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A Review on Data Logging System

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Abstract: A data logger, as the name suggests, it is a specific kind of electronic device that captures data over time and monitors changes in environmental variables. It is a versatile tool employed in areas such as scientific research, industrial processes, and building automation systems.

The main function of a data logger is to gather and save information from sensors or other sources for future analysis. This information can be examined later to identify recurring patterns or trends, to resolve issues, or to adjust processes or systems when necessary. Logging data can be used to find a pattern, and analysed behaviour to know conditions in past, it is very important to monitor and log environmental data related to processes this data gets stored with a time stamp, it can be used in the future if required. In this review paper, we primarily focus on the temperature parameter because it is one of the most important environmental variables affecting daily life.

Keywords **- Adriano, Datalogger, Temperature.**

Mr. S. M. Gosavi , at all [1] presents the idea on an IoT-Based Weather Monitoring System Using Arduino UNO, The project primarily combines the two-study fields-based control systems and data collection approach, in order to establish a huge database system based on the qualities used to generate the provided data. The major items here were picked based on the sensors that are widely utilized to develop the system in order to design an effective weather monitoring project. The recommended sensors are used to monitor and collect data on temperature and humidity. Weather Monitoring presents a method for real-time weather monitoring using a mobile application Arduino UNO provides this low-cost or low-cost platform for connecting all of these electronic devices and many sorts of sensors over the internet network. The major goal of the effort is to record weather that can be readily checked remotely using an Arduino UNO and the Internet of Things. This will make it easier, more reliable, and faster for users to monitor weather and other environmental indicators.

Nuvruta Aji , at all [2] Presents Utilizing an Internet of Things (IoT) system architectural concept is suggested to detect temperature and relative humidity through the use of a DHT11 temperature and humidity sensor. The sensor's ESP32 Wi-Fi microcontroller is capable of communicating with an Open Platform Communication (OPC) server through the SNMP (Simple Network Management Protocol), which is often employed to handle network devices and data transmission. In order to identify network variables, Object Identifiers (OIDs) are employed and saved in the MIB (Management Information Base). These two components are required by the SNMP monitoring tool in order for the user to keep track of the network infrastructure and execute troubleshooting operations.

Data gathered by the ESP32 Wi-Fi microcontroller is received via SNMP on the OPC server and transferred to an OPC Client and an OPC data logger. A ping channel is included in the OPC server for network latency measurement. In addition, the ESP32 microcontroller was linked through Wi-Fi to a mobile application, allowing for real-time data presentation alongside the HMI. The suggested system architecture layout's SNMP network latency test resulted in 126.33 ms for 13 minutes with no defective data packets. According to the findings, SNMP can serve as an alternative protocol for IoT data transport, which has the potential to provide reliable and efficient data transfer for a wide range of applications.

Vivek Sehgal, at all in[3] presents Accurately capturing real-time data of operational variables is crucial in various process dynamics. In certain applications, process variables, such as temperature, pressure, flow, and level, may fluctuate over time, necessitating recording to enable control actions at specified set points. This study details the development of a portable data recorder, utilizing an 8-bit embedded controller connected to a temperature sensor through an A/D converter. The recorder is designed to track and record temperature fluctuations, which are displayed on a liquid crystal display (LCD) connected to the 8-bit integrated controller. Furthermore, the temperature data can be wirelessly transmitted to a PC or a PDA communication port using either an Infrared or Bluetooth connection.

Tarun Singh, at all in[4] Data logging has become a crucial aspect of contemporary measuring and instrumentation systems. Almost every industrial process necessitates data logging. They propose the design and development of a two-channel data logger in this work, which offers an inexpensive and practical means for keeping track of the voltage, current, power, and energy of two PV solar panels. The prototype data logger is based on the Arduino UNO and can save data to an SD card or in a smartphone. This data logger enables remote monitoring and data recording. This data logger's design is entirely based on open-source hardware and software components. The smart features of this data logger include measuring and monitoring the various parameters of two PV solar panels, as well as logging the data on suitable electronic devices.

Najawa Nazahua Mahzan, at all in[5] A universal data logger has been developed for photovoltaic (PV) monitoring systems, which is capable of storing vast amounts of data from multiple input channels in large memory storage. The system includes an Arduino Mega 2560 board, coupled with the ATmega2560 CPU, to process the incoming data. The data logger is used to monitor the electrical characteristics of a 240-W PV system, with the results sent to the input channels of the data logger. The raw data is then converted into digital input for data collection, and it is stored on an SD card.
A DS1307 Real Time Clock (RTC) chip is also included in the data logger to time stamp the data on the SD card after each recording procedure. To validate the data, the observations and outcomes are compared to data obtained from a commercial Data Taker DT80 data logger throughout the testing stage. Throughout the testing process, this will be utilized to assess the reliability as well as efficiency of the given data logger. The data logger findings will be compared to the commercial data logger to confirm data correctness and reliability.

