Lab Number 15
LAB-VOLT Robot

Objective:

Basic objectives of this lab are:-

- To have a complete overview of introduction of the Software named ROBOCIM, used to program LAB-VOLT robot system.
- Understanding environment of ROBOCIM.
- Use of tools provided in ROBOCIM.
- Icon programming module for the Robot and software is covered in detail.

Introduction:

The **ROBOCIM** Software is used to simulate and control the operation of the Servo Robot System, Lab-Volt, and optional external devices such as Gravity Feeders, Belt Conveyors, or Linear Slides. One of the key features of the **ROBOCIM** simulates the actual equipment withthree-dimensional representations. Sophisticated mathematical models accurately simulate the mechanical and electrical characteristics of the equipment. The **ROBOCIM** allows users to interactively control and view the motion of the system. Programs can be created with the **ROBOCIM** Software to control the equipment using either the text programming mode or theicon programming mode.
Some of the characteristics of ROBOCIM software are given below:

- Easy-to-use, menu-driven software
- Simulation and control modes
- Three-dimensional (3D) virtual environment
- Seven predefined layout/camera view settings
- Programming without actual equipment
- Point recorder panel to easily record, rename, view coordinates, hide, and delete points
- Create and run simple task programs using icons and graphical tools (no keyboard input required)
- Create and run simple and complex task programs by entering all necessary commands using the keyboard.
- Powerful set of task commands such as: Delay, Do-Until, If-Else, While-Repeat, and many others.

Theory:

In this lab first of all an overview of the environment of ROBOCIM software is given. The program generated in virtual environment of the software will be executed as it is in the real world, so this software is used to test the program produced before implementing it in the real world this will lead to increased security of the robot, in order to save robot from any damage as it is very expensive equipment.
The overall window of project of ROBOCIM is divided into three sections. These sections

provide various options for controlling robot position, orientation as well as control over external objects such as Gravity Feeders, Belt Conveyors, or Linear Slides:-

1. Upper right side showing virtual environment of robot and external objects attached to it.
2. Lower side is showing controller status and recording point options
3. Upper left side shows motion, object and program options.

The screenshot of the environment is given below:

In the project window of the ROBOCIM, following are the tabs present on the top:-

File	Motion	Controller	View	Window	Preferences	Help	Test

Options provided under above mentioned tab is given in detail below:-

- Motion:
  - Cartesian System
    - XYZ coordinates
    - Pitch
    - roll
  - Articulate
  - Joint motions
  - Gripper
    - Open
    - Close
  - Set soft home

- Clear soft home
- End effecter movements

- View:
  - Work surfaces
  - Joint axes: on every joint there will appear an axis if this option is selected
  - End effecter axes: on end effecter axes will appear if this option is selected
- Windows:
  - 1 window
  - 2 window:- shows windows with XY, YZ, XZ options
  - 3 window:- bottom split and top split
  - 4 window

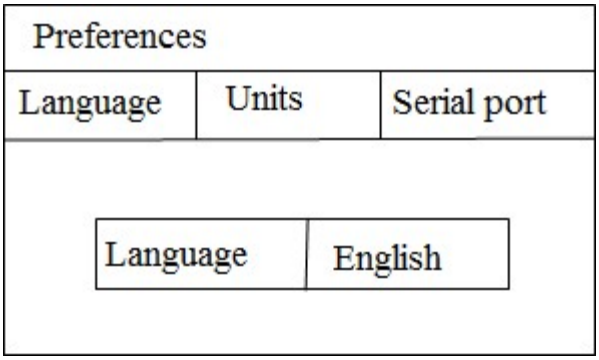
Windows can appear in two forms:-

1. Stalked
2. Side by side

- Preferences:

Should always be set at start of the project

- Language
- Unit
  - Millimeter
  - Meter
  - Inch
  - Feet
  - Centimeter
- Serial port



After the above explained tabs, there appears following two options:-

1. Simulation:-

This should be selected when work only to be done in virtual environment that is only towork on the ROBOCIM work window

2. Control:-

This should be selected when the Lab-Volt robot has to be moved in real time togetherwith the movement in the environment.

On lower side:-

There is a red button is used to record and save point in the memory and project window,same as learn GP command in workspace.
To get information of any point use this button:-

On the extreme left there is window with following information:-

1. Motion Tab:

In motion tab, options are available for movement of all the joints in the lab-volt robot.For movement of joints use these two buttons:

Gripper motion control is also provided in this tab. Status displays the number of external devices connected with the robot. Here two channels are provided to connect external devices.

