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DEVELOPMENT OF DAQ & GUI FOR INDUSTRIAL APLLICATION

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ABSTRACT
This project deals with the study of an old analyzer which is very expensive and used for estimation of strategic elements. The analyzer is working on DOS (Disk Operating System) and old electronic hardware which are obsolete in the market. Therefore, the old hardware and its frequent problems, it was planned to upgrade the analyzer with latest electronic hardware and GUI (Graphical User Interface) software compatible to latest windows operating system. Catalyst temperature of the analyser is one of the important parameters which need to be measured and controlled. For this purpose, analyser was using old PID board which was obsolete and not working. As a part of under graduation the PID board is to be replaced with latest PID controller. Suitable PID Controller is to be selected and configured for attaining the temperature of 350°C.

1. INTRODUCTION

- A steel sample is taken and it is melted at a temperature then certain gases will be evolved. From the evolved gases carbon and Sulphur gases data will be measured.
- Here IR (infrared) detector is used for detecting the gases and PID(Proportional-Integral- derivative) controller is used for the algorithm control to regulate process variables.
- The obtained data of Sulphur and carbon from the IR detector is stored in the DAQ Card i. e (NI 6341), which is then stored in the database using Mongodb and SQLITE3.
- Later for the visualization of the data GUI is developed with the help of PYQT5 and QT Designer.
- Moreover, for the graphical representation of the obtained data we are using MatPlotLibrary that plots the given data for better analysis.
- After developing the GUI interface when we try to retrieve the data of a specific cell by selection the process is being freezed. Thus, to overcome this problem QThreads are used
- The designs for the user interface, the color, the spacing, the fonts are styled using CSS i.e., Cascading Style Sheets.

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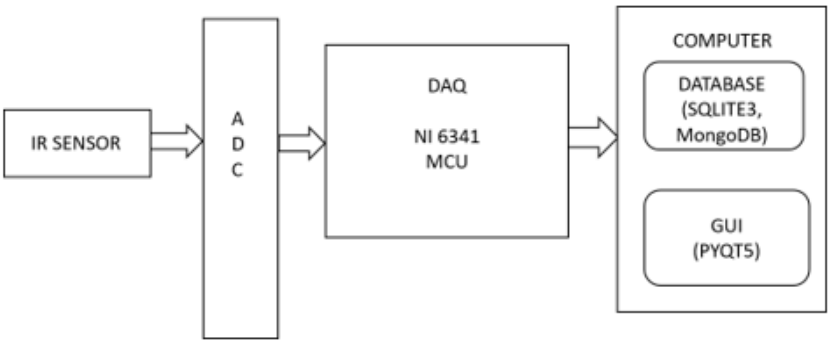

Fig 1.1: Block Diagram of the system

2. PID CONTROLLER

A proportional–integral–derivative controller (PID controller) is an instrument used in industrial control applications to regulate temperature, flow, pressure, speed and other process variables. PID (proportional integral derivative) controllers use a control loop feedback mechanism to control process variables. PID controllers are the most accurate and stable controller.

A PID controller continuously calculates an error value e(t) as the difference between a desired setpoint (SP) and a measured process variable (PV) and applies a correction based on proportional, integral, and derivative terms (denoted P, I, and D respectively).

In practical terms, PID automatically applies an accurate and responsive correction to a control function. An everyday example is the cruise control on a car, where ascending a hill would lower speed if constant engine power were applied. The controller's PID algorithm restores the measured speed to the desired speed with minimal delay and overshoot by increasing the power output of the engine in a controlled manner.

The first theoretical analysis and practical application of PID was in the field of automatic steering systems for ships, developed from the early 1920s onwards. It was then used for automatic process control in the manufacturing industry, where it was widely implemented in at first pneumatic and then electronic controllers. Today the PID concept is used universally in applications requiring accurate and optimized automatic control.

Fig 2.1: PID Controller

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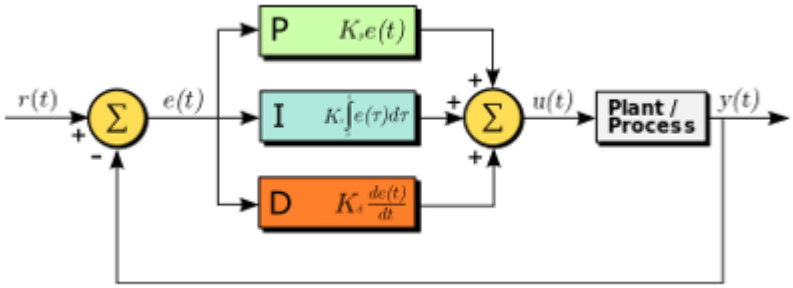

Fig 2.2: A block diagram of a PID controller in a feedback loop. r(t) is the desired process value or setpoint (SP), and y(t) is the measured process value (PV).

