ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΑΤΡΩΝ
UNIVERSITY OF PATRAS

ΑΝΟΙΚΤΑ ακαδημαϊκά μαθήματα ΠΠ

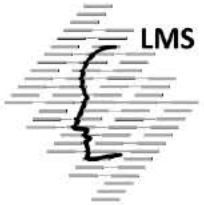
Αριθμητικός Έλεγχος Εργαλειομηχανών

Ενότητα 12: Advanced CNC Features

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

Patras, 2015

Objectives of section 12

- **Explain** the concept of mirror imaging
- **Decide** when the use of mirror imaging is appropriate
- Write simple programs in word address that **employ** mirror imaging
- **Explain** the concept of polar rotation
- **Decide** when the use of polar rotation is appropriate

Mirror Imaging

- **Mirror imaging** means changing the **sign (+ or -)** of an axis movement
- **Mirror imaging** is used in a program to ***save repetitive programming*** when the direction of movement is the only difference between part features
- **Mirror imaging** is normally used in conjunction **with subroutines** or **do loops**
- **Reduce programming time** when there is **symmetry**
- Depending on the **quadrant** of the mirror imaging some or all of the factors below will be affected :
  - Sign of the axis
  - Milling direction(up- or down- milling)
  - Arc rotation direction (clockwise or counterclockwise)

Polar Rotation

- Despite the differences in controllers, there is **certain information** that every MCU needs in order to carry out a **polar rotation**:
- The **X axis coordinate** of the center of rotation
- The **Y axis coordinate** of the center of rotation
- The **index angle**, or the ***angle as measured counterclockwise*** from the
  - + X axis to the start of the rotation

Polar Rotation

The amount of the rotation

- Following the initial rotation to the **index angle**, subsequent rotations may be specified ***as some angular value other than the index angle***.
- The rotations will occur in a **counterclockwise direction**
- A **code to initiate** polar rotation
- A **code to cancel** polar rotation

Summary 1/2

- **Mirror imaging** means changing the **sign (+ or -)** of an axis movement
- **Mirror imaging** is used in a program to ***save repetitive programming*** when the direction of movement is the only difference between part features
- **Mirror imaging** is normally used in conjunction **with subroutines** or **do loops**
- **Polar rotation** is an **indexing** of the NC machine's Cartesian coordinate system to some **angle** other than its normal state
- **Polar rotation** may be used to perform operations that otherwise would require the use of a **rotary axis** or lengthy coordinate calculations
- **Polar rotations** may be used in conjunction with **do loops** or **subroutines**

Vocabulary Introduced in this section

- Mirror imaging
- Polar axis system
- Polar rotation
- Tread lead

End of Section

Funding

- This educational material has been developed in the teaching duties of the respective educator.
- The Project "**Open Academic Courses at the University of Patras**" has funded only the reformation of the educational material.
- The Project is implemented within the context of the Operational Programme "Education and Lifelong Learning" (EdLL) and is co-funded by the European Union (European Social Fund) and national resources.

Reference Note

License Note

Notes Preservation

Any reproduction or modification of this material must include:

- the Reference Note
- the License Note
- the Notes Preservation statement
- the Third Parties' Works Note (if exists)

as well as the accompanying hyperlinks.