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(ФГБОУ ВО «МГТУ «СТАНКИН»)**

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Институт цифровых интеллектуальных систем

Дисциплина: «Программирование обработки сложных поверхностей на  
станках ЧПУ»

Отчет по лабораторной работе №4  
«Генерация и редактирование текстовых контуров. Обработка нескольких  
поверхностей заготовки»

Выполнил:

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Дата: \_\_\_\_\_

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**Цель работы:** Генерация текстовых контуров и их использование на различных гранях заготовки.

## Ход работы

С помощью утилиты «Текст в G-код» были сгенерированы траектории для создания 3-х надписей на заготовке.

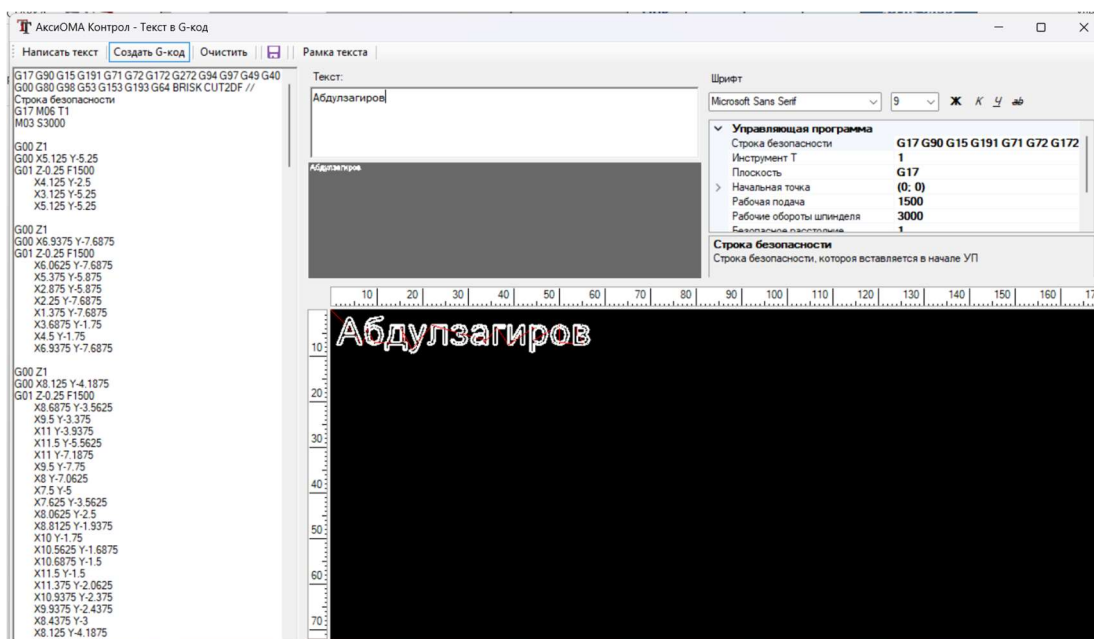


Рис.1. Окно утилиты «Текст в G-код».

В коде программы с помощью команды `workpiece` был задан начальный размер куба и начала координат

```
#workpiece(0, 1024, 1, 80, 80, 80, -15, -33, -80)
```

И после обрисовки первой и второй надписи были добавлены команды `workpiece_pos` для изменения положения и ориентации заготовки

```
#workpiece_pos(-15, -33, 0, 0, 90, 0)
```

```
...
```

```
#workpiece_pos(-5, -40, -80, 0, 90, 90)
```

В результате был получен куб 3-мя надписями (рис. 2)