2.1 P- Controller:

Proportional or P- controller gives an output that is proportional to current error e (t). It compares the desired or set point with the actual value or feedback process value. The resulting error is multiplied with a proportional constant to get the output. If the error value is zero, then this controller output is zero.

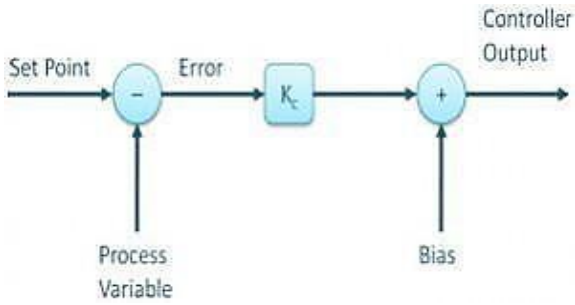

Fig 2.3: Block diagram of P-Controller

This controller requires biasing or manual reset when used alone. This is because it never reaches the steady- state condition. It provides stable operation but always maintains the steady-state error. The speed of the response is increased when the proportional constant Kc increases.

2.2 MONGODB Vs. RDBMS:

Table 2.1: Differences between SQL & NOSQL

RDBMS	MONGODB
RDBMS is a relational database model in which data is stored in multiple tables.	MongoDB is an open source, document-oriented database that has no concept of tables, schemas, rows or SQL
Records are stored as rows in tables, wherein table are organized into columns with each column to one datatype.	MongoDB uses different formats to store data such as document stores, graph databases, key-value stores, and more.

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It follows a typical schema design comprises of several tables and relationships between them.	It is based on a schema-less data representation with no regards to the concept of relationship.
RDBMS databases are vertically scalable meaning when database loads increase, you scale database by increasing the capacity of existing hardware.	MongoDB is a one-size-fits-all database and is considered to be more scalable than the traditional RDBMS database models.

3. Design methodologies:

As the size of CSS resources used in a project increases, a development team often needs to decide on a common design methodology to keep them organized. The goals are ease of development, ease of collaboration during development, and performance of the deployed stylesheets in the browser. Popular methodologies include OOCSS (object-oriented CSS), ACSS (atomic CSS), CSS (organic Cascade Style Sheet), SMACSS (scalable and modular architecture for CSS), and BEM (block, element, modifier).

CSS frameworks are pre-prepared libraries that are meant to allow for easier, more standards-compliant styling of web pages using the Cascading Style Sheets language. CSS frameworks include Blueprint, Bootstrap, Foundation and Materialize. Like programming and scripting language libraries, CSS frameworks are usually incorporated as external .css sheets referenced in the HTML <head>. They provide

a number of ready-made options for designing and laying out the web page. Although many of these frameworks have been published, some authors use them mostly for rapid prototyping, or for learning from, and prefer to 'handcraft' CSS that is appropriate to each published site without the design, maintenance and download overhead of having many unused features in the site's styling.

Selectors may be combined in many ways to achieve great specificity and flexibility. Multiple selectors may be joined in a spaced list to specify elements by location, element type, id, class, or any combination thereof. The order of the selectors is important. For example, `div .myClass {color: red;}` applies to all elements of class

myClass that are inside div elements, whereas. `.myClass div {color: red;}` applies to all div elements that are

inside elements of class myClass. This is not to be confused with concatenated identifiers such as `div.myClass {color: red;}` which applies to div elements of class myClass.CSS is used to define styles for

your web pages, including the design, layout and variations in display for different devices and screen sizes.

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4. RESULT AND OUTPUT

FIG 4.1: COMPLETE CS-400 SYSTEM

FIG 4.2: ANALYSIS GRAPH-1

FIG 4.3: ANALYSIS GRAPH-2

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FIG 4.4: ANALYSIS GRAPH-3

CONCLUSION

Tools and devices are upgrading frequently by replacing all the complications faced by the previous one. This evolution always helps to do the things in an efficient way. Like the old analyser which is which is very expensive and used for estimation of strategic elements in this project is upgraded with the latest analyser i.e., PID with latest electronic hardware. With this we can achieve our desired output with almost no error. Along with that the RDBMS which is very fixed and need more memory is replaced with the NoSQL database i.e., MongoDB. This MongoDB is a document-oriented database in which we can vary the usage of the memory accordingly. We can also add the required data whenever needed as it is not fixed. Thus, efficient tools make the work more productive with the better workflow.

FUTURE SCOPE

- We can easily calculate the peak and steep points of the sample data from the database.
- We can also use GUI development in car dashboards and also for the automated dashboards.
- Python Mongodb is useful in storing the data in all types of sectors in the society, for instance in agriculture sector we can store all the crop yielding fields data in database.

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