oriented coordinate system has used, in which linear movements along the X, Y, and Z coordinates have provided (picture 1). In addition, each of which can be associated with circular rotations. But we don't consider rotation in the framework of the articles. If the machine has a single spindle, the Z-axis is parallel to the spindle axis; otherwise, it is perpendicular to the clamping plane of the part. The positive directions of the axes correspond to the relative movement of the tool and the workpiece. The x-axis is located in the horizontal plane corresponding to the clamping plane [3].

Setting tasks for the CNC operator is as follows:

- Clamp the workpiece in the clamping plane. If necessary, secure with fixtures. They are shown in Figures 3 and 4. Anchor points are marked with 1.2;
- Determine the processing coordinates;
- Determine the sequence of the order of work;
-Apply cyclic processing if necessary.

Multipliers can be especially confusing. Write “Magnetization (kA/m)” or “Magnetization (103 A/m).” Do not write “Magnetization (A/m) 1000” because the reader would not know whether the top axis label in Figure 1 meant 16000 A/m or 0.016 A/m. Figure labels should be legible, approximately 8 to 12 point type.



a) b)

Figure 3:
Technical drawings of blanks.a - cutting from the four corner sheets of the rectangular sheet.
b - slip edge of the workpiece.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 7, Issue 9 , September 2020

III. SYSTEM ANALYSIS

After fixing the workpiece, the CNC operator has a lot of painstaking work to install the cutting element of the machine for accurate posing. To facilitate this work, one of the points is attached, that is the origin of the technical drawing made with the help of KOMPAS. (Figure 2 point S). The origin of the technical drawing is shown in Figure 3 a, b.
Composing a program for translating the coordinates of the drawing for further application of the recording of workpiece processing frames. The above phrases will be shown by example. Figure 3 shows two tasks for the CNC operator. The blank sheet is 15mm thick and made of high carbon steel [4].
- Figure 3 a - cut out a workpiece from a right-angled triangle with a hole in the specified place. All dimensions are shown in the drawing (Fig. 3 a).

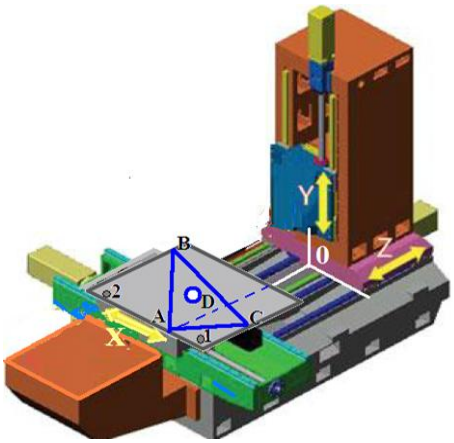


Figure 4: Cutting path A-> B B-> C C-> A (triangle). Tool approach to point D for drilling. Anchoring points are designated blanks 1, 2.

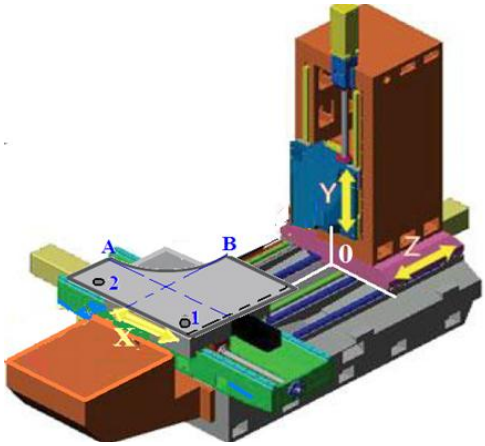


Figure 5: Cutting tool path A-> B (oval). Anchoring points are designated blanks 1, 2.

To remove the nodal coordinates of the workpiece from the drawing made using KOMPAS, you can do the following:

"COMPASS" -> "service" -> "measure" -> "point coordinates". Further, the coordinates of the nodal points in a certain order and copy the result to Notepad and save. Next, using a special program to translate the readable form, this can write with any translator. For example: "Pascal", "Delphi" "SI ++" and others. This makes it easier and saves time to record the control block for CNC machines. Below is a program for this purpose written in the "Delphi-7" language [5].

