Selectable Line Processor

ROB9205 (Final Project)

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DESCRIPTION

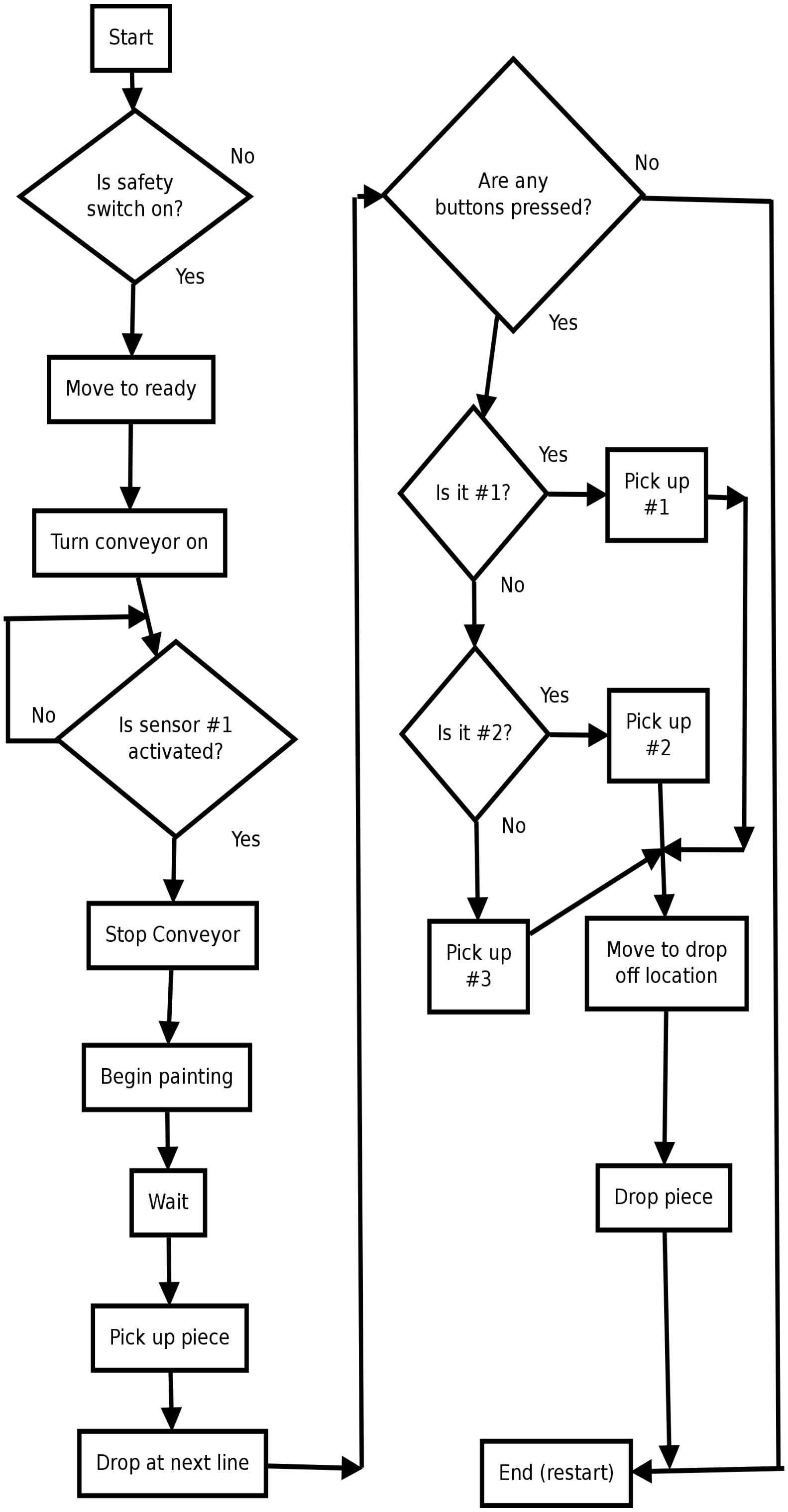
This project was designed for a multi-line production plant, where objects must be optionally moved with visual confirmation. The base requirements are a six axis robot, conveyor belt and two sensors. We decided to use a inductive proximity sensor for a safety switch as it is less likely to be activated accidentally, and a photoelectric sensor (Omron 33Z-D82 as used in the sensor project) for the destination sensor since it can be positioned further away (to avoid being covered in paint).

The creativity was implementing user input to decide how the automated process would continue. The process can be run indefinitely until an error is spotted, and can be switched to an alternative path. After, it can seamlessly be moved back to the main operation. Without this, it would require the user to reprogram the robot with the pedant or computer. Our program allows dynamic changes with three low cost pushbuttons.