Soman Saha, at all in [6] A low-cost multi-channel (eight to twenty-two channel) data logger may be simply developed and used to transform the analogue signal of physical parameters of various tests or other engineering reasons. A proper programme code can be used to digitally read the value using a PC. Their goal was to offer a module and a software package that, when placed in a computer, allows one to remotely capture and monitor many signals of the same or different sorts consecutively at the same time. Signals from numerous sensors have been successfully conditioned. Interfacing these signals with an ADC and a computer's parallel port now fulfills the purpose of data capture. The ease of use and dependability of a PC and channel selection multiplexers contribute to the data logger's flexibility. The design and installation of such equipment costs about $30, making it quite affordable in comparison to other commercially available data loggers.

Miss Arati Sawarkar, at all in [7] The paper describes a data gathering system for temperature, pressure, and humidity in real-time process dynamics. A web page allows the user to track their energy use. The Wi-Fi unit works by delivering data from the load gathered by IOT activities to the cloud, which may be viewed via the system's homepage. The suggested system makes use of an Arduino microcontroller, and the data created by IOT activities is transmitted to the cloud over the internet. The created data unit is retrieved from the cloud and shown on the analytical webpage through the internet, making it easy to examine and thereby providing detailed energy use statistics to the authorized user.

Pramod Aradwad , at all in[8] To prevent losses during harvesting, food grains are often collected with a higher moisture content. However, it is critical to maintain and improve food quality during drying and storage by controlling vital variables such as temperature and relative humidity. Monitoring and controlling these characteristics in real time can enhance post-harvest processing and decrease losses. A data logger was created to achieve real-time monitoring of drying and storage conditions. The data logger includes a precision integrated sensor for relative humidity and temperature (DHT22), an SD card, an LCD, an RTC 3231 for real-time humidity and temperature tracking and data collection, and a motor control driver. To combine these components into a single platform for sequential operation, an open-source software program was developed. A double-walled insulated silo exhibits less temperature and humidity variation than a single-walled or triple-walled plastic storage structure. The key benefits of this system's architecture are its affordability, adaptability, durability, and user-friendliness in a variety of settings.

Mr.Suleiman M., at all in [9] With the progress of scientific and technical research and manufacturing processes, data collection systems have become an essential tool. The need for cost-effective data recording systems to manage the complexity of data collection and processing has grown along with these advances. To meet the need for temperature and humidity data acquisition in research and industry, this study developed an embedded system capable of monitoring and analyzing these variables at predetermined time intervals.
The hardware design comprises five functional parts: an ATMega328P, a real-time clock, a liquid crystal display unit, an SD card, and a DHT22 for data collection. Collected data is saved and analyzed. A 16 x 2 alphanumeric LCD visual interface display device is utilized to handle and display the collected data. This useful technology simplifies data logging and makes it more effect ive. During testing, the temperature and relative humidity errors were 2.24% and 3.12%, respectively, demonstrating remarkable accuracy and the ability to carry out the required function.

Ahmad shukri fazil rahman, at all [10] Developing an interface to extract data from a low-cost data logger was accomplished by designing a graphical user interface (GUI). The data logger was developed using a standard pic18f4550 microcontroller with an Electrically Erasable Programmable Read-Only Memory (EEPROM) module for simple data recording. The graphical user interface (GUI) programme was created in VB.net 2013 and evaluated in a Windows 10 operating system. Proteus VSM software was used to simulate temperature and humidity sensors. The GUI exhibited its capacity to gather data from the data logger and convert it to Comma-Separated Values (CSV) format via the simulation and prepare it for further analysis.

Ahmad shukri fazil rahman, at all in [11] presents in. Monitoring vehicle performance in terms of fuel consumption, velocity, and other relevant characteristics is critical for determining if a vehicle is functioning at peak efficiency. The aim of this research is to create a novel data-logging system that can oversee the overall performance of vehicles. Data was acquired via a wireless device mounted to the automobile, which sent data to the base station. An 8-bit Single-Chip Microcontroller was used to build the data logger (data acquisition processor). Speed, revs, fuel levels, and temperature probes installed in the experimental vehicle gave the

necessary data. The data collection processor then processed the data before sending it to a computer through an RLM3000-Radio Link Modem. The data logger laboratory findings at various speeds, revs, and fuel levels are shown and discussed here.

Zuraidi saad, at [12] all The research presented here describes the design, development, testing, and deployment of a portable temperature data logger for use in a severe industrial setting. The data logger is powered by 5V and features an open source Arduino microcontroller that allows for the integration of multiple thermocouple sensors with their modules. The system also includes secure digital (SD) card storage, a liquid crystal display (LCD), a real-time clock, and a sturdy acrylic electronic case. The data logger is designed to collect eight thermocouple readings at three-second intervals and display them on the LCD at the same time. The recorded temperature data during hydro distillation showed a consistent profile pattern, with the second round of hydro distillation resulting in the highest yield of extracted oil at 0.004%. The study successfully achieved its objective of developing an affordable, portable, and resilient eight-channel temperature sensor module capable of collecting and storing real-time data.