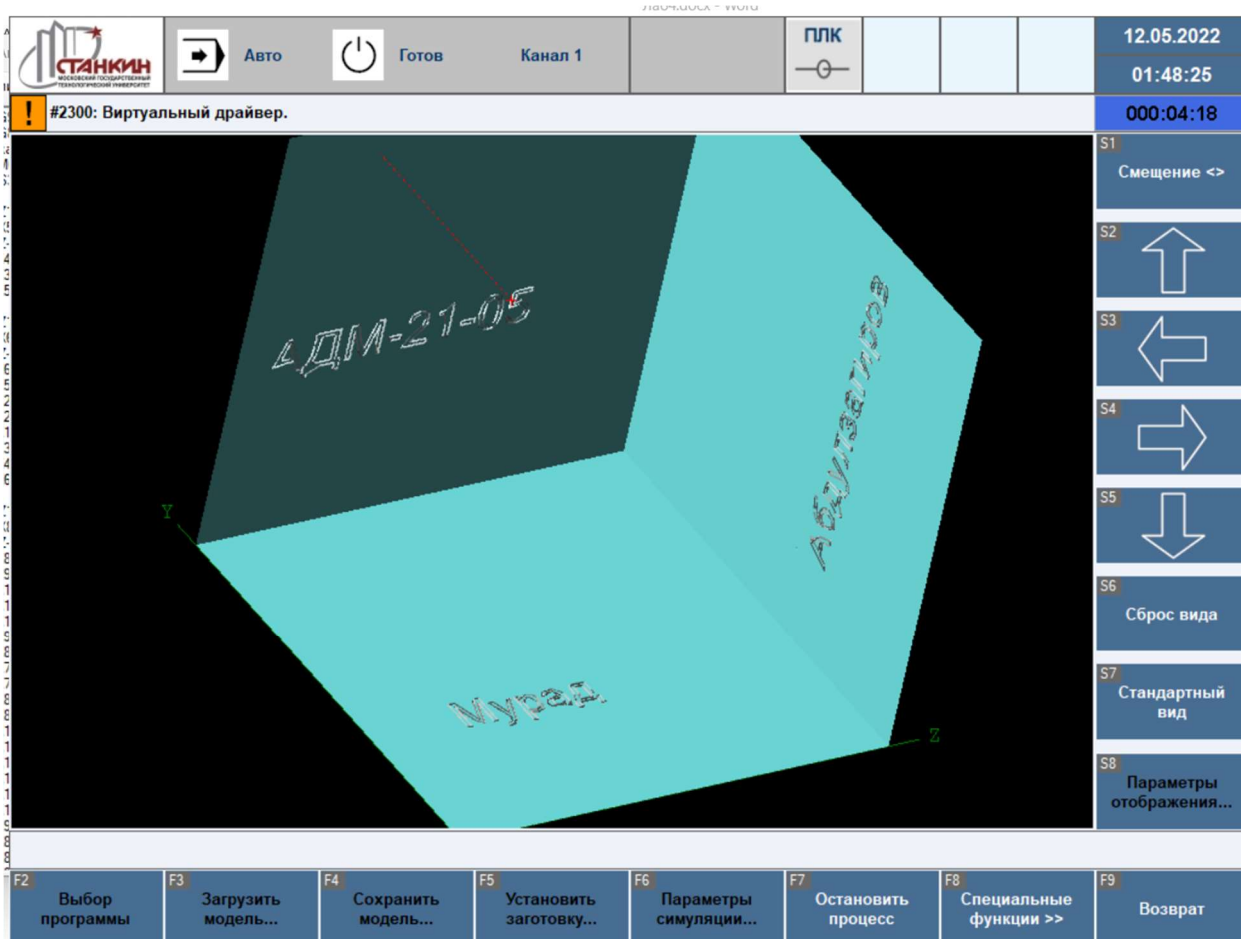


Рис.2. Исходный вид заготовки

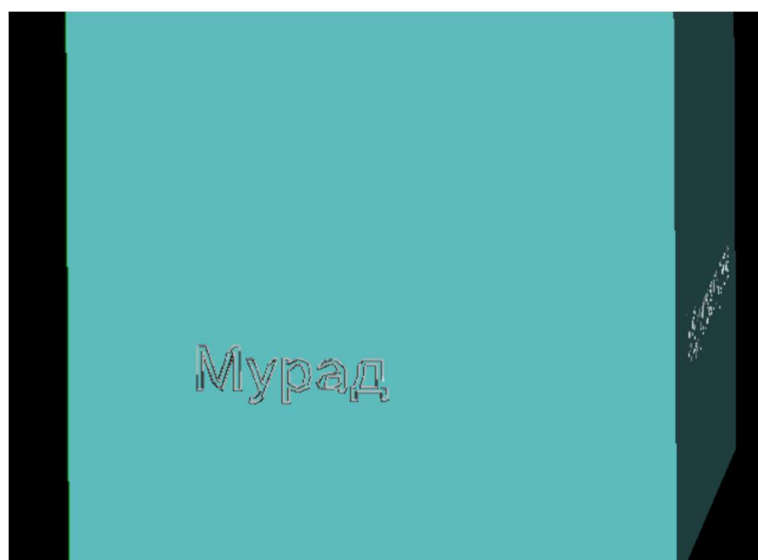


Рис.3. Исходный вид заготовки



Рис.3. Исходный вид заготовки.

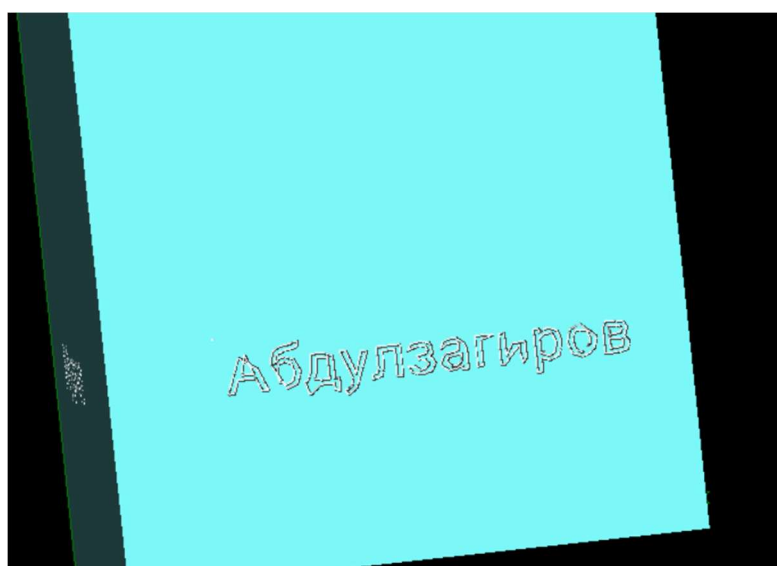


Рис.4. Исходный вид заготовки (один из вариантов).

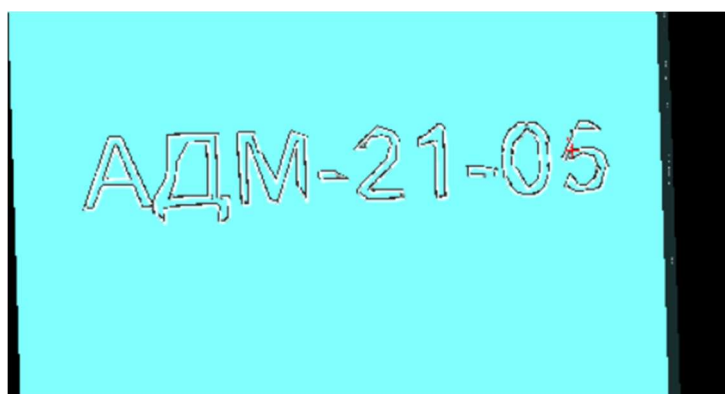


Рис.5. Исходный вид заготовки.

(При каждом запуске программы отображаемый контур всегда получался разным, возможно особенность «железа» компьютера (процессор AMD))

Листинг 1.

