International Journal of Innovative Research in Engineering
Volume 4, Issue 1 (January-February 2023), PP: 42-44.
www.theijire.com ***ISSN No: 2582-8746***

Digital Electronics Uses In Real Life Applications

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How to cite this paper:
Bhagwat Tushar Babasaheb[1], Bhad Sainath Asaram[2], "Digital Electronics Uses In Real Life Applications", IJIRE-V4I01-42-44.

Abstract: *Nowadays, most of the modern electronic devices such as computers, mobile phones work with digital electronics. Digital electronics projects use a digital signal instead of an analog signal for their operation. There are many benefits of using digital signals in place of analog signals, viz. speed of operation, data protection, reproducibility, etc. The best examples of digital electronic systems are mobile phones in which voice is converted into a series of electronic pulses as digital (or 0s and 1s) and then transmitted to the receiver end where these digital pulses get converted back into a voice. The logic gate is the common fundamental unit of digital electronics and basic gates include three types: AND, OR, and NOT. Two universal gates NAND and NOR gates are made of these three basic gates. These Digital logic circuits are integrated into a single IC to design several processors and controllers.*

Key Word: *Gates, Processors, Controllers, IC's*

I.INTRODUCTION

Digital technology, digital electronics or digital circuits are electronics that operate on the digital signals. To make it understand easily, analog devices are electrical components that give you continuous signals or values (that is the reason it is also continuous signals). So, it becomes a bit complex to power the electronic circuit with continuous values. Here, digital electronics come into play. In digital the signals are converted into only two different signals unlike continuous signals of analog device. In digital the signals are sent in the form of ON and OFF or 1 and 0. Where 1 stands for ON and 0 stands for OFF. Therefore, it is clear to the circuit that if the signal is 1 then the whole circuit will power ON and if the signal is 0 the circuit will be OFF.

The reason that it is been introduced to the electrical engineering curriculum is that these days all the engineering streams are interrelated and over they are been considered as multi-disciplinary. So, the knowledge of digital electronics is very much needed for an electrical engineer.

Digital electronics, digital circuits, and digital technology are electronics that are operated on digital signals. Digital techniques are much easier for getting the electronic device. These devices are used to switch into one of the known states apart from reproducing a continuous range of values. Digital circuits are made from a large collection of logic gates and a simple electronic representation of the Boolean logic function.

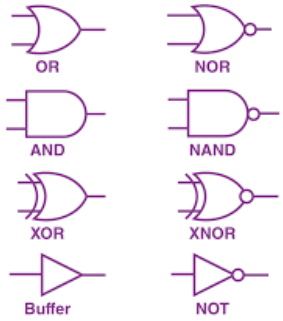

Fig.Basic Gates of Digital Electronics

II.COMPONENTS OF DIGITAL ELECTRONICS

Digital electronics or the digital circuit comprises various components that perform specific functions. These components are divided into two categories:

-Active components

-Passive components

The active components are the transistors and diodes, while passive components are the capacitors, resistors, inductors, etc.

Diodes

Diodes are manufactured using semiconductor materials. They are used for allowing the flow of current in a particular direction. Different types of diodes are used in the construction of the digital circuit.

Transistors

A semiconductor device with three terminals is known as a transistor. The main function of the transistor is to amplify the signal, and it is also used as a switching device.

Capacitors and Inductors

The main function of the capacitor is to store electrical energy. A capacitor is made using two conducting plates, and between these plates, an insulator is placed. The change in the current is resisted with the help of an inductor. They are used for storing electric energy in the magnetic field.

Logic Gates

Logic gates are the basic components of the digital circuit with one output and more than one input. AND, OR, and NOT gates are the basic gates, while NAND and NOR are the universal gates. EX-OR and EX-NOR are the special gates.

Battery and Switch

The conversion of chemical energy into electric energy takes place because of the battery. It is used as a source of energy. The flow of the electric current is controlled by using a switch.

Resistors

The flow of current in the circuit is opposed by the resistor. The fixed resistor and variable resistor are the two types of resistors. All the resistors work on the basis of Ohm's law.