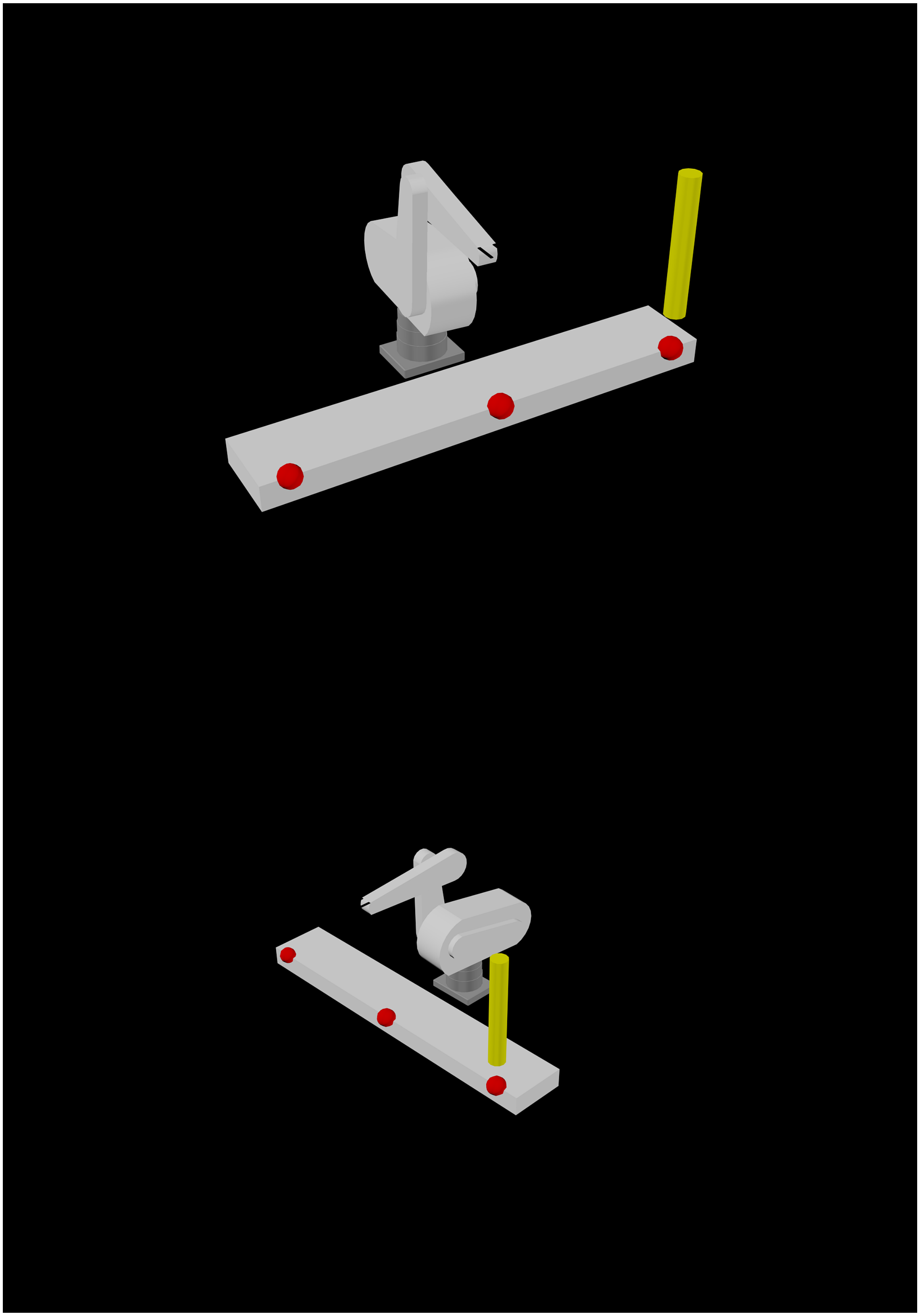
PROCESS

1. The program will only run in automatic mode if the enable/safety switch is on.
2. The robot will move into the ready position and open its grippers.
3. The conveyor belt will turn on and begin moving the parts down the line.
4. Once the sensor at the painting station has been reached, the conveyor will turn off and the painting process will take place.
5. The robot will pick up the finished product, and move it to the next assembly line (in our example program, the robot will move the piece back to the beginning).
6. The three user input buttons are checked, and if none are in use, the program will restart
7. If a button is pressed, the robot will move above the piece selected (#1, #2 or #3), and pick it up.
8. The piece can now be removed from the assembly line to a predefined location for further visual inspection.
9. The process will now repeat from the beginning.