G17 G90 G15 G191 G71 G72 G172 G272 G94 G97 G49 G40 G00 G80 G98 G53  
G153 G193 G64 BRISK CUT2DF // Строка безопасности

#workpiece(0, 1024, 1, 80, 80, 80, -15, -33, -80)

G17 M06 T35  
M03 S300

G00 Z1  
G00 X5.125 Y-5.25  
G01 Z-0.25 F1500  
X4.125 Y-2.5  
X3.125 Y-5.25  
X5.125 Y-5.25

G00 Z1  
G00 X6.9375 Y-7.6875  
G01 Z-0.25 F1500  
X6.0625 Y-7.6875  
X5.375 Y-5.875  
X2.875 Y-5.875  
X2.25 Y-7.6875  
X1.375 Y-7.6875  
X3.6875 Y-1.75  
X4.5 Y-1.75  
X6.9375 Y-7.6875

G00 Z1  
G00 X8.125 Y-4.1875  
G01 Z-0.25 F1500  
X8.6875 Y-3.5625  
X9.5 Y-3.375  
X11 Y-3.9375  
X11.5 Y-5.5625  
X11 Y-7.1875  
X9.5 Y-7.75  
X8 Y-7.0625  
X7.5 Y-5  
X7.625 Y-3.5625  
X8.0625 Y-2.5  
X8.8125 Y-1.9375  
X10 Y-1.75  
X10.5625 Y-1.6875  
X10.6875 Y-1.5  
X11.5 Y-1.5  
X11.375 Y-2.0625  
X10.9375 Y-2.375

X9.9375 Y-2.4375  
X8.4375 Y-3  
X8.125 Y-4.1875  
X8.125 Y-4.1875

G00 Z1  
G00 X9.5 Y-7.1875  
G01 Z-0.25 F1500  
X10.375 Y-6.75  
X10.75 Y-5.5625  
X10.375 Y-4.375  
X9.5 Y-4  
X8.625 Y-4.375  
X8.3125 Y-5.5625  
X8.625 Y-6.75  
X9.5 Y-7.1875  
X9.5 Y-7.1875

G00 Z1  
G00 X16.125 Y-7.0625  
G01 Z-0.25 F1500  
X16.75 Y-7.0625  
X16.75 Y-8.8125  
X16 Y-8.8125  
X16 Y-7.6875  
X12.75 Y-7.6875  
X12.75 Y-8.8125  
X12 Y-8.8125  
X12 Y-7.0625  
X12.375 Y-7.0625  
X12.9375 Y-5.6875  
X13.125 Y-3.5625  
X13.125 Y-3.375  
X16.125 Y-3.375  
X16.125 Y-7.0625

G00 Z1  
G00 X15.375 Y-4  
G01 Z-0.25 F1500  
X13.875 Y-4  
X13.6875 Y-5.8125  
X13.25 Y-7.0625  
X15.375 Y-7.0625  
X15.375 Y-4

G00 Z1  
G00 X17.8125 Y-8.6875

```

G01 Z-0.25 F1500
  X18.3125 Y-8.4375
  X18.75 Y-7.6875
  X17.875 Y-5.4375
  X17.125 Y-3.375
  X17.9375 Y-3.375
  X18.625 Y-5.375
  X19.0625 Y-6.75
  X20.1875 Y-3.375
  X21 Y-3.375
  X19.375 Y-7.6875
  X19 Y-8.625
  X18.5625 Y-9.1875
  X17.9375 Y-9.4375
  X17.4375 Y-9.375
  X17.4375 Y-8.6875
  X17.8125 Y-8.6875
  X17.8125 Y-8.6875

```

```

G00 Z1

```

```

G00 X22.1875 Y-3.375
G01 Z-0.25 F1500
  X25.4375 Y-3.375
  X25.4375 Y-7.6875
  X24.6875 Y-7.6875
  X24.6875 Y-4
  X22.9375 Y-4
  X22.9375 Y-6.25
  X22.625 Y-7.4375
  X21.8125 Y-7.6875
  X21.3125 Y-7.6875
  X21.3125 Y-7.0625
  X21.75 Y-7.125
  X22.0625 Y-6.9375
  X22.1875 Y-6.25
  X22.1875 Y-3.375

