DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING
UNIVERSITY OF TEXAS AT ARLINGTON
INTRODUCTION TO ROBOTICS - ME 5337
PROJECT #3
DUE DATE: SIX CLASS MEETINGS FROM ASSGINED DATE
TOPIC: REAL WORLD APPLICATION ON
EXPERIMENTATION WITH GMF S-110 INDUSTRIAL ROBOT

The main element of this project is the experimentation with an articulated robot, a GMF S-110. Observe the safety rules since motion and workspace of this robot are not as intuitive as those of the IBM 7535 SCARA. The main objectives of this project are to get familiar with structured robot programming, articulated robot capability, workspace reach, KAREL language (while, true, if, math operations, interactive programming, etc.), robot safety issues, program development, writing, compiling, executing, point teaching, extensive use of taught point information, and other issues as discussed in class.

Project requirements:

- Continue familiarization with the robotics lab and understanding of robot safety rules.
- Familiarize yourself with the basic articulated GMF S-110 robot, its operation, capabilities, workspace, etc.
- Familiarize yourself with the programming language of the robot. This language is called KAREL. **Note:** The programming language manuals are not to be removed from the lab.
- Learn how to power on the robot and calibrate as well as the functions of the teach-pendant – dead man switch, emergency stop, point teaching, etc.
- Learn how to write a KAREL program on the PC, download/upload it to/from the robot controller, compile and eventually execute the program.
- Learn how to instruct the robot to perform various types of motion available/capable such as point to point, via points, etc.
- Learn how to teach positions and save them.
- Learn how to utilize and move the robot relative to taught positions.

You will program the robot to perform a pick and place operation. The pick and place points are not always at the same locations. Therefore, you need to teach both of these points to the robot. Once the robot knows the pick and the first place points, you are to instruct the robot to pick up objects/parts and place them in a pattern.

The robot will have to pick up parts from a designated location on the conveyor system. You will be given a sample program for the Proximity Sensor and End Effector Close/Open commands/lines. Note that this is not the complete program. You must observe robot structured programming principles. Your program should be a modular and expandable as possible. Write your program assuming that you do not have a-priori knowledge of the number of parts to be manipulated.

NOTE:
DO NOT USE TOOL 1 ON THE TEACH PENDANT OR IN YOUR PROGRAM AS THIS ENABLES THE QUCK RELEASE MECHANISM ON THE QUICK CONNECT DISCONNECT COUPLER. RELEASING THE COUPLER WILL RESULT IN THE END EFFECTOR FALLING OF THE ROBOT.

Robot Speed Notes:

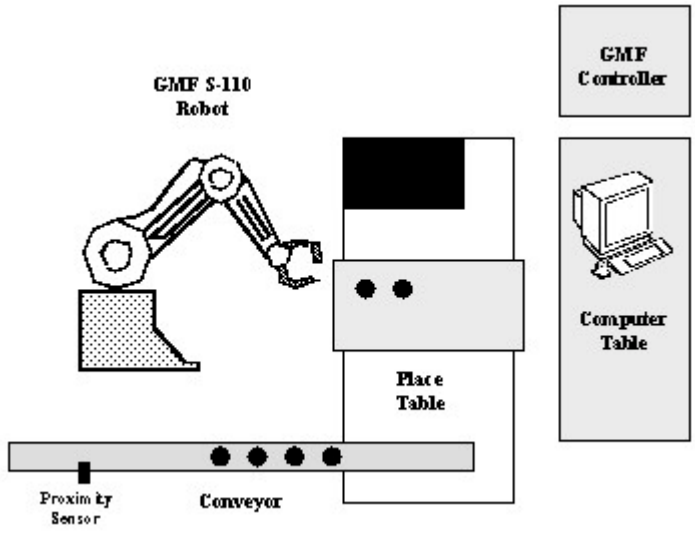
Set the speed on the teach pendant to 25%. You must set the speed of the robot to no more than 700 units in your program. The command is given in the sample program.

Teach Pendant Notes:

- Handle **very** carefully – do not drop
- Change the tool to **TOOL 2**
- Reversed Gripper Operations; Open closes the gripper and Close opens the gripper

KAREL Sample Program Lines

```
PROGRAM GET_PART
  VPAR
   PICK : POSITION
   PLACE : POSITION
   WHILE DIN[1] DO            -- wait for a part at proximity sensor
   $SPEED = 700               -- speed of robot
   OPEN HAND 2                -- gripper is reversed
   CLOSE HAND 2               -- gripper is reversed
:::::::
END GET_PART
```



- You are to turn in a formal project report.
- The demonstrations are to be performed at a day to be defined later.