Review on 40 Pins Microcontroller 8051

Prachi Dukale[1], Sanjana Lad[2*], Taskeen Merchant [3], Gaurav Rane[4], Aman Qureshi[5,] Abdul Ahad Khan[6], Shakila Shaikh[7] , Shiburaj Pappu[8]

[1,2,3,4,5,6]Dept. of Computer Science, Rizvi College of Engineering, Mumbai, India
[7,8]Dept. of Computational Science and Technology, Rizvi College of Engineering, Mumbai, India

Corresponding Author: ladsanjana99@gmail.com

Abstract— A microcontroller can be considered a self -contained system with a processor ,memory and peripherals and can be used as an embedded system .The majority of microcontrollers in use today are embedded in other machinery, such as automobiles , telephones , appliances and peripherals for computer systems .Mixed signal microcontrollers are common integrating analog components needed to control non digital systems In the context in the internet of things, microcontrollers are economical and popular means of data collection, sensing and actuating the physical world as edge devices.

Keywords - memory; microcontroller; architecture;

I. INTRODUCTION

8051 Microcontroller is designed by Intel in 1981. It is an 8-bit microcontroller. It is built with 40 pins DIP (dual inline package), 4kb of ROM storage and 128 bytes of RAM storage, 2 16-bit timers. It consists of four parallel 8- bit ports, which are programmable as well as addressable as per the requirement. An on-chip crystal oscillator is integrated in the microcontroller having crystal frequency of 12 MHz[1]. The 8051 architecture performs many functions (CPU), random access memory (RAM), input/output(I/0), interrupt logic, time etc) in one package.[2].

The micro-controller has on-chip fringe devices. The 8051 is a 8-bit microcontroller planned by Intel. It is known to be advanced for math and single Boolean operations.
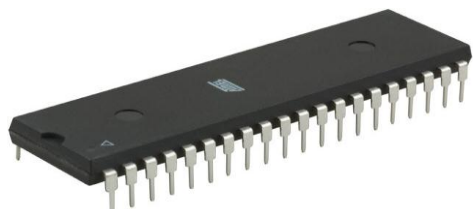

Fig.1.1 8051 Microcontroller

In spite of it's moderately, the 8051 is a standout amongst the most mainstream microcontrollers being used today. Numerous subordinate microcontrollers have been subsequent produced that are in view of and perfect with the 8051. The capacity to program a 8051 is an ability for any individual who arrangements to create items that will exploit microcontrollers.

As a last paragraph of the introduction should provide organization of the paper/article (Rest of the paper is organized as follows, Section I contains the introduction of 8051 microcontroller , Section II contain the literature review of the microcontroller, Section III contain the methodology which explains the architecture , pin diagram and analysis of 8051 microcontroller, Section IV contain the result and discussion about 8051 microcontroller, section V explain the microcontroller's conclusion and future scope, Section VI concludes the reference work used for this project.

II. LITERATURE REVIEW

8051 chip is a basic chip which includes a number of peripheral I/O devices having two t Timer/Counters, 8-bit I/O ports, and a UART. The

In [1] the author described that 8051 has a separate memory space for code (programs) and data.

The architecture of separated memory is referred to as Harvard architecture whereas Von Neumann architecture defines a system where data and code can share common memory.
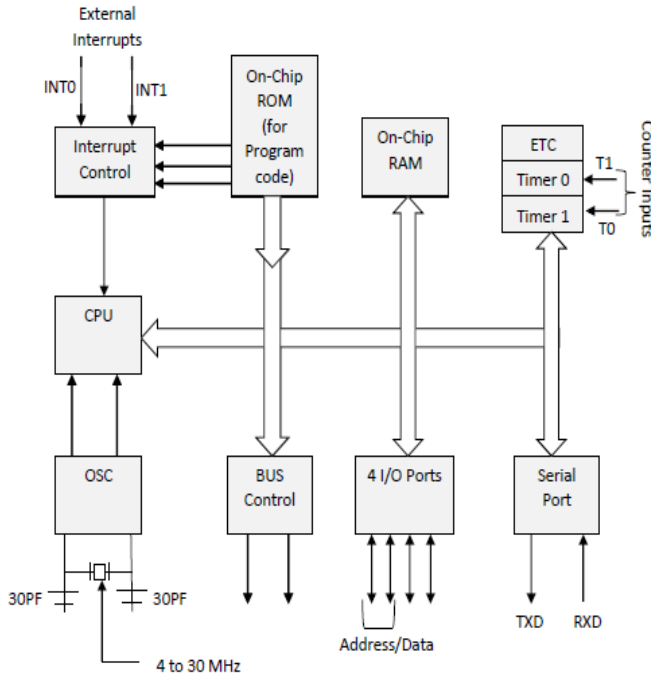
Fig 1.2 Architecture