```

```

G00 Z1

```

```

G00 X29.1875 Y-5.4375
G01 Z-0.25 F1500
  X29.8125 Y-5.875
  X30 Y-6.5
  X29.5 Y-7.4375
  X28.125 Y-7.75
  X26.8125 Y-7.4375
  X26.3125 Y-6.5625
  X27.0625 Y-6.5625

```

X27.375 Y-7  
X28.125 Y-7.1875  
X28.9375 Y-7  
X29.1875 Y-6.5  
X29.0625 Y-6.0625  
X28.6875 Y-5.8125  
X28 Y-5.75  
X27.75 Y-5.75  
X27.75 Y-5.1875  
X28 Y-5.1875  
X28.875 Y-5  
X29.125 Y-4.5625  
X28.875 Y-4.0625  
X28.1875 Y-3.875  
X27.5 Y-4  
X27.25 Y-4.375  
X26.4375 Y-4.375  
X26.9375 Y-3.5625  
X28.125 Y-3.3125  
X29.4375 Y-3.625  
X29.875 Y-4.5  
X29.75 Y-5.0625  
X29.1875 Y-5.4375  
X29.1875 Y-5.4375

G00 Z1  
G00 X33.6875 Y-6.5625  
G01 Z-0.25 F1500  
X33.6875 Y-5.625  
X33.1875 Y-5.625  
X31.9375 Y-5.8125  
X31.5 Y-6.5  
X31.75 Y-7  
X32.4375 Y-7.1875  
X33.125 Y-7  
X33.6875 Y-6.5625  
X33.6875 Y-6.5625

G00 Z1  
G00 X33.6875 Y-7.25  
G01 Z-0.25 F1500  
X32.1875 Y-7.75  
X31.125 Y-7.4375  
X30.75 Y-6.5625  
X31.375 Y-5.4375  
X33.3125 Y-5.0625  
X33.6875 Y-5.0625



X33.625 Y-4.375  
X33.375 Y-4  
X32.6875 Y-3.875  
X31.875 Y-4.0625  
X31.625 Y-4.625  
X30.875 Y-4.625  
X31.375 Y-3.625  
X32.6875 Y-3.3125  
X34 Y-3.625  
X34.4375 Y-4.875  
X34.4375 Y-7.6875  
X33.6875 Y-7.6875  
X33.6875 Y-7.25

G00 Z1  
G00 X36.5 Y-4  
G01 Z-0.25 F1500  
X36.5 Y-7.6875  
X35.75 Y-7.6875  
X35.75 Y-3.375  
X38.25 Y-3.375  
X38.25 Y-4  
X36.5 Y-4

G00 Z1  
G00 X39 Y-7.6875  
G01 Z-0.25 F1500  
X39 Y-3.375  
X39.75 Y-3.375  
X39.75 Y-6.625  
X41.6875 Y-3.375  
X42.5 Y-3.375  
X42.5 Y-7.6875  
X41.75 Y-7.6875  
X41.75 Y-4.4375  
X39.8125 Y-7.6875  
X39 Y-7.6875

G00 Z1  
G00 X44.5625 Y-3.875  
G01 Z-0.25 F1500  
X45.75 Y-3.3125  
X47.0625 Y-3.875  
X47.5625 Y-5.5  
X47 Y-7.1875  
X45.75 Y-7.75  
X44.5625 Y-7.375

X44.5625 Y-9.3125  
X43.8125 Y-9.3125  
X43.8125 Y-3.375  
X44.5625 Y-3.375  
X44.5625 Y-3.875

G00 Z1  
G00 X44.5625 Y-6.6875  
G01 Z-0.25 F1500  
X45.6875 Y-7.1875  
X46.4375 Y-6.75  
X46.75 Y-5.5  
X46.5 Y-4.3125  
X45.6875 Y-3.875  
X44.5625 Y-4.625  
X44.5625 Y-6.6875