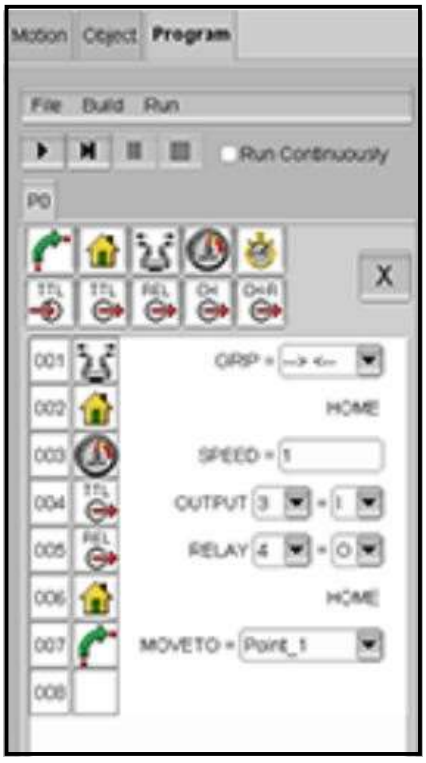
2. Options Tab:

In object tab:

- We can see that as robot is already added, so we can edit properties of the robot.
- Grid option is available to place robot at place of one's choice.
- New tab is used to add new library
- Library contains different external objects that can be added in the virtual environment
- For example add linear slide, change position and orientation from the options tab
- Connect
  - Linear slide on channel1
  - rotary carousel on channel2
- To place robot on linear slide so that it can move on it, go to robot position tab, click and check ROBOT ON THE LINEAR SLIDE tab, use FLIP ROBOT for changing orientation of robot.
- Add rotary carousel on channel 2 and then go to its properties showing terminal connections:-
  - Normally open(yellow) → TTL1
  - Normally close(blue) → TTL2
- Add gravity feeder now, gravity feeders do not require channels, select number of parts you want to add in properties of gravity feeders and given terminal connections:-
  - Normally open(yellow) → TTL3
  - Normally close(blue) → TTL4

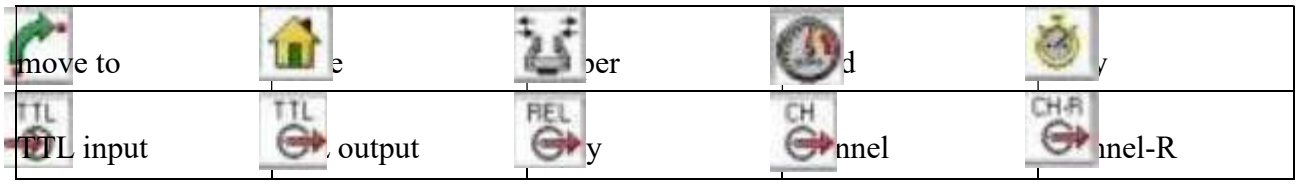
3. Program Tab

When all the required objects are added go to the program tab for icon programming. Programtab will show following drop down menu:-



Icons Explained:-

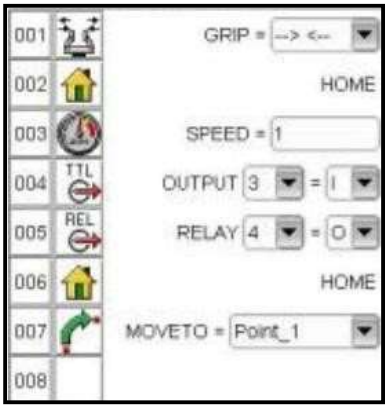
Go to program tab check icon programming (in file Tab) now following tabs will be available in programming:-



Procedure for programming is:-

- Start to program now
- Click home and no setting options will be given
- Click move to, and give points using setting menu. Record point by clicking red button saved points will appear in drop down menu
- Click speed icon, give speed between 1 and 99
- Click gripper options for gripper opening and closing.
- Add TTL inputs
- Add delay
- Build
- Compile
- run

Sample program:-



Procedure:

- Go to start menu
- Open ROBOCIM
- There will be two options available when ROBOCIM opens:

- Create a new project
- Open an existing project
- Do hard home
- Now add points in the motion tab, by using record button, create a list of required points having desired motions
- Go to object tab add required objects as explained in detail up in the theory section.
- Go to programming tab and use icons to add points movements, speed and delays
- Compile program and run on only software with the help of simulation tab and on hardware with control tab checked.

Analysis:

ROBOCIM is a very useful, important, user friendly and easy software used to control Lab-Volt robot system. This software provides control over robot as well as external devices attached to it. It provides option to develop a complete copy of real time environment in software it will help students to understand functionality of robot without damaging it.