III.TRENDS OF DIGITAL ELECTRONICS

1). Home Security System

The aim of this project is to develop a security system to protect homes and offices from thieves. This project is designed by using LDR, LASER, buzzer, microcontrollers, and embedded C programming. When a thief or an unauthorized person enters a home, this security system circuit rings an alarm.

2). Walking Stick with Heart Attack Detection

The purpose of this project is to indicate heartbeat condition and it is designed especially for senior citizens who are prone to suffer from heart-related problems. This project consists of a microcontroller, an ECG circuitry, and a Bluetooth module.

The ECG circuitry captures a heartbeat signal from the patient by using sensors and then sends that signals to a microcontroller. Next, the microcontroller compares the heartbeat with the normal rate, and if finds above the threshold levels, it will immediately warn the people around with a buzzing sound. The Bluetooth module helps in a medical emergency at the time of the heart attack.

3). Micro Controller Based Tachometer

This is a simple electronic transducer that aims to measure the speed of the shaft. For any rotational system, rpm (revolutions per minute) is the necessary information to operate the loads at specified speeds. So this project achieves low-cost of operation. This project is useful in floor tools and industrial control processes.

4).Vehicle Immobilization System

The aim of this vehicle immobilization system project is to detect vehicle theft by using an embedded system. This project uses a keypad to enter the password and LCD display to show the authorization information. If an authorized person enters the correct password, then the vehicle allows the person to start and drive it. If an unauthorized person enters the wrong password, the alarm will turn on and also sends the message to the owner of the vehicle.

5). Digital Soil Moisture Tester

This digital soil moisture tester project is used to check whether the soil is wet or dry, and also to check the wetness or dryness of cotton (woven and woolen) fabrics. In this project, the tester uses a number of LEDs driven by a display driver IC LM3915.

When the two test probes are inserted in the soil, the display shows the relative magnitude of conductance between the two test probes. And, also measures the dryness or wetness of the soil which is indicated by sequential lighting of LED1 through LED9.

6). PWM Chopper

This project is used to design & analysis a PWM chopper for ON/OFF control with a second-order filter. This project

is used for generating a PWM which is used for designing a PWM chopper used to control variable power supplies like wind turbine systems, photovoltaic, etc. The main function of the second-order filter is to compensate the o/p against the variations of irradiation & the load. Basically, this study mainly focuses on determining the connection between the pulse durations with regard to parameters of the system & technological supplies.

7). Digital Soil Moisture Tester

The digital soil moisture tester is used to monitor the soil condition whether the soil is wet/dry. This tester is also used to test the wetness or dryness of fabrics made with cotton, woolen, etc. This tester includes a display with a number of LEDs used for indication purposes. Once the two test rods are inserted in the soil, then the display panel will show the magnitude of conductance among the two probes. Based on the soil resistance, it measures the condition of the soil through the readings of soil resistance.

8). 8051 Microcontroller based Digital Voltmeter

This simple project is used to design a digital voltmeter using 8051 microcontrollers. The main intension of this project is to measure the input voltage that ranges from 0V- 5V. In this project, the input voltage used by this circuit is DC voltage so that an accurate output can be obtained and that is displayed on LCD.

9). Digital Temperature Sensor

This project is used to design a digital temperature sensor project. The main function of this project is to exhibit the value of digital temperature. These circuits are applicable to ecological applications.

10). Digital Object Counter

This project is used to design a 5V digital object counter. The main function of this circuit is to count the objects. This circuit can be designed with a digital IC and LDR.

11). Raspberry Pi & Face Recognition based Door Lock System

In-home security systems, monitoring the people plays an essential role to check who is coming and leaving the house. We know that the home security system is mainly designed through password-based but sometimes these can be modified or stolen easily. To overcome this issue, here is a security system namely door lock system using face recognition.

IV.CONCLUSION

Devices used in applications such as these are constantly decreasing in size and employing more complex technology. It is therefore essential for engineers and students to understand the fundamentals, implementation and application principles of digital electronics, devices and integrated circuits. This is so that they can use the most appropriate and effective technique to suit their technical need.

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