G00 Z1  
G00 X50.25 Y-3.3125  
G01 Z-0.25 F1500  
X51.75 Y-3.875  
X52.3125 Y-5.5  
X51.75 Y-7.1875  
X50.25 Y-7.75  
X48.8125 Y-7.1875  
X48.25 Y-5.5  
X48.8125 Y-3.875  
X50.25 Y-3.3125  
X50.25 Y-3.3125

G00 Z1  
G00 X50.25 Y-7.1875  
G01 Z-0.25 F1500  
X51.1875 Y-6.75  
X51.5 Y-5.5  
X51.1875 Y-4.3125  
X50.25 Y-3.875  
X49.375 Y-4.3125  
X49.0625 Y-5.5  
X49.375 Y-6.75  
X50.25 Y-7.1875  
X50.25 Y-7.1875

G00 Z1  
G00 X55.3125 Y-7.6875  
G01 Z-0.25 F1500  
X53.3125 Y-7.6875

X53.3125 Y-3.375  
X55 Y-3.375  
X56.1875 Y-3.6875  
X56.625 Y-4.5  
X56.0625 Y-5.4375  
X56.8125 Y-6.5  
X56.375 Y-7.375  
X55.3125 Y-7.6875  
X55.3125 Y-7.6875

G00 Z1  
G00 X54.0625 Y-4  
G01 Z-0.25 F1500  
X54.0625 Y-5.1875  
X54.9375 Y-5.1875  
X55.625 Y-5.0625  
X55.875 Y-4.5625  
X55.625 Y-4.125  
X54.875 Y-4  
X54.0625 Y-4

G00 Z1  
G00 X54.0625 Y-5.75  
G01 Z-0.25 F1500  
X54.0625 Y-7.0625  
X55.0625 Y-7.0625  
X55.75 Y-6.9375  
X56 Y-6.4375  
X55.75 Y-5.9375  
X55 Y-5.75  
G00 X54.0625 Y-5.75  
G00 Z1

#workpiece\_pos(-15, -33, 0, 0, 90, 0)

G00 Z1  
G00 X7.6875 Y-7.6875  
G01 Z-0.25 F1500  
X6.9375 Y-7.6875  
X6.9375 Y-2.625  
X5.25 Y-7.6875  
X4.5 Y-7.6875  
X2.8125 Y-2.625  
X2.8125 Y-7.6875  
X2.0625 Y-7.6875  
X2.0625 Y-1.75

X3.25 Y-1.75  
X4.875 Y-6.6875  
X6.5 Y-1.75  
X7.6875 Y-1.75  
X7.6875 Y-7.6875

G00 Z1  
G00 X9.3125 Y-8.6875  
G01 Z-0.25 F1500  
X9.8125 Y-8.4375  
X10.25 Y-7.6875  
X9.4375 Y-5.4375  
X8.625 Y-3.375  
X9.4375 Y-3.375  
X10.125 Y-5.375  
X10.625 Y-6.75  
X11.75 Y-3.375  
X12.5625 Y-3.375  
X10.9375 Y-7.6875  
X10.5625 Y-8.625  
X10.125 Y-9.1875  
X9.4375 Y-9.4375  
X9 Y-9.375  
X9 Y-8.6875  
X9.3125 Y-8.6875  
X9.3125 Y-8.6875

G00 Z1  
G00 X14.125 Y-3.875  
G01 Z-0.25 F1500  
X15.375 Y-3.3125  
X16.6875 Y-3.875  
X17.125 Y-5.5  
X16.625 Y-7.1875  
X15.3125 Y-7.75  
X14.125 Y-7.375  
X14.125 Y-9.3125  
X13.375 Y-9.3125  
X13.375 Y-3.375  
X14.125 Y-3.375  
X14.125 Y-3.875

