PYTHON BASED DATA PRESENTATION OF INDUSTRIAL AUTOMATION

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Abstract **A set of predefined jobs executed sequentially and systematically by the help of hardware and software is the concept of industrial automation. Industrial automation helps in Increasing Productivity, Increasing Quality, Reducing Cost, Increasing Safety in working conditions.**

Industrial automation is basically consisting of Hardware control, Software control and Field instruments. Hardware control is consisting of microcontrollers, PID controllers, PLC controllers and DCS controllers. Software controller is SCADA and field instruments is consists of sensors and output devices.

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Python's simple, easy to learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse.

Keywords **Programmable Logic Controller (PLC), Supervisory Control And Data Acquisition (SCADA).**

I. INTRODUCTION

Python turns out to be surprisingly versatile in this setting, whether for prototyping a single conveyor belt or taming a building full of robots. This talk explains how to **use Python** for interfacing with two common **industrial automation** devices: a barcode scanner and a Programmable Logic Controller (PLC).

The only thing we have used Python for recently was to take a PLC database and translate it into a bunch of EXCEL files. It is better in my opinion to work on something other than the working database to get those translations right or sensible.

One advantage that we did realize a bit afterwards is that we can store additional data in these files such as data on field devices, calibration info and set points. As such, kind of wish that we had used python to port the comma separated database to some sort of relational database. It is actually a good example of the power of Python and the associated libraries.

II. Python based data presentation of Industrial Automation

a. Basic principle

Here we have tried get a temp sensor parameter dipped in a fluid in side a container. The container is then heated with a help of a heater. The sensor is connected to the PLC input card and heater is connected

to the PLC output card. In the PLC we have written a ladder diagram to get the temperature sensor data ant to control the heater.

A SCADA design and program is written inside the SCADA software, which will display the temperature data on the screen. Then this data is feed to a EXCEl file by using DAT BASE CONNECTIVITY property inside the SCADA. So the change in temperature will be displayed in PLC, SCADA and EXCEL simultaneously.

The temperature data will be then fetched from EXCEL file to PYTHON software. Python software will display the data in a graphical representation format. The program of Python is shown below for reference

b. Python program

```
import xlrd
import matplotlib.pyplot as plt
sheet=xlrd.open_workbook ("E:/python/Test/demand1.xlsx").sheet_by_index(0)
times=[]
temps=[]
for row in range(0,5):
    time = sheet.cell_value((row+1),0)
    temp = sheet.cell_value((row+1),1)
    times.append(time)
    temps.append(temp)

plt.plot(times,temps)
plt.title(" Time Vs Temperature ")
plt.xlabel(" times ")
plt.ylabel(" temps ")
#plt.xlim(20,60)
plt.show()
```

Figure 1: Program of Python

III. Architecture, standards and data processing

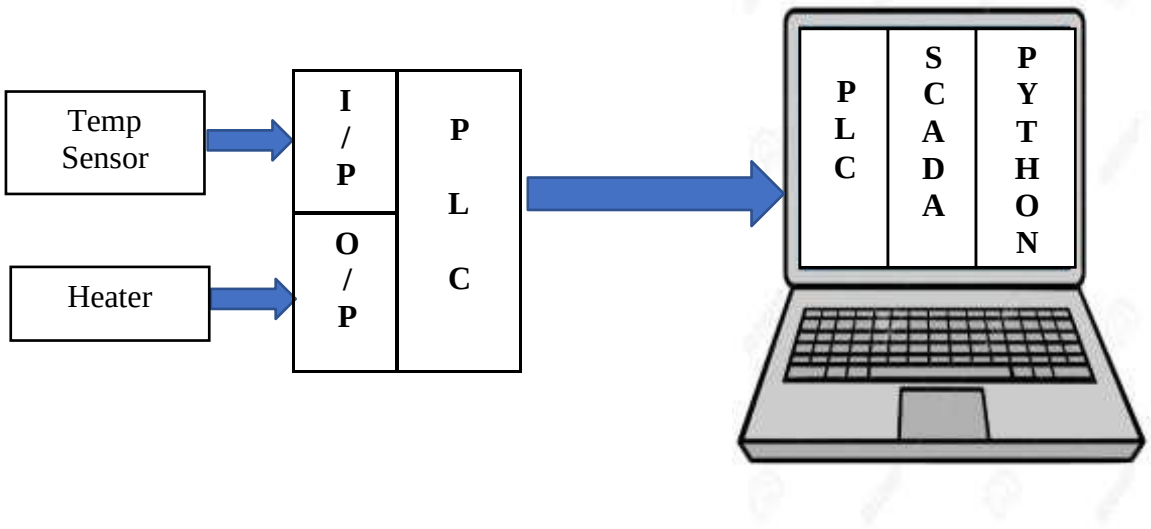

Figure 2: Signal flow Block Diagram

IV. Application Python based data presentation of Industrial Automation

- Python can be use with Industrial Automation for display the data in 3D or 4D graph pattern
- It can be used for predictions of faults.
- It can be used for huge data storage.
- It can be used for the process control and estimation and costing of the product, time, quality, etc.

