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# **1. INTRODUCTION**

## 1.1 AIM

Design of DAQ for acquiring 8 channel analog voltage or temperature and 8 channel digital data. System shall maintain record for 1 month in local storage. Live stream to PC shall be supported.

## 1.2 PROBLEM STATEMENT

* Consult customer and obtain detailed requirements.
* Design GUI.
* Decide mechanism for data storage and retrieval.
* Design algorithm, data format and structures for storage and transmission of data.

## 1.3 DOCUMENT CONVENTIONS

|  |  |
| --- | --- |
| ADC | Analog to Digital Convertor |
| DAQ | Data Acquisition |
| GUI | Graphical User Interface |

## 1.4 INTENDED AUDIENCE AND READING SUGGESTIONS

This project is a prototype for the analogue and digital data acquisition system and it is restricted within LTTS. This has been implemented under the guidance of Mr. Jagdish Prasad Sahu.

## 1.5 SCOPE

The purpose of this system is to collect data from a set of 8 temperature sensors, process it and store it on a local storage for a period of one month. This data is meant to be easily accessible through the GUI of the system for specific time periods, modify or delete it as per user requirement. The system is also designed to give the real-time readings of the data in the GUI.

# **2. DESCRIPTION**

## 2.1 PRODUCT PERSPECTIVE

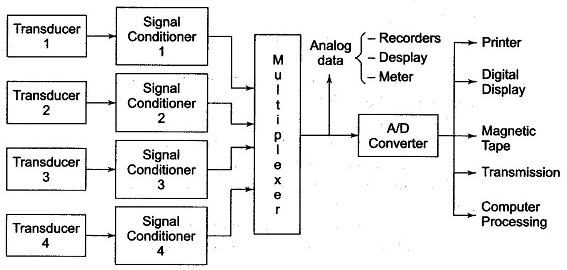
The project consists of:

* Temperature Sensor (PPG101JA / PPG101JB)
* Microcontroller (ATMega328P)
* USB to TTL Converter
* Computer

This project will store the following:

* **Temperatures** with respect to time for 8 channels
* **Analogue** reading of the sensors for all 8 channels w.r.t. time

## 2.2 PRODUCT FEATURES



## 2.3 USER CLASS and CHARACTERISTICS

The characteristic features of the GUI are:

* Switch to toggle between real-time data and saved data to be displayed.
* Ability to edit, delete and add data saved in the database

## 2.4 OPERATING ENVIRONMENT

* Centralised Database
* Operating system: Windows/Ubuntu.
* Database: CSV File
* Language: Python

## 2.5 ASSUMPTION DEPENDENCIES

* ADC word size is assumed to be 10 bits.
* Microcontroller has inbuilt pull-up resistance.
* Regulated steady DC power supply available.

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# **3. SYSTEM FEATURES**

## 3.1 STIMULUS/RESPONSE SEQUENCES

* + Search for dataset between two timestamps.
  + Add a new entry to the dataset.
  + Edit/Delete an existing entry from dataset.

## 3.2 FUNCTIONAL REQUIREMENTS

Other system features include:

### 3.2.1 CENTRALISED DATABASE:

Centralised database implies that all the data is recorded in a single location. It can be easily accessed by the application.

### 3.2.2 GRAPHICAL USER INTERFACE

Graphical User Interface makes easy to use the application for users. By using GUI, user can add a new entry to the dataset. Also, user can edit and delete the entry from dataset.

# **4. EXTERNAL INTERFACE REQUIREMENTS**

## 4.1 USER INTERFACES

* Front-end software: Python
* Back-end software: CSV file in python

## 4.2 HARDWARE

* Temperature Sensor: PPG101JA/PPG101JB RTD
* Microcontroller: ATMega328P/ATMega328
* Communication Interface: USB to TTL Converter
* Power Supply: Regulated DC Power supply 5V.

## 4.3 SOFTWARE

Following are the software used for the Analog and Digital Data Acquisition System.

|  |  |
| --- | --- |
| **Software Used** | **Description** |
| Operating System | Windows/Ubuntu (32 bit/64 bit) – Application will support both the platforms. |
| Database | Storing the data entries in CSV file. |
| Python | To implement the application, python language is used for better understanding |
| RAM | 2 GB recommended |
| Memory | 1 GB free disk space recommended |

## 4.3 COMMUNICATION INTERFACES

The communication interfaces used for this project are UART for communication between the microcontroller and the computer.

## 4.5 HIGH LEVEL REQUIREMENTS

|  |  |
| --- | --- |
| **ID** | **Description** |
| HL\_01 | Input from temperature sensor |
| HL\_02 | Live stream Output |
| HL\_03 | Storing data entries |
| HL\_04 | Graphical User Interface |
| HL\_05 | Number of samples per minute |

## 4.6 LOW LEVEL REQUIREMENTS

|  |  |
| --- | --- |
| **ID** | **Description** |
| LL\_01 | Sensors to measure temperature |
| LL\_02 | Graphical User Interface |
| LL\_03 | PPG101JA / PPG101JB |
| LL\_04 | ATMega328P / ATMega328 |
| LL\_05 | USB to TTL converter |

# **5. NONFUNCTIONAL REQUIREMENTS**

## 5.1 QUALITY ATTRIBUTES

* **AVAILABILITY:** The data for all 8 sensors shall be stored for one month (30 days) and shall be accessible at any point of time or live feed as per user requirement.
* **CORRECTNESS:** The data shall be stored correctly for the specific channel and there shall be minimal lag while showing the live data.
* **MAINTAINABILITY:** The data shall be easily editable to add, modify or delete to eliminate errors.
* **USABILITY:** The GUI shall be easy to use with intuitive and interactive controls.

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# **6. REFERENCES**

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