G00 Z1  
G00 X14.125 Y-6.6875  
G01 Z-0.25 F1500  
X15.25 Y-7.1875  
X16.0625 Y-6.75

X16.3125 Y-5.5  
X16.0625 Y-4.3125  
X15.3125 Y-3.875  
X14.125 Y-4.625  
X14.125 Y-6.6875

G00 Z1

G00 X20.8125 Y-6.5625

G01 Z-0.25 F1500

X20.8125 Y-5.625  
X20.3125 Y-5.625  
X19.0625 Y-5.8125  
X18.6875 Y-6.5  
X18.875 Y-7  
X19.5625 Y-7.1875  
X20.3125 Y-7  
X20.8125 Y-6.5625  
X20.8125 Y-6.5625

G00 Z1

G00 X20.8125 Y-7.25

G01 Z-0.25 F1500

X19.3125 Y-7.75  
X18.3125 Y-7.4375  
X17.875 Y-6.5625  
X18.5 Y-5.4375  
X20.4375 Y-5.0625  
X20.8125 Y-5.0625  
X20.8125 Y-4.375  
X20.5 Y-4  
X19.8125 Y-3.875  
X19 Y-4.0625  
X18.75 Y-4.625  
X18 Y-4.625  
X18.5 Y-3.625  
X19.875 Y-3.3125  
X21.125 Y-3.625  
X21.625 Y-4.875  
X21.625 Y-7.6875  
X20.8125 Y-7.6875  
X20.8125 Y-7.25

G00 Z1

G00 X26.4375 Y-7.0625

G01 Z-0.25 F1500

X27.0625 Y-7.0625  
X27.0625 Y-8.8125

```
X26.3125 Y-8.8125
X26.3125 Y-7.6875
X23.0625 Y-7.6875
X23.0625 Y-8.8125
X22.3125 Y-8.8125
X22.3125 Y-7.0625
X22.6875 Y-7.0625
X23.25 Y-5.6875
X23.4375 Y-3.5625
X23.4375 Y-3.375
X26.4375 Y-3.375
X26.4375 Y-7.0625
```

```
G00 Z1
G00 X25.6875 Y-4
G01 Z-0.25 F1500
    X24.1875 Y-4
    X24 Y-5.8125
    X23.5625 Y-7.0625
    X25.6875 Y-7.0625
G00 X25.6875 Y-4
G00 Z1
```

```
#workpiece_pos(-5, -40, -80, 0, 90, 90)
```

```
G00 Z1
G00 X5.6875 Y-5.8125
G01 Z-0.25 F1500
    X4.5625 Y-2.75
    X3.4375 Y-5.8125
    X5.6875 Y-5.8125
```

```
G00 Z1
G00 X7.75 Y-8.5
G01 Z-0.25 F1500
    X6.75 Y-8.5
    X6 Y-6.5
    X3.1875 Y-6.5
    X2.5 Y-8.5
    X1.5625 Y-8.5
    X4.0625 Y-1.9375
    X5 Y-1.9375
    X7.75 Y-8.5
```

```
G00 Z1
G00 X14 Y-7.75
G01 Z-0.25 F1500
```

X14.875 Y-7.75  
X14.875 Y-10.0625  
X14 Y-10.0625  
X14 Y-8.5  
X8.9375 Y-8.5  
X8.9375 Y-10.0625  
X8.0625 Y-10.0625  
X8.0625 Y-7.75  
X8.625 Y-7.75  
X9.25 Y-6.125  
X9.375 Y-4.875  
X9.4375 Y-3.0625  
X9.4375 Y-1.9375  
X14 Y-1.9375  
X14 Y-7.75

G00 Z1  
G00 X13.125 Y-7.75  
G01 Z-0.25 F1500  
X13.125 Y-2.6875  
X10.3125 Y-2.6875  
X10.3125 Y-3.125  
X10.25 Y-4.8125  
X10.125 Y-6.0625  
X9.5 Y-7.75  
X13.125 Y-7.75

G00 Z1  
G00 X22.1875 Y-8.5  
G01 Z-0.25 F1500  
X21.375 Y-8.5  
X21.375 Y-2.9375  
X19.5 Y-8.5  
X18.6875 Y-8.5  
X16.8125 Y-2.9375  
X16.8125 Y-8.5  
X16 Y-8.5  
X16 Y-1.9375  
X17.3125 Y-1.9375  
X19.0625 Y-7.4375  
X20.875 Y-1.9375  
X22.1875 Y-1.9375  
X22.1875 Y-8.5