V. Result and Analysis

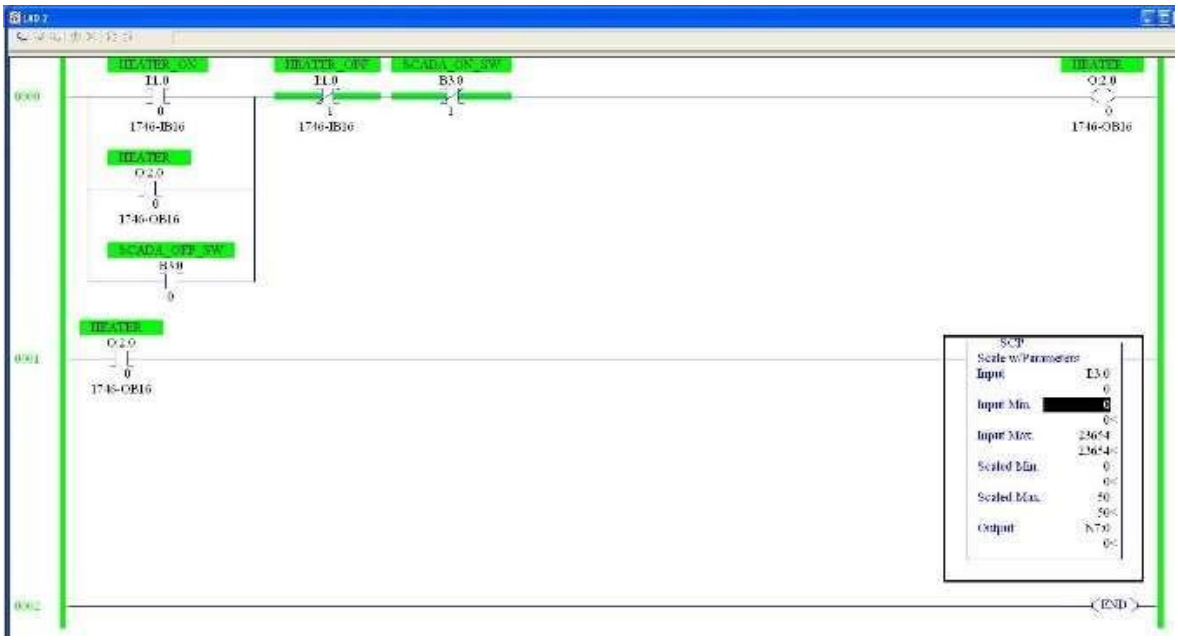

Figure 3: PLC Program

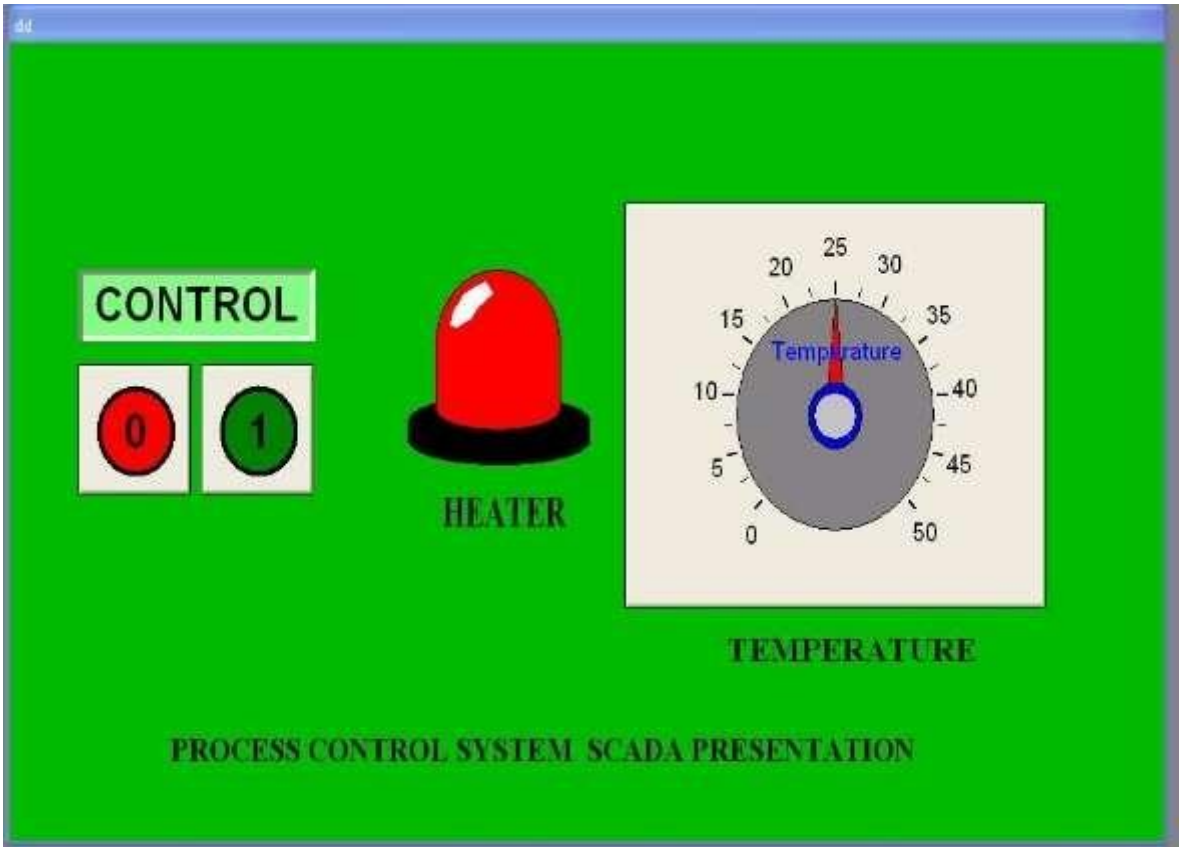

Figure 4: SCADA Visualization

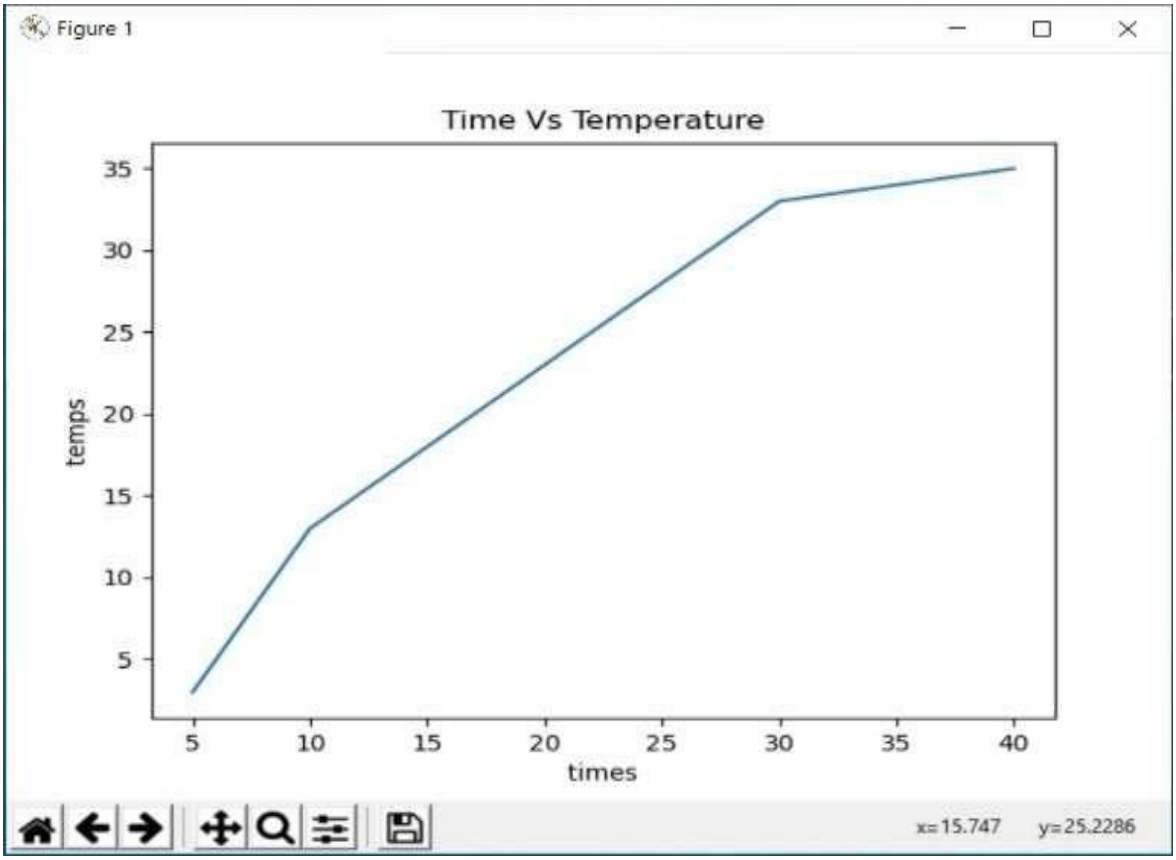

Figure 3: Python Program output

VI. Conclusion

We presented this paper to introduced the concept of a system in which smart sensors were applied to monitor and control the various industrial parameters. The temperature sensor output is scaled inside the PLC which is calculated and then SCADA gets the data for presentation as well as the data is feed to excel and we get the desired value in the EXCEL. Then the Data is processed as per requirement of Python and the output is presented in the format of graph.

VII. References

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