Scholastic Seed Inc.

www.gjeis.com

global Journal of ENTERPRISE INFORMATION SYSTEM

Microcontroller AVR 8051 Using Process Sensor

– **Pushpendra Pal Singh***

Assistant Professor, G.L. Bajaj Institute of Management, Greater Noida Uttar Pradesh

pps2907@gmail.com *https://orcid.org/000-0003-3164-0847*

ARTICLE HISTORY

Paper Nomenclature: Case Based Study (CBS)

Paper Code: GJEISV15I1JM2023CBS2

Submission at Portal (www.gjeis.com): 11-Jan-2023

Manuscript Acknowledged: 15-Jan-2023

Originality Check: 20-Jan-2023

Originality Test (Plag) Ratio (Ouriginal): 08%

Author Revert with Rectified Copy: 26-Jan--2023

Peer Reviewers Comment (Open): 29-Jan-2023

Single Blind Reviewers Explanation: 16-Feb- 2023

Double Blind Reviewers Interpretation: 21-Feb-2023

Triple Blind Reviewers Annotations: 24- Feb-2023

Author Update (w.r.t. correction, suggestion & observation): 28- Feb-2023

Camera-Ready-Copy: 11- Mar-2023

Editorial Board Excerpt & Citation: 16-Mar-2023

Published Online First: 31-Mar-2023

ABSTRACT

Purpose: A design that integrates hardware and software is required to process sensor data. The microcontroller is the most important component in the sensor processing chain. Embed computing, including its hardware and software, has a significant position in India's economy since it creates more than one billion employees in this area. The trend for engineers right now is sensor processing. The real-world challenge critically significant in sensor computation is the design and usage of equipment and software. Students at graduate and postgraduate levels need to be given challenging tasks to integrate and test the theory that underpins embedded hardware and software. Embedded hardware refers to components such as microcontrollers and microprocessor platforms, and embedded software relates to programming languages such as C, C++, and Java. The study aims to provide software functions and testing and debugging for versatility and performance to achieve successful implementation of handling sensors employing microcontrollers that are most often used all over the globe.

Design/Methodology/ Approach: the present study is mainly based on secondary data. The data and relevant statistics for this study have been collected from different sources.

Findings: This research summarises recent advancements while also attempting to bring a fresh comparative perspective. Better exploration of the performance, compatibility, and characteristics with various other critical elements will assist in giving new directions for the design and development of processing sensors.

Originality/ Value: This research compares current advances to get fresh insights. New design and development ideas may be found by studying processing sensors' performance, compatibility, and characteristics with other critical elements.

Paper type: Case Based Study.

KEYWORDS: ARM | AVR | Processor Sensor | Microcontroller | Embed

***Corresponding Author** (Pushpendra)*

- Present Volume & Issue (Cycle): Volume 15 | Issue-1 | Jan-Mar 2023
- International Standard Serial Number: Online ISSN: 0975-1432 | Print ISSN: 0975-153X
- DOI (Crossref, USA) https://doi.org/10.18311/gjeis/2023
- Bibliographic database: OCLC Number (WorldCat): 988732114
- Impact Factor: 3.57 (2019-2020) & 1.0 (2020-2021) [CiteFactor]
- Editor-in-Chief: Dr. Subodh Kesharwani
- Frequency: Quarterly
- Published Since: 2009
- Research database: EBSCO https://www.ebsco.com
- Review Pedagogy: Single Blind Review/ Double Blind Review/ Triple Blind Review/ Open Review

- Publishers: Scholastic Seed Inc. and KARAM Society
- Place: New Delhi, India.
- Repository (figshare): 704442/13

Introduction:

A sensor may be a device, module, machine, or subsystem that monitors its surrounding environment for the occurrence of events or changes and then communicates those findings to other electronic components, most often a computer processor. A sensor is a device that transforms the physical phenomena it detects into a quantifiable digital signal that may subsequently be displayed, read, or subjected to further processing. The diagram is an explanation of how a sensor operates. Sensors may be categorised according to various criteria by various experts and academics. The initial level of organisation places the sensors into either the Active or the Passive category, depending on their operation mode.

The processing sensor has made its way into almost every area of electronic equipment. It is a computer system designed for a particular control function in a huge system, and its needs are often specified and devoted. Processing sensors, composed of both hardware and software components, represent the semiconductor industry sector that is expanding at the quickest rate. These sensors are used in various goods, from mobile phones to MP3 players to car braking systems [10]. We are used to using a wide variety of embedded systems, from the most basic controllers to the most complex, and we can do so successfully in our day-to-day lives [3][2]. Software/hardware codesign, also known as the contemporaneous or simultaneous construction of software modules to meet system-level goals [10], is a technique that shows promise for tackling the complexity of today's sophisticated embedded systems.