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 7, Issue 9 , September 2020

```
unit Unit1;
interface
uses
 Windows, Messages, SysUtils, Variants, Classes, Graphics, Controls, Forms,   Dialogs, StdCtrls, Buttons, ExtCtrls;
Type
```

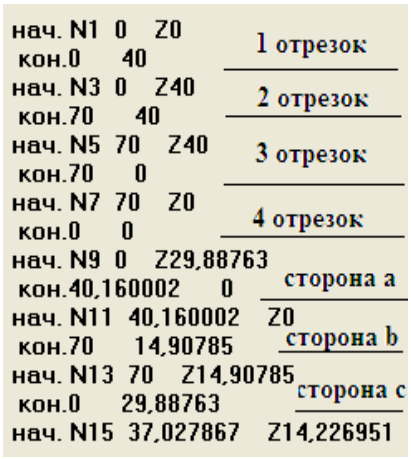


Figure 6: Screenshot of the program for making a triangular sheet.

```
Form1 = class(TForm)
BitBtn1: TBitBtn; Label1: TLabel;
  Procedure
BitBtn1Click(Sender: TObject);
private{ Private declarations }
```

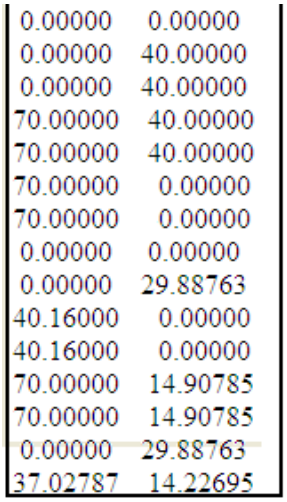


Figure 7: Screenshot of the screen resulting from the launch of programs.

```
public { Public declarations }
end;
var
Form1: TForm1;   time_f:TextFile;   x,y:array [1..100] of longint;
implementation
{$R *.dfm}
```

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 7, Issue 9 , September 2020

```
procedure TForm1.BitBtn1Click(Sender: TObject);
vara,b:array [1..100] of real;
s,se,s1,s2,pat:string;
rabx,raby:longint;
i,j,k,code,N:integer; r,rabc,ii:real;
begin
assignfile(time_f,'11.txt'); reset(time_f);
j:=0; k:=0; se:=''; N:=0;
repeat
readln(time_f,s);
for i:= 1 to length(s) do begin
if copy(s,i,1)='x' then begin
s1:=copy(s,4,length(s)-6); j:=j+1;  val(s1,a[j],code);
if code=0 then begin val(s1,a[j],code); x[j]:=trunc(a[j]); N:=N+1;
iffrac(j/2)<>0 then begin
se:=se+'нач. N'+inttostr(N)+'  '+floattostr(a[j])+'  ' end
else  se:=se+' кон.'+floattostr(a[j])+'  ';  end;
end;
if copy(s,i,1)='y' then begin
s2:=copy(s,4,length(s)-6);k:=k+1;   val(s2,b[k],code);
if code=0 then begin
iffrac(k/2)<>0 then begin val(s2,b[k],code); y[k]:=trunc(b[k]);
se:=se+'  '+'Z'+floattostr(b[j])+#13 end
else  se:=se+'    '+floattostr(b[j])+'   '+#13; end;
end;
untileof(time_f);
closefile(time_f);   Label1.Caption:=se;
assignfile(time_f,'pereden.txt'); rewrite(time_f);
for i:=1 to j do writeln(time_f,a[i]:10:5,'  ',b[i]:10:5);
closefile(time_f);
end.
```

IV. INPUT DESIGN

The screenshot of the program launch screen is shown in Figure 6, and its text file is shown in Figure 7. There has been left to the reader to analyze the results based on Figure 3-a. The origin 15 means the coordinates of the center of the circle.

Application for blank drawing 3-b, can be run easily. All described are applicable when the start of machining coincides with the workpiece origin. Of course, this is always not legitimate as for how to exactly match the origin of the drawing. That easily can be established using the transfer of the coordinate axes by the formula:

$$\begin{cases} x = x' + a \\ z = z' + b \end{cases}$$

Where x.y is the new coordinate: x', y'' is the origin of the sketch. At the same time, it is not difficult to recalculate the coordinates of the points.

