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Development of a V-I Health Logger and Monitor for Electronic Appliances

Rohit More¹, Yashodip Hiwarale², Sneha Kendre³, Minal Deshmukh⁴, Abhijeet Chitre⁵,
Archana Ratnaparkhi⁶

U.G. Student, Department of Electronics and Telecommunication Engineering, Vishwakarma institute of information Technology, Pune, India¹.

U.G. Student, Department of Electronics and Telecommunication Engineering, Vishwakarma institute of information Technology, Pune, India².

U.G. Student, Department of Electronics and Telecommunication Engineering, Vishwakarma institute of information Technology, Pune, India³.

Associate Professor, Department of Electronics and Telecommunication Engineering, Vishwakarma institute of information Technology, Pune, India⁴.

Associate Professor, Department of Electronics and Telecommunication Engineering, Vishwakarma institute of information Technology, Pune, India⁵.

Associate Professor, Department of Electronics and Telecommunication Engineering, Vishwakarma institute of information Technology, Pune, India⁶.

ABSTRACT:In this paper, we present the development of a V-I Health Logger and Monitor for electronic appliances. The system is designed to measure and log the voltage and current consumption of appliances and monitor their health in real-time. The system consists of a hardware unit that is connected to the electronic appliance and a Hardware platform that provides a user-friendly interface to monitor the appliance's health. The hardware unit measures the voltage and current of the appliance and transmits the data to the software platform through a wired connection. The Hardware platform provides a real-time view of the appliance's voltage and current consumption and alerts the user if any abnormal behaviour is detected. The system can be used to monitor the health of electronic appliances in residential and commercial settings.

KEYWORDS: V-I health logger, electronic appliances, real-time monitoring, voltage, current

I. INTRODUCTION

Electronic appliances have become an essential part of modern life, and their usage has increased dramatically over the years. However, with increased usage, the risk of appliances malfunctioning or breaking down has also increased. A malfunctioning appliance not only results in inconvenience but can also lead to safety hazards such as fire or electric shock. Therefore, it is important to monitor the health of electronic appliances to detect any abnormal behaviour before a catastrophic event occurs.

In this paper, we present the development of a V-I Health Logger and Monitor for electronic appliances to maintain the health and performance of these systems, it is important to monitor voltage and current levels over time to diagnose and address any issues that arise [1]. We present the development of a voltage and current health logger and monitor that can be used to measure and record electrical data in a range of settings. The system consists of a hardware unit that is connected to the electronic appliance and a hardware platform (LCD Display) that provides a user-friendly interface to monitor the appliance's health [2].



This device is designed to track and record the voltage and current levels of various electrical components in a system [3], and provide real-time feedback to the user about the performance and health of the system [4].

The development of a voltage and current system health logger and monitor requires expertise in electronics, software development, and data analysis. The device typically consists of a microcontroller, sensors to measure voltage and current, and Hardware (LCD Display) to analyse and log the data in SD Card (.csv file). The device can be used in a variety of applications, including monitoring the performance of renewable energy systems [5], such as solar panels and wind turbines, as well as in industrial automation and control systems [6]. The benefits of using a voltage and current system health logger and monitor include early detection of potential problems, which can help prevent system failures and reduce maintenance costs [7]. The device also provides a detailed record of system performance, which can be used to optimize system efficiency and identify areas for improvement.

Overall, the development of a voltage and current system health logger and monitor is an important step towards ensuring the reliability and efficiency of electrical systems in various applications.

II. RELATED WORK

The development of voltage and current system health loggers and monitors has been an area of research and development in the electrical engineering field for several decades. The purpose of such systems is to monitor the health of electrical systems by recording voltage and current data [8], and to provide real-time alerts in case of any abnormalities or faults [8, 9]. In this literature review, we will discuss the history and current state of the art in the development of voltage and current system health loggers and monitors.

One of the earliest works in this area was published in 1979 by L.R. Jones [14], who described a voltage monitoring system for use in power distribution SYSTEMS [10]. The system used microprocessors to sample and record voltage data, and was capable of detecting voltage sags and swells, as well as power OUTAGES [9]. This work laid the foundation for the development of more advanced voltage monitoring systems.

In the 1990s, the development of digital signal processing techniques and advances in microprocessor technology led to the development of more sophisticated voltage and current monitoring systems [11]. In 1994, J.A. Yorke and K.J. McAlister published a paper describing a real-time voltage and current monitoring system for power distribution networks [12]. The system used digital signal processing techniques to analyse voltage and current waveforms [13], and was capable of detecting faults such as overvoltage, undervoltage, and short-circuits [20].

Since then, numerous studies have been conducted to develop more advanced and robust voltage and current monitoring systems. In 2005, M. Chen et al. Described a wireless sensor network-based system for monitoring power quality in industrial environments [15]. The system used a combination of wireless sensor nodes [17] and data fusion techniques to collect and analyse voltage and current data in real-time.