As a result of this, the purpose of this research is to give software functions and testing and debugging for versatility and performance to achieve successful implementation of handling sensors employing microcontrollers that are most often used all over the globe. The study paper technique teaches implementation skills and design strategies, which are both necessary for creating and developing projects. Mastering the conceptual framework and its implementation is the primary topic of this study.

8051 Microcontroller

1981 was the year when Intel first released its 8051 microcontrollers. It is a microcontroller with 8 bits of memory. It utilises a 40-pin DIP (dual inline package), 4 kilobytes of ROM storage, 128 bytes of RAM storage, and two 16-bit timers in its construction. According to the specification, it has four parallel 8-bit ports that can be programmed and addressed. These ports are included in the device.

AVR Microcontroller

RISC Processor is an acronym that stands for Alf and Vegard's AVR. It was a machine based on a modified version of the Harvard architecture, and both the System and the data have all been placed in a secure physical computer memory. Although these two types of information were located in distinct memory systems, the user could still browse knowledge and objects stored in memory locations using specific directions. AVR is neither a signifier in any sense of the word nor does it symbolically represent anything in particular.

Embedded Systems:

Research Operating devices are contained on a single chip and use a mix of hardware and software specifically designed to carry out a particular task. The physical manifestation of a real processing sensor might take the form of either portable gadgets or massive installations. A processing sensor is a physical device that can be programmable and is operated by a primary processing core, which is commonly a microcontroller or a computerised processor.

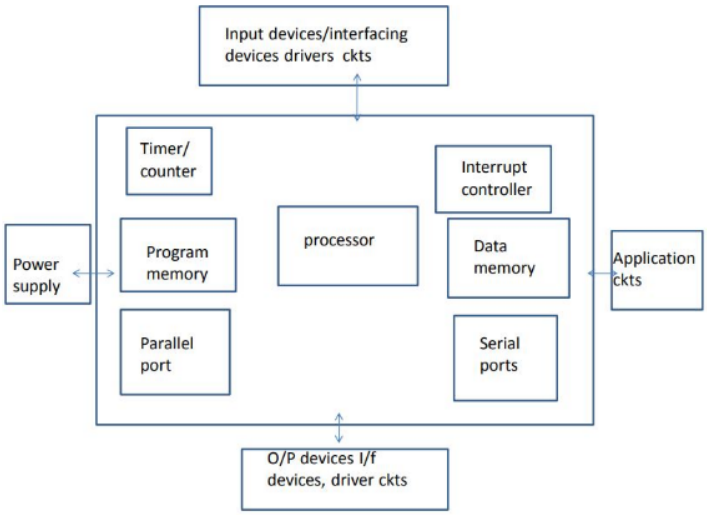


Figure 1: Block diagram of processing sensor

The instructions for the programme are kept in authored store or flash memory; these directions are alluded to as firmware, and they are designed to operate with a constrained amount of the computer's underlying hardware. The processing sensor includes a timer and handles its output, which is delivered to the System to create the matching output and input. It is equipped with a serial and parallel network port, allowing for the transmission and reception of serial data, respectively.

Ordinary processors, which contain integrated circuits for storing and peripherals located on separate chips, and microcontrollers, which have these components built directly onto the chip, are the two main types of embedded processors. Microcontrollers are becoming more common due to their power requirements, size, and cost improvements. The study of how sensors are processed is something that engineers must perform to open up new doors in the realm of electronics.

Type of microcontrollers in embedded System

Because a microcontroller is a slightly elevated device, yet it is still slower than a CPU, every directive is carried out in a microcontroller at an incredible rate. The control logic register was programmed to activate the quartz oscillator whenever the generator was switched to the ON position. At the initial few milliseconds of the process, the help

regarding is taking place, and parasite electrodes are being charged during this time. Recording bits into special function registers begins after the output current reaches its maximum value and or the frequency of both the quartz clock becomes steady. Everything transpires by the oscillator's watch, and the operation of the total electronics system commences. This whole process happens in a very quick few nanoseconds.

Process of Hardware Development and Software Design for Processing sensor Design:

A programmable processing sensor comprises a microcontroller, which could include either a microcontroller or computerised signal processor (DSP). It relies on flash memory for storing most of the time and static RAM for runtime memory. There is a wide variety of processing and sensor creation tools now available.