G00 Z1  
G00 X25.9375 Y-6.5625  
G01 Z-0.25 F1500

X23.4375 Y-6.5625  
X23.4375 Y-5.75  
X25.9375 Y-5.75  
X25.9375 Y-6.5625

G00 Z1

G00 X31 Y-8.5

G01 Z-0.25 F1500

X26.625 Y-8.5

X27 Y-7.375

X28.375 Y-6

X29.75 Y-4.75

X30.0625 Y-3.625

X29.75 Y-2.8125

X28.875 Y-2.5

X28.0625 Y-2.8125

X27.625 Y-3.75

X26.75 Y-3.75

X27.4375 Y-2.3125

X28.875 Y-1.8125

X30.4375 Y-2.375

X30.9375 Y-3.6875

X30.5625 Y-4.9375

X30 Y-5.625

X29 Y-6.5

X28.125 Y-7.3125

X27.8125 Y-7.75

X31 Y-7.75

X31 Y-8.5

G00 Z1

G00 X35.0625 Y-8.5

G01 Z-0.25 F1500

X34.1875 Y-8.5

X34.1875 Y-3.3125

X32.625 Y-3.6875

X32.625 Y-3

X33.875 Y-2.6875

X34.4375 Y-1.8125

X35.0625 Y-1.8125

X35.0625 Y-8.5

G00 Z1

G00 X39.6875 Y-6.5625

G01 Z-0.25 F1500

X37.1875 Y-6.5625

X37.1875 Y-5.75



X39.6875 Y-5.75  
X39.6875 Y-6.5625

G00 Z1  
G00 X42.625 Y-1.8125  
G01 Z-0.25 F1500  
X43.5625 Y-2  
X44.25 Y-2.6875  
X44.625 Y-3.75  
X44.75 Y-5.25  
X44.625 Y-6.75  
X44.25 Y-7.8125  
X43.5625 Y-8.4375  
X42.625 Y-8.625  
X41.6875 Y-8.4375  
X41 Y-7.8125  
X40.5625 Y-6.75  
X40.4375 Y-5.25  
X40.5625 Y-3.75  
X41 Y-2.6875  
X41.6875 Y-2  
X42.625 Y-1.8125  
X42.625 Y-1.8125

G00 Z1  
G00 X42.625 Y-8  
G01 Z-0.25 F1500  
X43.5625 Y-7.375  
X43.8125 Y-6.5625  
X43.875 Y-5.25  
X43.8125 Y-3.9375  
X43.5625 Y-3.0625  
X42.625 Y-2.5  
X41.6875 Y-3.0625  
X41.4375 Y-3.9375  
X41.3125 Y-5.25  
X41.4375 Y-6.5625  
X41.6875 Y-7.375  
X42.625 Y-8  
X42.625 Y-8

G00 Z1  
G00 X46.8125 Y-4.5625  
G01 Z-0.25 F1500  
X48.0625 Y-4.125  
X49.5 Y-4.75  
X50.0625 Y-6.3125

```
X49.5 Y-8
X47.8125 Y-8.625
X46.375 Y-8.1875
X45.6875 Y-6.8125
X46.5625 Y-6.8125
X47 Y-7.6875
X47.8125 Y-8
X48.8125 Y-7.5
X49.1875 Y-6.375
X48.8125 Y-5.25
X47.8125 Y-4.875
X46.625 Y-5.4375
X45.9375 Y-5.4375
X46.25 Y-1.9375
X49.75 Y-1.9375
X49.75 Y-2.6875
X46.9375 Y-2.6875
G00 X46.8125 Y-4.5625
G00 Z1

M30
```

**Вывод:** в данной лабораторной работе мы изучили программные инструменты для создания управляющие программы с использованием генерации текстовых контуров и создали надписи на различных гранях заготовки.