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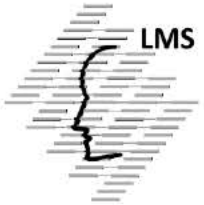
Ενότητα 11: Do Loops and Subprograms

Δημήτρης Μούρτζης, Επίκουρος Καθηγητής
Πολυτεχνική Σχολή
Τμήμα Μηχανολόγων & Αεροναυπηγών Μηχανικών

COMPUTER NUMERICAL CONTROL OF MACHINE TOOLS

Laboratory for Manufacturing Systems and Automation
Department of Mechanical Engineering and Aeronautics
University of Patras, Greece



Dr. Dimitris Mourtzis

Assistant Professor

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Objectives of section 11

- Describe a **do loop**
- Describe a **subprogram**
- Describe **nested loops**
- Write simple programs using **loops, subroutines and nested loops**

Do loops

- If an operation is to be repeated ***over a number of equal steps***, it may be programmed in what is referred to as a **do loop**
- In a **do *loop*,** the MCU is instructed to ***repeat an operation*** (in this case, drill a hole five times) rather than be programmed for five separate hole locations.
- A **do loop** simply instructs the MCU to **repeat** a series of NC program statements a ***specified number of times***.
- Usually, **looping capability** on a CNC controller is an optional item, therefore not all controllers have it. The looping feature is sometimes **added** to the controller by the controller's manufacturer
- In other cases, it is **programmed** into the controller by the machine tool manufacturer.
- This means that the NC codes used to initiate a **do loop** can vary widely from machine to machine, even if they are all equipped with the same basic controller model

Do loops

Programming a Loop

- Naturally, there is a **G code** to institute a **do loop**
- As mentioned previously, there are no standard codes for **do loops**
- The method described in this section ***is only one of the schemes in use***

Do loops

- The **format** for a do loop is:

N… **G25 Pppp Qqqq Ll**
N**ppp** X/Y/Z
N… X/Y/Z
N… X/Y/Z
N**qqq** X/Y/Z

- **Where**:

G25 –Signals the start of a loop

P – Specifies the beginning block number of the loop

Q – Specifies the ending block number of the loop

L – Specifies the number of times to perform the loop

Subprograms

- A ***subprogram*** is a separate program called by another program
- The use of subprograms can significantly **reduce** the amount of programming required on some parts.
- One way to use a ***subprogram*** is to place one or more **do loops** in the subprogram. This is known as ***nesting***
- Subprograms can also be **nested** in other subprograms, or ***nested within do loops***
-
- This gives the programmer a great deal of **flexibility** and a powerful programming tool.

Calling Subprograms

Main Program

O0001

N001 X/Y/Z

N002 -

N003 -

N004 M98P2000L1

N005 -

N006 -

N007 -

N008 M30

Subprogram

O2000

N001 X/Y/Z

N002 -

N003 -

N004 M99

- Where:

  M98 – Instructs the MCU to **jump** to a subprogram

  P2000 – Tells the MCU that O2000 is the **subprogram ID**

  L1 – Instructs the MCU to **execute** the subprogram one time

Calling Subprograms

Subprogram Explanation

- Notice that a **subprogram** has ***its own program ID number***, in this case **O1000**

- The sequence blocks also are numbered **independently** from the main program

- The only **difference** between the subprogram and an independent program is the ***return to calling program command*** (**M99**) at the end of the program

Subroutines

- **Subroutines** :