FLOWCHART

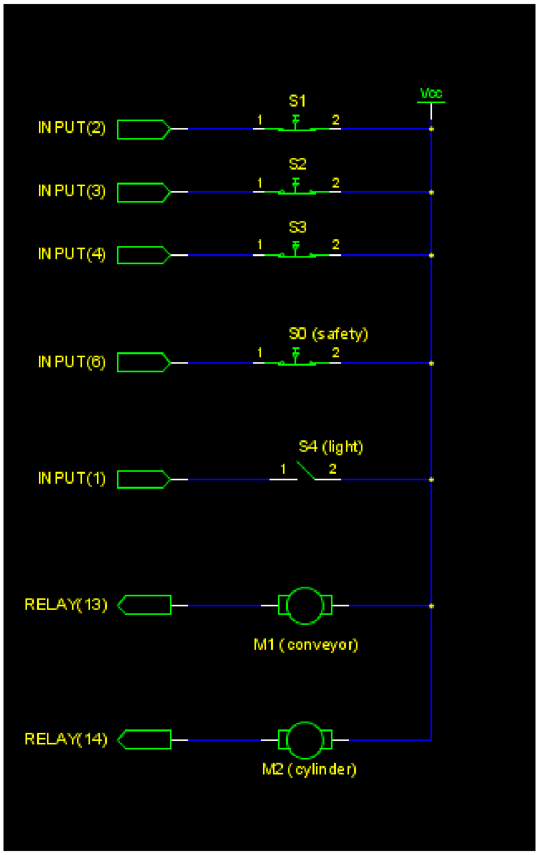

Start
Is safety switch on?
No
Yes
Move to ready
Turn conveyor on
No
Is sensor #1 activated?
Yes
Stop Conveyor
Begin painting
Wait
Pick up piece
Drop at next line
Are any buttons pressed?
No
Yes
Is it #1?
Yes
Pick up #1
No
Is it #2?
Yes
Pick up #2
No
Pick up #3
Move to drop off location
Drop piece
End (restart)

DRAWING/RENDER OF APPLICATION



As shown on the previous page, each red object represents a sensor and are used as a marker for each location (abovelocation1, abovelocation2 and abovelocation3 as seen in the code). The gray object represents a conveyor belt. The yellow cylinder is a representation of a paint gun.

WIRING DIAGRAM



PROGRAM

```
sub painting() ;; This is used for the painting process
  output_set(14, 1) ;; Turn on cylinder
  delay(500) ;; Delay for 500 milliseconds
  output_set(14, 0) ;; Turn off cylinder
  delay(500)
  output_set(14, 1)
  delay(500)
  output_set(14, 0)
  delay(500)
  output_set(14, 1)
  delay(500)
  output_set(14, 0)
end sub

sub liftbit() ;; This process is used to gently lift a piece
  grip(3) ;; Ensure that the grippers are open
  grip_finish()
  tz(40) ;; Go down (not used in courseware, command #1)
  finish()
  grip(2.25) ;; Clamp down
  grip_finish()
  tz(-40) ;; Lift up
  finish()
end sub

sub pieceremoveal(int n)
  case n ;; Not used in courseware, command #2
    of 1:
      move(abovelocation1)
      liftbit()
      move(droparea)
      grip(3)
    of 2:
      move(abovelocation2)
      liftbit()
      move(droparea)
      grip(3)
    of 3:
      move(abovelocation3)
      liftbit()
      move(droparea)
      grip(3)
  end case
end sub

main
teachable cloc abovelocation1, abovelocation2, abovelocation3, droparea
speed 25
startinghere::
if(input(6)) ;; safety switch
  ready()
  grip(3)
  finish()
  output_set(13, 1) ;; this is the conveyor, turn it on
    if(input(1)) ;; light sensor 1
    output_set(13, 0) ;; turn off belt
    painting()
    move(abovelocation1)
    liftbit()
    output_set(13, 1)
    move(abovelocation3)
    sensorspot::
      if(input(1)) ;; This is the light sensor
        output_set(13, 0)
        tz(40)
        finish()
        grip(3) ;; drop the piece
        tz(-40)
        goto startinghere
    end if
    goto sensorspot
  end if
end if

if(input(2) || input(3) || input(4)) ;;If any of the remove buttons area
pressed (OR operator not used in courseware, command #3)
  if(2)
    pieceremoveal(1) ;;Variable passing not used in courseware, command #4
  end if

  if
    pieceremoveal(2)
  end if

  if
```

```
    pieceremoveal(3)
  end if
end if

goto startinghere
end main
```