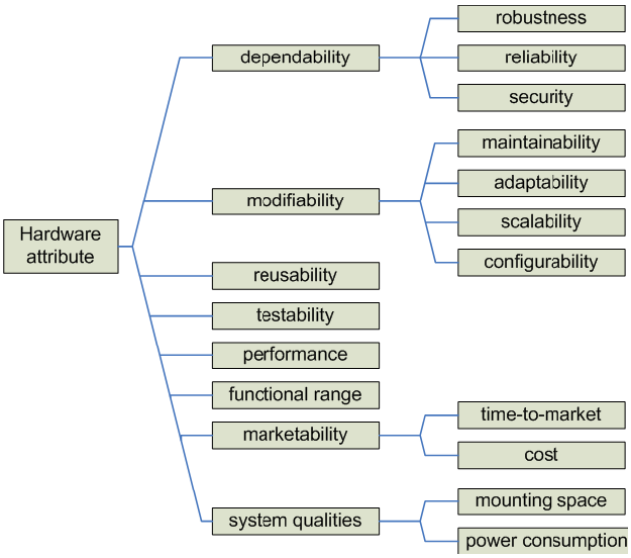


Figure 2: Embedded Hardware Platform

The programming "language for the kernel and the applications themselves serve as the foundation for the creation of embedded operating systems. The compiler package is an extremely important component in the process of developing embedded systems. The prototype for a particular processor and the embedded structure are both examples of hardware tools.

In most cases, a processing sensor will run the same set of instructions several times in order to complete a particular job. Embedded software often comes with an existing production system that has technical specifications and capabilities that are set in stone. The embedded device is shown in the graphic that may be seen above [3].

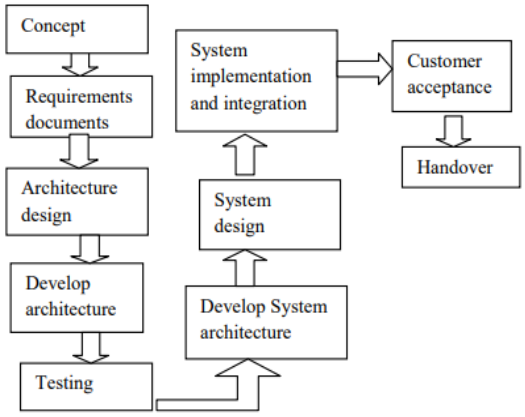


Figure 3: Process of processing sensor development

An Overview of the Architecture and Instructions for Programming the 8051 Especially Appropriate: The "embedded microcontroller 8051 is a programming device that comprises of a CPU core, data memory, programme memory, two timers, four input/output ports that are each eight bits wide, interrupt, one serial port, and a bus controller. It is a microcontroller with eight bits, 128 bytes of random access memory (RAM), 4 kilobytes of ROM on chip for storing programme code, and a specific function register. The architecture of the 8051 microcontroller is shown in the Figure below" [10].

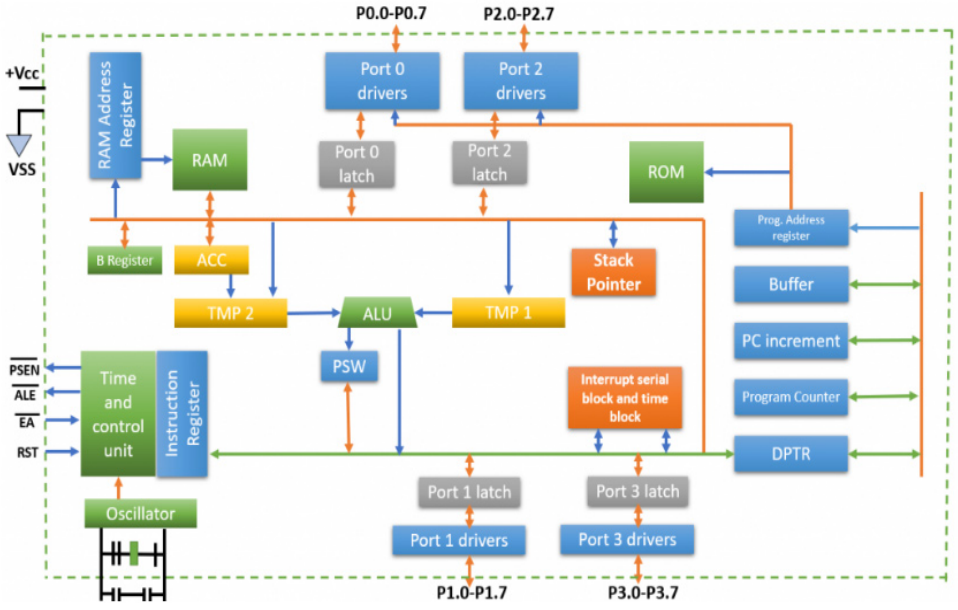


Figure 4: Architecture block diagram of 8051 embedded controller.