Using the result of the obtained results (Fig. 7), we can write control blocks for CNC machines in the following form:

N001 G0 X0 Z0
N010 G01 X0 Z40 …..
N020 G01 X70 Z40 …..
N030 G01 X70 Z0 …..
N040 G01 X0 Z0 …..
N050 G0 X0 Z29.88763 …..
N060 G01 X40.16 Z0 …..

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 7, Issue 9 , September 2020

N070 X70.16 Z14.90785
N080 G0 X0 Z29.88763
N090 G0 Y-5
N090 M30

Here means other parameters of the control block that are required for machining work pieces. In addition, the G01 keywords can be written once.

If you paid attention, the equidistant line is not taken into account here. But this is not part of our topic.

Consider the problem of making a shaft from a steel bar: the cross-section is a rectangle ABCD (Figure 8). It immediately becomes clear how it facilitates the tedious work, the translation program for which has given above.

Application area. This program has used for CNC machines, as with manual control. But also in programming for automation, the production of machine parts for small industrie [6].

V. OUTPUT DESIGN

The use of this method greatly facilitates the painstaking work of a programmer or machine operator without a perfect study of the CAM system. Especially in the manufacture of decorative items which has widely used in the national economy. Besides, writing a translation program is not difficult. There can be written without special programs and use a program written by the authors.

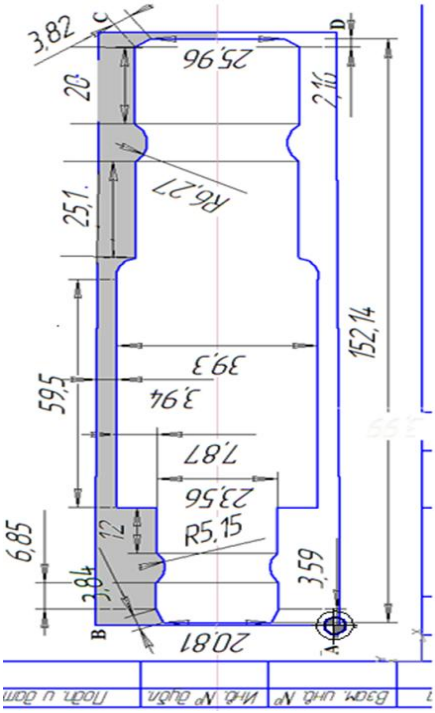


Figure 8: Technical drawing for the production of a shaft from a steel bar.

REFERENCES

1. Sosonkin B.L., Martinov G.M. Programming of numerical control systems. -M .: Logos, 2008.-344 p.
2. Bosinzon MA Modern CNC systems and their operation. - M .: Publishing Center "Academy". - 192 p.
3. S.I. Romanyuk A.M. Yakimovich PROGRAMMING OF NUMERICAL PROGRAMMING CONTROL SYSTEMS "SINUMERIK 840D / 810D" Minsk BNTU 2010 75 p.
4. SINUMERIK 840D Software version 4 Project Planning NCU 571-573 Manual Edition 08.97
5. FANUC Series 3 OPERATING MANUAL li / 310i / 31 Qis-MODEL A, FANUC CORPORATI1N. - 1720 p.
6. A. Zholobov., Zh. A., Mrochek., A. V. Averchenkov., M. V. Terekhov., V. A. Shkaberin CNC MACHINES: DEVICE, PROGRAMMING, TOOLING AND EQUIPMENT E- mail: flinta@mail.ru; WebSite: www.flinta.ru.

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 7, Issue 9 , September 2020

AUTHOR'S BIOGRAPHY

№	Full name place of work, position, academic degree and rank	Photo
1	**Rahmonkulov Raimkul,** Associate Professor, Department of Technology Engineering of the Almalyk branch of the Tashkent State Technical University named after Islam Karimov, Uzbekistan, Tashkent region, Almalyk. 110100.	
2	**ManshurovSherzodTuychiboevich,** assistant of the Almalyk branch of the Tashkent State Technical University named after Islam Karimov, Uzbekistan, Tashkent region, Almalyk. 110100.	
3	**TashkulovAkmalAlishero'g'li,** assistant of the Almalyk branch of the Tashkent State Technical University named after Islam Karimov, Uzbekistan, Tashkent region, Almalyk. 110100.