SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

Coimbatore-35

Department of Biomedical Engineering

Course Name: ROBOTICS AND AUTOMATION IN MEDICINE

III Year : VI Semester

TITLE: DEGREES OF FREEDOM AND PROGRAMMING

Types of Joints

- The types of joints common in robotics are:
  - Linear or Prismatic Joint (P Joint)
  - Revolute Joint (R Joint)
    - Pure rotational joint
    - Twisting joint and
    - Revolving joint
  - Cylindrical Joint (Combination of prismatic & revolute joint)
- Both the *Prismatic* and *Revolute* Joints provide *one DOF* each.
- The *cylindrical joint* provides *2 DOF*.

Types of Joints

- The DOF associated with the arm and body of the robot are:
  - Vertical Traverse: Up and down motion
  - Radial Traverse: In and out motion
  - Rotational Traverse: Rotation of arm about the vertical axis
- The DOF associated with the wrist of the robot are:
  - Wrist Roll / Wrist Swivel: Rotation of the wrist about arm axis
  - Wrist Pitch / Wrist Bend: Up and down rotation of the wrist
  - Wrist Yaw: Right and left rotation of the wrist

Robot Programming

- The robot programming languages are classified into five distinct levels:
  - Microprocessor / microcomputer level
  - Point – to – Point (P – t – P) level
  - Motion level
  - Structural programming level and
  - Task oriented level
- In the ***microprocessor level***, traditional assembly language is used.

Robot Programming

- In the ***point – to – point level,*** the robot joints are moved through a series of points in the work space by either a teach pendant or by manual movement through appropriate points.
- These points are stored and the stored program if required can be edited. A simple program can be:
    1. GO TO POINT C, STOP
    2. GO TO POINT D, STOP
    3. OPEN GRIPPER
- In the ***motion level***, point to point motions can be implemented. The additional features available in this level are Branching, Subroutines and Sensing Capabilities.

Robot Programming

- In the ***Structured programming level***, extensive use of coordinate transformations and frames are possible.
- Complex data structures, sensors processing and parallel processing capabilities are the features of this level.
- The if – then – else and while – do structures provide powerful control aids in this level.
- Definable subroutines can also be accommodated in this level.

THANK YOU