Overview and Programming of AVR Embedded Controller:

A sort of microcontroller that sees widespread use in the processing of sensor design is an AVR. AVR was developed to capitalise on the benefits of interconnection and control. The AVR uses the Harvard architecture, designed to maximise speed and parallelism. This has 32 general registers, all directly coupled to the arithmetic and logic unit. The application portion and the boot loader section make up its flash memory. This memory is separated into two sections. AVR is responsible for two different applications. The stages involved in the creation of AVR software and hardware are outlined in the image below". [9]

Hardware and software complexities:

Developers are required to be significant players in both the hardware and software technologies due to the growing memory sizes and increasing complexity of modern CPUs. Processing sensor scientists have always placed a significant amount of emphasis on the creation and advancement of processing sensors. On the hardware side, the most important element is to expand capabilities at a cost that is affordable. On the software side of things, complexity is on the rise as a greater number of projects are undertaken. Together with an increase in the amount of money projects expend on software and hardware, that trend for integrative solutions is growing.

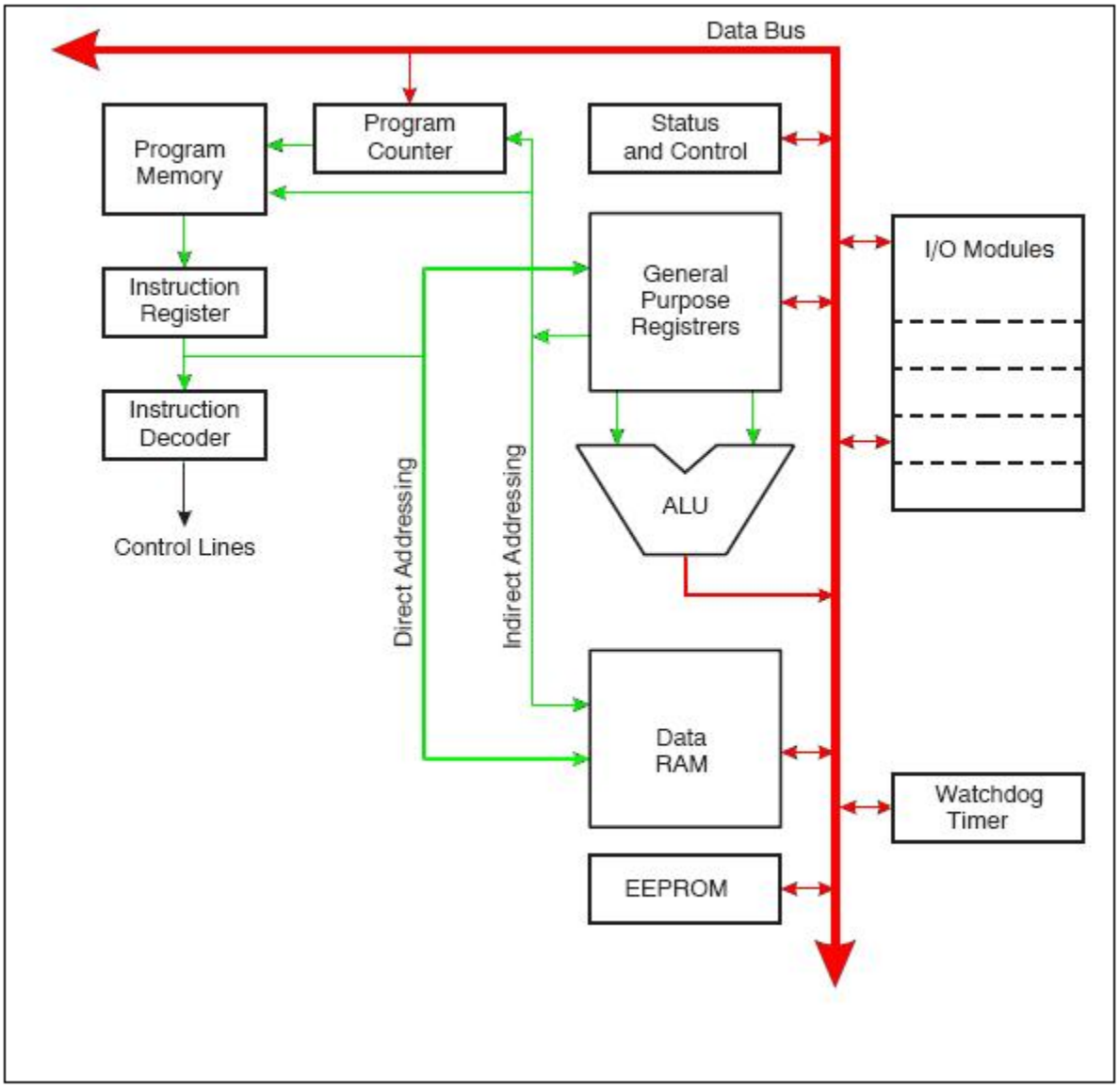


Figure 5: AVR Architecture overview

Comparison Table:

Table 1: Comparison between 8051 and AVR

	8051	AVR
Architecture	Harvard architecture	RISC architecture
Processing Power	Low power consumption	Low power consumption
Software Support	Windows and Linux	Windows CE and Linux
Expandability	Boolean processing capability, pin compatible	Full code compatibility, pin compatible
Performance	High performance	High performance and self programming
Powerful	Powerful handling capability	In System programming, debugging and verification
Processor core	-	-
Cost	Low cost	Low cost

Conclusion:

In this article, we gave a study of processing sensor data in the form of development of hardware and software and design. This is our primary focus. Our explanation of architecture, software, and programming modules is presented in the form of a case study and is based on the popularly used processors and controllers 8051 and AVR. Students are given the opportunity to study concepts in a methodical manner and come up with inventive solutions for assignments thanks to the learning style.

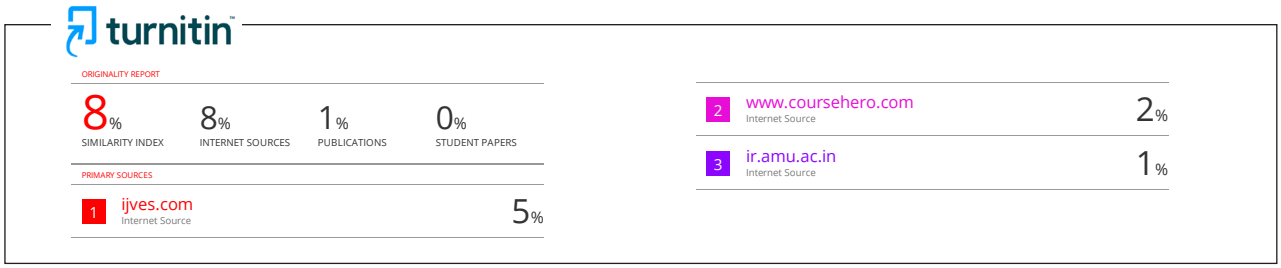
References:

- Z.Nakutis, M. Saunoris, "challenges of Embedded Systems Teaching in Electronics Engineering." ISSN 1392-1215, 2010 No.6 (102)
- P. Naresh Kumar, Dr. N.S. Murthy Sharma, Mr. M.S. Madan Mohan, Mr. Dhana Ray, "Design and Implementation of ARM Intelligent Monitoring System Using Zibee," International Journal of Research in Computer and Communication Technology, IJRCCT, ISSN 2278_5841, Vol.1, Issue 7, December 2012
- Mohammad Ali Mazidi, Janice Gillispie Mazidi "The 805 Microcontroller and Embedded Systems."
- Dr.Gaute My Kelbust, "The AVR Microcontroller and C Compiler Co Design."
- Gunar Schirner, Gautam Sachdeva, Andreas Gerstlauer, Rainer Domer, "Modeling, simulation and Synthesis in a Embedded Software Design Flow for an ARM Processor," April 10, 2006.
- Manuel Kosch, Joachim Lechner, Andreas Weitzer, Johann Gros Bschadl, Alexander Szekely, Stefana Tillich, and Johannes Wolker Storfer, "Hardware/software Codesign of Elliptic Curve Cryptography on an 8051 Microcontrollers."
- Vishnu A. Patankar, Alok Jain, Randal E. Bryant, "Formal Verification of an ARM Processor."
- Md.Mejbaul Haque, Md. Kamal Hossain, Md. Mortuza Ali, Md. Rafiqul Islam Sheikh, "Microcontroller Based Single Phase Digital Prepaid Energy Meter for Improved Metering and Billing System," International Journal of Power Electronics and Driver System (IJPEDS), Vol.1, No.2, December 2011, Pp 139-147, ISSN: 2088-8694.
- Arvind Krishna Swamy, Rajiv Gupta "Profile Guided Selection of ARM and Thumb Instruction."
- Gooran Horvat, Damir Sostaric, and Drago Zagar, "User Authorisation System Using Zibee WSN and AVR architecture."