- **Independent program** which is called within the program

- Used when there is **need for repeating** a sequence of commands

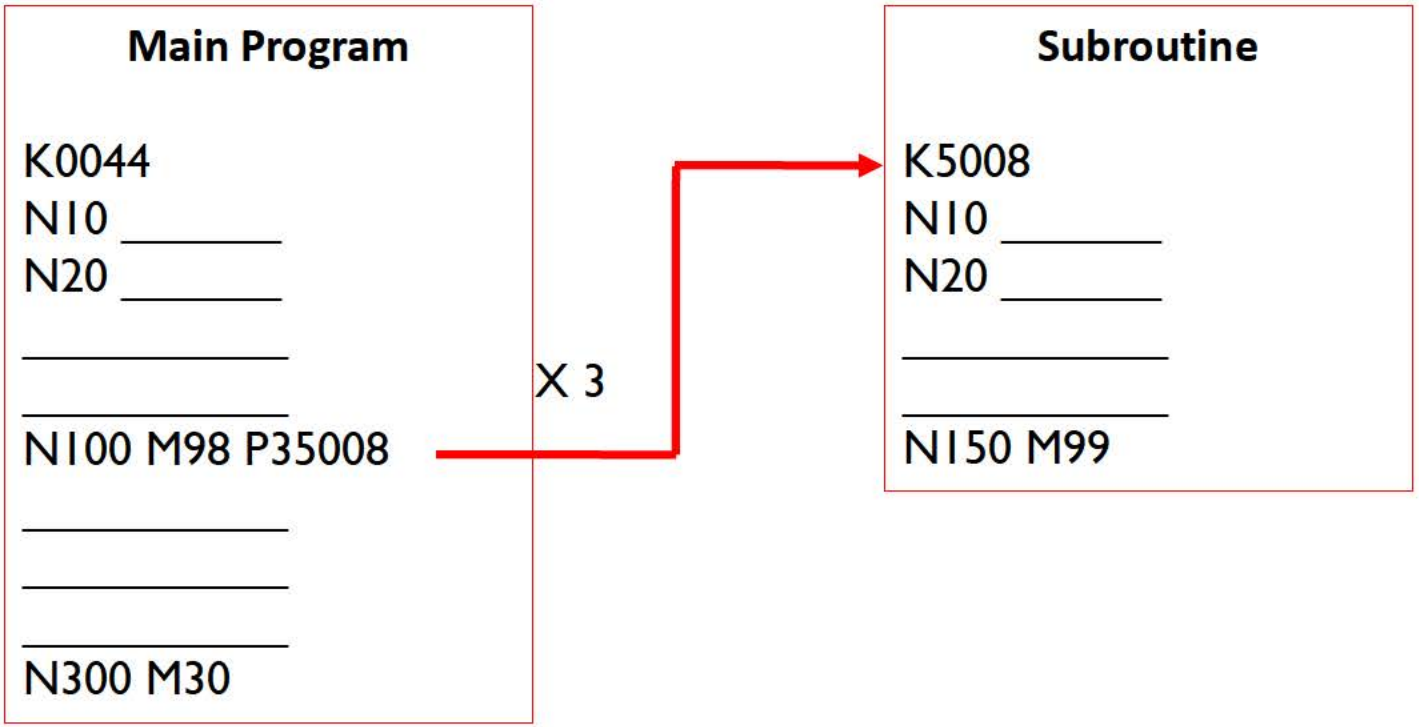
- Programming **time saving**

- **Register** orders once, **recall** anywhere in the program and **repeat** as many times as needed

- **M98**, **M99** commands

Subroutines

- Programming with **FANUK MCU**



Nested Loops

- **Do loops** may ***nest*** inside other do loop or subprograms
- Similarly, **subprograms** may ***nest*** inside other subprograms
- In writing a CNC program, a **reference sketch**, is a valuable **aid** in developing a **machining strategy**
- It also provides a way for the programmer to **check** his or her work

Summary

The important **concepts** presented in this section are:

- A **do loop** instructs the MCU to **repeat** a series of instructions a specified number of times

- The **format** for a do loop is;

G25P...Q..-L.

  - **Where**:.

G25 turns on the loop
P is the **beginning block** number of the loop.
Q is the **ending block** number of the loop.
L is the **number of times** to repeat the loop.

Summary

- A s**ubprogram** is a program called by another program in **a parent-child**
- The **format** for calling a subprogram is:

P....M98L.

  - **Where**:

P	-	is the **program number** of the subprogram.
M98	-	causes subprogram **P** to **execute.**
L	-	specifies the **number of times** subprogram **P** executes.

- **Nested loops** are placed inside other loops or **inside** subprograms
- The **codes for subprograms** and **do loops vary** from controller
- To program a particular machine, it will be necessary to ***consult the programming manual*** for the machine in question.

Vocabulary Introduced in this section

- Do loop
- Main program
- Nested loop
- Subprogram
- Subroutine

End of Section

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