External Code Memory: The program code which can be executed is stored in this code memory. The code memory size is about 64K Bytes. External RAM Data Memory: This is read-write memory and it is used for storing data. Internal Memory: The 8051's on-chip memory consists "256 memory bytes" or (First 128 bytes: 00h to 1Fh Register) Banks 20h to 2Fh Bit Addressable RAM ,30 to 7Fh General Purpose RAM 128 bytes: 80h to FFh Special Function Registers. INTERRUPTS: In [3], it is described that Interrupts are the events that temporarily suspend the main program, pass the control to the external sources and execute their task. It passes the control to the main program where it had left off. 8051 has 5 interrupt signals, i.e. INT0, TFO, INT1, TF1, RI/TI. Every interrupt can be enabled or disabled by setting bits of the IE register and the whole interrupt system can be disabled by clearing the EA bit of the same register. ADDRESSING MODES: The addressing modes in 8051 microcontrollers are

1) Immediate Addressing
2) Register Addressing
3) Direct Addressing
4) Indirect Addressing
5) Relative Addressing
6) Absolute addressing
7) Long Addressing
8) Indexed Addressing.

COMPILERS: The following are the Compilers for 8051 Microcontroller: CEIBO++ Compiler, Crossware 8051 Development Suite, IAR Embedded Workbench for 8051,

Keil uVision IDE for 8051 Microcontroller, MCU 8051 IDE, mikroC PRO for 8051, Tasking 8051 Toolset

Features that have made the 8051 popular:
1. Chip program memory is of 4KB
2. 128 bytes on chip data memory(RAM)
3. Register Banks are given 64 bytes
4. Bit-addressable memory 16 bytes
5. General-purpose memory of 80 bytes
6. No. of reg banks-4
7. User defined software flags-128
8. Data bus is 8 bit
9. Address bus is 16 bit
10. 16 bit timers
11. 3 internal interrupts and 2 external interrupts.
12. Byte as well as bit addressable RAM area of 16 bytes.
13. 8-bit ports-4
14. Program counter and data pointer is of 16 bit
15. 12 MHz Crystal with 1 Microsecond instruction cycle.

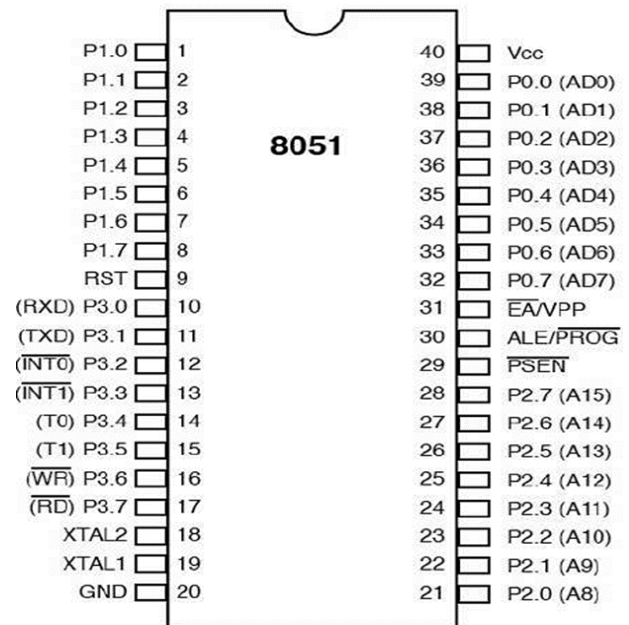## III. METHODOLOGY

PIN DIAGRAM AND ANALYSIS

Fig 1.3 8051 Microcontroller

The pin diagram and pin configuration of microcontroller 8051, we are taking into deliberation a 40 pin Dual inline package (DIP). Let's see through pin configuration in brief:-
- Pins 1 − 8:- recognized as Port 1. Different from other ports, this port doesn't provide any other purpose. Port 1 is a domestically pulled up, quasi bi directional Input/output port.