In recent years, the development of the Internet of Things (iot) has led to the development of even more advanced voltage and current monitoring systems. In 2018, J. Li et al. Published a paper describing a cloud-based power quality monitoring system that used iot devices to collect and transmit voltage and current data to a cloud server [18]. The system was capable of detecting and diagnosing various power quality issues, such as voltage dips, voltage swells, and harmonic distortion

In conclusion, the development of voltage and current system health loggers and monitors has been an active area of research and development in the electrical engineering field for several decades. Advances in digital signal processing techniques, microprocessor technology, wireless sensor networks, and iot have led to the development of increasingly sophisticated and robust systems for monitoring the health of electrical systems. These systems are critical for ensuring



the reliability and safety of power distribution networks in a wide range of applications, from industrial settings to residential environments

III. METHODOLOGY

The hardware unit consists of a microcontroller, voltage and current sensors, and a wireless communication module. The microcontroller is programmed to measure the voltage and current consumption of the appliance at regular intervals and transmit the data to the software platform through a wireless connection. The software platform receives the data and provides a real-time view of the appliance’s voltage and current consumption [5].

The software platform is designed to be user-friendly and can be accessed through a web browser or a mobile application. The platform displays the voltage and current consumption of the appliance in real-time and provides alerts if any abnormal behaviour is detected [19]. The platform also logs the data, which can be used to analyse the appliance’s health over time [1].

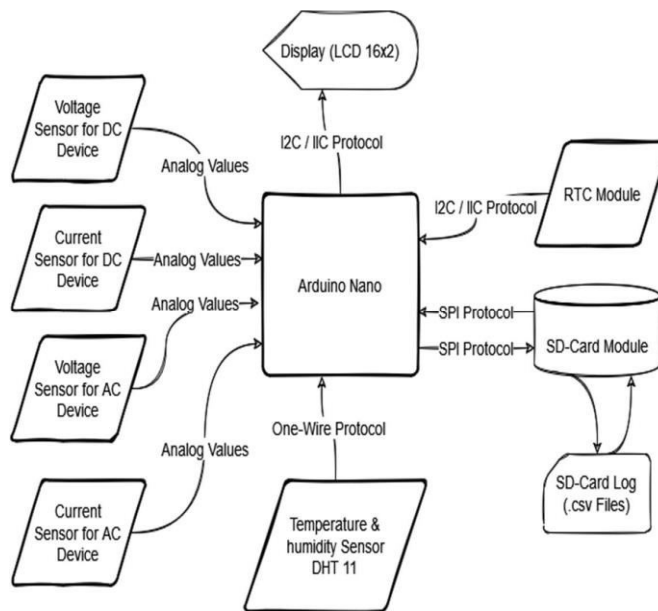


Fig 1: System Architecture

The System uses 3 different Protocols for inter device communication as shown in the above figure.

IIC / I2C Protocol

1. SPI Protocol
2. One-wire Protocol

The 4 sensor produce data and is read as analog values by the microcontroller. Hence the 4 Analog values transfer. The block wise function of the above Block diagram is depicted in the below figure.

Major interaction within the block is of data read and write as shown in the below figure along with the flow data.

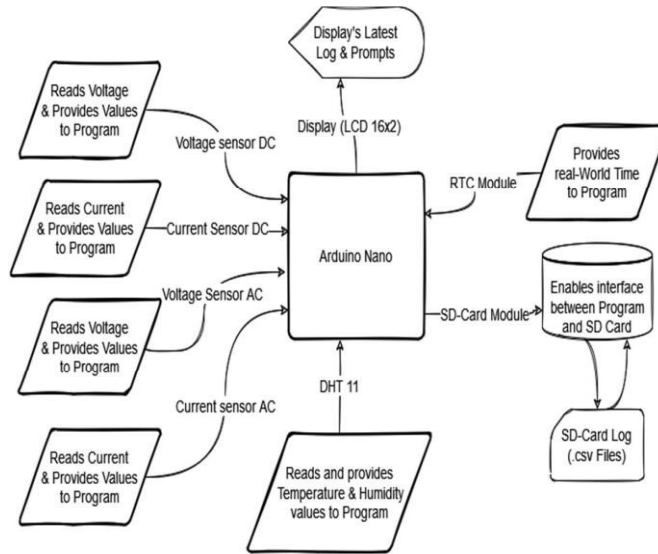


Fig 2: functional block diagram.

IV. EXPERIMENTAL RESULTS

With this implementation, we have successfully created a device to log a system’s health parameters, of an AC or DC Appliance or device along with the temperature and humidity of the current environment with the date and time stamp which could be downloaded in a CSV format for further study. And for showing the working condition of device. We connect the AC Bulb of 230 volt and set the threshold VOLTAGE AND check if the voltages increase than threshold voltage then our system switch off the load (bulb) to overcome the damage of load appliances



Working



Final Output Diagram

VI. CONCLUSION

Thus, by Implementation of this project, we will learn and practically implement multiple sensor integration, work with 3 different types of Protocols, Power distribution circuits as per system requirements, and ways to isolate and handle AC Tracks in the circuit.

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