Annexure 15.9

Submission Date	Submission Id	Word Count	Character Count
20-Jan-2023	(Turnitin)	1661	10810

Analyzed Document	Submitter email	Submitted by	Similarity
3.2 CBS2_Pushpendra _GJEIS Jan to Mar 2023.docx	pps2907@gmail.com	Pushpendra Pal Singh	08%


turnitin

ORIGINALITY REPORT

8%	8%	1%	0%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	ijves.com Internet Source	5%
2	www.coursehero.com Internet Source	2%
3	ir.amu.ac.in Internet Source	1%

Reviewers Memorandum

Reviewer's Comment 1: The microcontroller is the most important component in the sensor processing chain. The purpose of this research is to give software functions and testing and debugging for versatility and performance to achieve successful implementation of handling sensors employing microcontrollers that are most often used all over the globe.

Reviewer's Comment 2: The research is quite significant in nature. It compares current advances to get fresh insights. New design and development ideas may be found by studying processing sensors' performance, compatibility, and characteristics with other critical elements.

Reviewer's Comment 3: The findings of the study are interesting. It summarises recent advancements while also attempting to bring a fresh comparative perspective. Better exploration of the performance, compatibility, and characteristics with various other critical elements will assist in giving new directions for the design and development of processing sensors.

Citation

Pushpendra Pal Singh
"Microcontroller AVR 8051 Using Process Sensor"
Volume-15, Issue-1, Jan-Mar 2023. (www.gjeis.com)

https://doi.org/10.18311/gjeis/2022
Volume-15, Issue-1, Jan-Mar 2023
Online iSSN : 0975-1432, **Print iSSN** : 0975-153X
Frequency : Quarterly, Published Since : 2009

Google Citations: Since 2009
H-Index = 96
i10-Index: 964

Source: https://scholar.google.co.in/citations?user=S47TtNkAAAAJ&hl=en

Conflict of Interest: Author of a Paper had no conflict neither financially nor academically.

Editorial Excerpt

The article has 8% of plagiarism which is the accepted percentage as per the norms and standards of the journal for publication. As per the editorial board's observations and blind reviewers' remarks the paper had some minor revisions which were communicated on a timely basis to the authors (Pushpendra), and accordingly, all the corrections had been incorporated as and when directed and required to do so. The comments related to this manuscript are noticeably related to the theme "**Microcontroller AVR 8051 Using Process Sensor**" both subject-wise and research-wise. The focus of the paper is to provide software functions and testing and debugging for versatility and performance to achieve successful implementation of handling sensors employing microcontrollers that are most often used all over the globe. The study paper technique teaches implementation skills and design strategies, which are both necessary for creating and developing projects. Overall, the paper promises to provide a strong base for the further studies in the area. After comprehensive reviews and editorial board's remarks the manuscript has been categorized and decided to publish under the "**Case Based Study**" category.

Acknowledgement

The acknowledgment section is an essential part of all academic research papers. It provides appropriate recognition to all contributors for their hard work and effort taken while writing a paper. The data presented and analyzed in this paper by (Pushpendra) were collected first handily and wherever it has been taken the proper acknowledgment and endorsement depicts. The author is highly indebted to others who facilitated accomplishing the research. Last but not least, endorse all reviewers and editors of GJEIS in publishing in the present issue.

Disclaimer

All views expressed in this paper are my/our own. Some of the content is taken from open-source websites & some are copyright free for the purpose of disseminating knowledge. Those some we/I had mentioned above in the references section and acknowledged/cited as when and where required. The author/s have cited their joint own work mostly, and tables/data from other referenced sources in this particular paper with the narrative & endorsement have been presented within quotes and reference at the bottom of the article accordingly & appropriately. Finally, some of the contents are taken or overlapped from open-source websites for knowledge purposes. Those some of i/we had mentioned above in the references section. On the other hand, opinions expressed in this paper are those of the author and do not reflect the views of the GJEIS. The authors have made every effort to ensure that the information in this paper is correct, any remaining errors and deficiencies are solely their responsibility.