- Pin 9: - RESET pin is utilized to set the micro-controller 8051 to its primary values, whereas the micro-controller is functioning or at the early beginning of application. RESET pin is needed to set elevated for two machine rotations.
- Pins 10 – 17:- recognized as Port 3. This port supplies a number of other functions such as timer input, interrupts, serial communication indicators TxD & RxD, control indicators for outside memory interfacing WR & RD, etc. This is a domestic pull up port with quasi bi directional port within.
- Pins 18 and 19:- All these are employed for interfacing an outer crystal to give system clock.
- Pin 20:- Titled as Vss –symbolize ground (0 V) association.
- Pins- 21-28:- recognized as Port 2 (P 2.0 – P 2.7) – other than serving as Input/output port, senior order address bus indicators are multiplexed with this quasi bi directional port.
- Pin- 29:- Program Store Enable or PSEN is employed to interpret sign from outer program memory.
- Pin-30:- External Access or EA input is employed to permit or prohibit outer memory interfacing. If there is no outer memory need, this pin is dragged high by linking it to Vcc.
- Pin-31: - Address Latch Enable or ALE is brought into play to de-multiplex the address data indication of port 0 (for outer memory interfacing). Two ALE throbs are used for every machine rotation.
- Pins 32-39: recognized as Port 0 (P0.0 to P0.7) – other than serving as Input/output port, low order data & address bus signals are multiplexed with this port (to provide the use of outer memory interfacing). This pin is a bi directional Input/output port (the single one in microcontroller 8051) and outer pull up resistors are necessary to utilize this port as Input/output.
- Pin-40: is known as Vcc is the chief power supply. By and large it is +5V DC.
- In 1980's 8051 microcontroller was designed by Intel. Its foundation was based on Harvard Architecture and was developed principally for bringing Embedded Systems into play. The creation was by means of NMOS technology but as NMOS technology needs more power to function theref=ore Microcontroller 8051 employing CMOS technology was re-intended by Intel and a new edition came into picture with a letter 'C' in the title name, for example: 80C51. These are most modern Microcontrollers which need less amount of power to function in comparison to their forerunners.
- Two buses are there in 8051 Microcontroller one for program and other for data. There are two storage rooms for both program and data of 64K by 8 size. It also has some number of other 8 bit and 16 bit registers.

- Internal functioning & processing Microcontroller 8051 comes with built-in RAM. It is prime memory and is employed for storing temporary data. This is unpredictable memory i.e. the data can get be lost when the power supply to the Microcontroller switched OFF.

IV. MICROCONTROLLER ARCHITECTURE 8051

From [4], CPU is the mind of any processing machine. It executes and manages all processes that are carried in the Microcontroller. There is no power over the functioning of CPU. Program printed is interpreted in storage space (ROM) and carries out all of them and complete the projected duty. Different types of registers are managed by CPU in 8051 microcontroller.
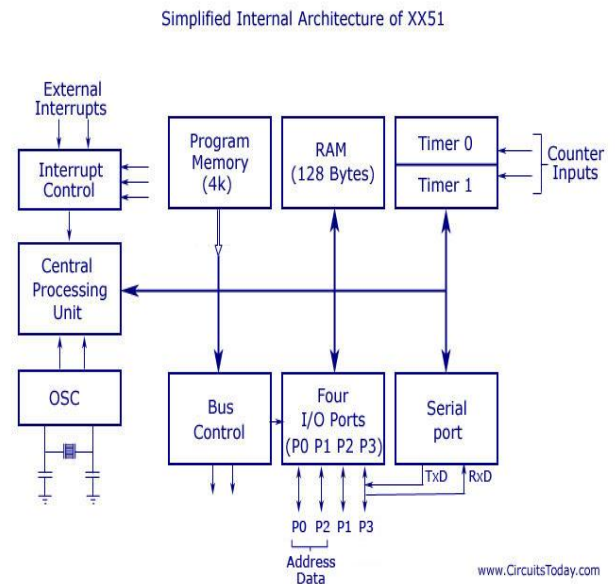

Fig1.4 8051Internal Architecture

V. RESULTS AND DISCUSSION

As a result, 8051 microcontroller has vast applications, a defined architecture, unique features, different types of interrupts and addressing modes, it has programming facility too and basic pin diagram.

VI. CONCLUSION AND FUTURE SCOPE

Hence, we studied that 8051 Microcontroller has its applications in many fields, especially used in Robotics and Medical field. There are various types of microcontrollers. 8051 is frequently used in various applications due to its advantages compared to other microcontrollers.

8051 has the biggest advantage due to its simplified architecture and instruction set. Computing power isn't too much of a problem, as new processors run at around 20 mips. In 8051 underline architecture we can program it in assembly language instead of using high level language.

Most of the microcontrollers may use 4-bit words and operate at frequencies as low as 4 kHz, for low power consumption. Mostly they have the ability to retain functionality while waiting for an event for example a button presses or other interrupt; power consumption while sleeping may be just in Nano watts, making many of them well built up for long lasting battery applications. The microcontrollers may serve performance-critical roles, where they are more likely to act like a digital signal processor (DSP), with higher clock speeds and power consumption.