Literature Survey Comparison Chart :

Sr.No.	Name of author	Technology	Advantages	Disadvantages
1	Mr. S.M.Gosavi , at all in [1] IoT-Based Weather Monitoring System Using Arduino UNO.	-Arduino UNO -DH11 (Temperature sensor) -Rain sensor -Carbon monoxide sensor -ESP 8266 wifi module	-Sensor values are stored in text files. -Output is displayed on the LCD screen	-No IP protection -No local memory.
2	Nuvruta Aji , at all in [2] IoT-Based Temperature & Relative Humidity Monitoring System Using Simple Network Management Protocol.	-SNMP(Simple Network Management Protocol) -OPC server -MS Access -ESP 32.	-Multiple layers of protocols are used. -HMI used.	-Can not connect to the internet directly. -System is complex. -A lot of protocol is used.
3	Vivek Sehgal, at all in [3] Smart Wireless Temperature Data Logger.	-8052 microcontrollers -Max 232 is used.	- The outcomes of the temperature measurements are transmitted to a personal computer for analysis and storage. -A comparison is made between each temperature reading and a custom-defined threshold value.	-8 bit ADC is used.
4	Tarun Singh, at all in [4] Design & Development of Photovolatic Solar Pannel Data Logger.	-Hall effect sensor (ACS712) -Arduino uno -Bluetooth	-Bluetooth module is used for wireless communication. -Provision to store data locally. -Multiple measurements are taken from a single parameter.	-No IP protection is used. -Multiple methods are used to measure single parameter
5	Najawa Nazahua Mahzan, at all in [5] Design & Development Of An Arduino Based Data Logger For Photovoltaic Monitoring System.	-RTC protocol (PROTO) -Arduino uno	-It operated on two modes i.e. login mode , downloading mode. -It generates time stamp	-No ethernet connectivity.

6	Soman Saha, at all in [6] Design Of Low Cost Multi-Channel Data Logger.	-PC-based system -Software is used to store data	-Online analysis take place. -Software is used to select parameters & readout parameters.	-It is not mobile. -Dedicated display screen is not used.
7	Miss Arati Sawarkar, at all in [7] Real Time Data Logger & Cloud Based Data Management System.	-Wi-Fi module.(ESP8266) -MSP430FE423A -DH22 (Temperature sensor) - Tomcat server	-Sensor values are stored in text files & upload it to server database -Output is displayed on the LCD screen -Real time data is acquired	-No IP protection -No local memory. -One way communication. -Less interoperability of different standards
8	Pramod Aradwad , at all in [8] Development of microcontroller-based data logger for real-time monitoring of drying & storage of food grains.	- DH22 (Temperature sensor - Arduino mega 2560 -DS3231(RTC) -SD card module -LCD display	-Low cost -long term stability -long distance signal transmission - Customized cost-effective real-time monitoring system.	-Physical size is large. -System is complex. -A lot of protocol is used. -power consumption is high.
9	Mr.Suleiman M., at all in [9] Design & Implementation of Digital Temperature & Humidity Data Logger & Its Comparative Analysis With The Convential-One.	-ATMega 328P microcontroller - DH22 (Temperature sensor -DS1307 RTC -24C02(Read-Only Memory) -LM7805(Shunt Regulated IC)	-Data can be stored -Time stamped data -	-System is complex -Not good accuracy of measurement.
10	Ahmad shukri fazil rahman, at all in [10] Conceptual Implementation Of Data Logger With A Graphical User Interface Data Extraction Program.	-GUI is used -pic18f4550 microcontroller -Proteus is used.	-Simulation is done -Provision to store data locally. -More handshaking protocol is used -.csv file is generated.	-No IP protection is used. -10 bit ADC is used
11	Zuraidi saad, at all in [11] Design and Development Of Data Logger For Testing Vehicle Performance .	-RLM3000(Radio Link Modem) -Single chip microcontroller - SMT technique is used.	-More cost effective -Less time consuming to fabricate -RS232 is used for data transmission	-No ethernet connectivity - 8 bit ADC is used -Limited number of changeable parameter.
12	M H Abdullah, at all in [12] Development Open Source Microcontroller Based Temperature Data Logger.	- Arduino mega 2560 -SD card module -MAX6675(Digital thermocouple amplifier) -RTC module -LCD module.	-Pc based system -.Stores real time data -System can avoid moisture and water related problem.	-It is not mobile. -Its time consuming -Cost effective.

Conclusion :

Many data loggers utilize the Arduino Uno, and adding internet connectivity is a significant advancement in technology that might make data loggers available worldwide. Data loggers can be found in temperature-sensitive devices such as air conditioners, microwave ovens, automobiles, and so on. Process industries in which there is no physical route between the sensor and the display device. By continually monitoring the temperature, it may be utilized to control several biological processes in which temperature is critical. It may be used to calculate the day's highest and lowest temperatures. Applications requiring many display units.

Reference :

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