REFERENCES

[1] Donal Heffernan,"8051 Microprocessor" University of Limeric, May-2002

[2] Arduino Embedded Technologies, "An Encyclopedia Coverage of Compiler's, Programmer's & Simulator's for 8051, PIC, AVR".

[3] MacKenzieScott,"The8051Microcontroller, Prentice Hall. 3rd. Ed.," 1999.

[4] Yeralan and Ahluwalia." Programming and Interfacing the 8051 Microcontroller, Addison-Wesley", 1995.

[5] 8052 tutorial information by Vault Information Services: http://www.8052.com

[6] Intel's site for 8051 based products: http://developer.intel.com/design/mcs51/

[7] Philips' site for 8051 based products: http://www-us.semiconductors.philips.com/microcontrol/

[8] 8051 Microprocessor. https://en.wikibooks.org

[9] Introduction to 8051 Microcontroller - The Engineering Project-https://www.theengineeringprojects.com/2018/06/introduction-to-8051-microcontroller.html

[10] 8051 Microcontroller Architecture - javatpoint https://www.javatpoint.com/embedded-system-8051-microcontroller-architecture

[11] Tiwari, R. Sam and S. Shaikh, "Analysis and prediction of churn customers for telecommunication industry," 2017 International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC), Palladam, 2017, pp. 218-222. doi: 10.1109/I-SMAC.2017.8058343

[12] S. Navadia, P. Yadav, J. Thomas and S. Shaikh, "Weather prediction: A novel approach for measuring and analyzing weather data," 2017 International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC), Palladam, 2017, pp. 414-417. doi: 10.1109/I-SMAC.2017.8058382

[13] S. Shaikh, S. Rathi and P. Janrao, "IRuSL: Image Recommendation Using Semantic Link," 2016 8th International Conference on Computational Intelligence and Communication Networks (CICN), Tehri, 2016, pp. 305-308. doi: 10.1109/CICN.2016.66

[14] S. Shaikh, S. Rathi and P. Janrao, "Recommendation System in E-Commerce Websites: A Graph Based Approached," 2017 IEEE 7th International Advance Computing Conference (IACC), Hyderabad, 2017, pp. 931-934. doi: 10.1109/IACC.2017.0189

[15] A. Fasiku, Ayodeji Ireti, B. Olawale, Jimoh Babatunde, C. Abiola Oluwatoyin B., "Comparison of Intel Single-Core and Intel Dual-Core Processor Performance", International Journal of Scientific Research in Computer Science and Engineering, Vol.1, Issue.1, pp.1-9, 2013

[16] M. Sora, J. Talukdhar, S. Majumder, P.H Talukdhar, U. Sharmah, "Word level detection of Galo and Adi language using acoustical cues", International Journal of Scientific Research in Computer Science and Engineering, Vol.1, Issue.1, pp.10-13, 2013

[17] Manish Mishra, Piyush Shukla, Rajeev Pandey, "Assessment on different tools used for Simulation of routing for Low power and lossy Networks (RPL)", International Journal of Scientific Research in Network Security and Communication, Vol.7, Issue.4, pp.26-32, 2019

Authors Profile

Prachi Dukale is pursuing Bachelor of Computer Engineering from Rizvi College Of Engineering which is affliated with Mumbai University.She has a great enthusiasm in Microprocessor field and has plan to do Master Of Engineering in respective field.

Sanjana Lad is pursuing Bachelor of Computer Engineering from Rizvi College Of Engineering which is affliated with Mumbai University.She has done research on Database Management System.She has immense knowledge of Sql, Html, Css, Javascript etc. She will pursue Master Of Engineering Degree in Database for her future Scope.

Taskeen Merchant is pursuing Bachelor of Computer Engineering from Rizvi College Of Engineering which is affliated with Mumbai. University.She has been currently working on Java and Python Projects.She will pursue Master Of Engineering degree in Information Technology.

Gaurav Rane is pursuing Bachelor of Computer Engineering from Rizvi College Of Engineering which is affliated with Mumbai. University.He has been currently working on Java and Python Projects.He will pursue Master Of Engineering degree in Information Technology.

Aman Qureshi is pursuing Bachelor of Computer Engineering from Rizvi College Of Engineering which is affliated with Mumbai. University.He has been currently working on Java and Python Projects.He will pursue Master Of Engineering degree in Information Technology.

Abdul Ahad Khan is pursuing Bachelor of Computer Engineering from Rizvi College Of Engineering which is affliated with Mumbai. University.He has been currently working on Java and Python Projects.He will pursue Master Of Engineering degree in Information Technology.