TCET
DEPARTMENT OF ELECTRONICS ENGINEERING (ETRX)
Credit Based Grading System [CBGS - 2012(R)]/Choice Based Credit and Grading Scheme [CBCGS - 2016(R)]
CBCGS-2016(R)
Estd. 2001

E-Magazine Committee

Hari N. Khatavkar
(Chief Editor)
(TE ETRX)

Yashodhan Wagle

(Editorial Associate)

(SE ETRX)

Krishndutt Shirodkar

(Co-Editor)

(SE ETRX)

Rahul A. Patil

(Designing & Styling)

(SE ETRX)

Raj Dubey

(Research & Analysis)

(TE ETRX)

Arunendra Singh

(Editorial Associate)

(SE ETRX)

Aditi Jain

(Research & Analysis)

(TE ETRX)

Editors Message

It gives us great pleasure to welcome you to this edition of Techtronics. The E-Magazine committee presents the 'this that' issue of the E-Magazine of the Department of Electronics called Techtronics. No matter how long it takes; no matter how many revisions have been scrapped, we have perceived and come to the consensus that this magazine is what our fellow students would love to read and divulge their valuable time into.

In this and every issue, we offer a look at the twists and turns in the latest technological developments, ideas and innovations and ubiquitous insights on the current industry. Research articles and news form the bulk of the content, with a few innovative project ideas also as a section. The methodological quality of such publications has improved dramatically over the past few years.

Peer review remains a vital component of our assessment of submitted articles. There have been criticisms of this process, including delaying publication, unreliability of decision making, overly conservative approach automatically rejecting ‘non-standard’ ideas, and that peer review is poor at detecting errors and misconduct. However, these weaknesses can be managed by an effective

and active editorial office, and I believe they are outweighed by the benefits. There is a strong consensus that accepted articles are often improved by peer review after referees' comments and criticisms are dealt with; this explicit appraisal process also helps to engender the trust of the reader.

It is important that we have a good balance of different article type within the magazine. We are keen to encourage publication of high-quality evidence-based guidelines. Such articles are widely read (and downloaded), can have a major impact on scientific practices, and tend to be highly cited to the benefit of our Impact Factor. The magazine also has the potential to (re-) shape thinking on important concepts in science & technology.

Techtronics will always continue to publish high-quality research content in science & technology. The committee is thankful to the Department of Electronics and to the college for giving us this opportunity to be a part of.

Principal's Message:

I have great pleasure in conveying my best wishes to the Department of Electronics Engineering for releasing the technical magazine "TECHTRONICS" which brings the students and teachers of various disciplines on a common platform to share and display their ideas and creative talents.

I wish all the faculties and students who have involved in bringing out the magazine for their greater success and career ahead!!

Dr B. K. Mishra

Principal

Dean's Message:

It is a noble task on the part of the Department of Electronics Engineering to once again make it with their frequent issue "TECHTRONICS". I wish that this TECHTRONICS establishes to be a flint to fire the enthusiasm and excite their minds for many intrusive innovations among the faculty and students inspire passion among the members of the faculty of Electronics Magazine committee. My greeting to the editorial board to keep the good work!!!

Dr Lochan Jolly

Dean SSW

HOD's Message:

Once again, it's a moment of pride for the whole department of ETRX as we present the latest issue of our magazine "TECHTRONICS". This time around the magazine isn't just a regular one, it is much more exciting and much more innovative and informative. I appreciate my team for their sincere efforts in putting up such a beautiful magazine on the line. And I wish the radiance of ETRX keeps breaking old boundaries and set's up new limit, as we believe in aiming at stars…for sky is the limit for us.

Dr Sandhya Save

HOD ETRX

Dy HOD's Message:

The Electronics & Communication Engineering is one of the most dynamically changing and ever evolving branch since more than 100 years. Electronics is the foundation on which Information Technology and Computer Engineering has grown. All high-speed networks and computers work on the hardware designed by electronic engineers.

21st century is the century of communication as communication engineering has been growing exponentially in recent years. At TCET, department of electronics Institute developed state-of-art laboratories & centres of excellence so as to train our students in Electronics Engineering through flexible, adaptive and progressive training programs, Bridge Courses, Various project in signal System and communication Domain and other Domains along with cohesive interaction with the research organizations, academicians and industries and having experience faculties in the department. It is my pleasure to work with imminent students who egger to develop the carrier in Electronics Engineering.

Dr S. C. Patil

Dy. HOD ETRX

TABLE OF CONTENTS

TABLE OF CONTENTS

About the Department:

Department of ELECTRONIC ENGINEERING was established in the year 2008 at TCET. The ELECTRONICS branch has 14 qualified faculty members. The department has 9 well equipped labs and 3 classrooms. The course also focused on project-based learning such that the students can develop skills which are beneficial for upcoming demands of the industry.

The ETRX department also has a professional body named IETE (The Institution of Electronics and Telecommunication Engineer) which is recognised all over the globe. IETE plans various technical seminars and workshops for students for nurturing the technical skills of the students.

Vision of the Department:

Electronics' Department of Thakur College of Engineering and Technology (TCET) will thrive to achieve academic excellence in electronics and electronics related technical education in Mumbai University to develop internationally competent professionals with a sense of responsibility and social sensitivity.

Mission of the Department:

Electronics' Departments mission is to achieve academic excellence by creating the right academic Ambience, Nurturing, enhancing personal and professional skills enabling the students to compete globally.

Disciplines of the Department:

POs:

1. *Ability to demonstrate knowledge of electrical & electronics engineering.*
2. *Ability to demonstrate ability to identify, formulate and solve.*
3. *Ability to design electrical and electronic circuits and conduct experiments with electrical systems, analyze and interpret data.*
4. *Ability to design digital and analog systems and component.*
5. *Ability to visualize and work on laboratory and multidisciplinary tasks.*
6. *Ability to demonstrate skills to use modern engineering tools, software and equipment to analyze problems.*
7. *Ability to demonstrate knowledge of professional and ethical responsibilities.*
8. *Ability to communicate effectively in both verbal and written form.*
9. *Understanding of impact of engineering solutions on the society and also will be aware of contemporary issue.*
10. *To develop confidence for self-education and ability for life-long learning*
11. *Ability to recognize and adapt to emerging applications in engineering and technology.*
12. *To participate and succeed in competitive examinations like GATE, GRE*

PEOs:

PEO 1:	*To provide students with a strong foundation in the mathematical, scientific and engineering fundamentals necessary to formulate, solve and analyze engineering problems at hand and to prepare them for graduate studies.*
PEO 2:	*To prepare students to demonstrate an ability to identify, formulate and solve electronics engineering problems.*

PEO 3:	*To prepare students to demonstrate ability to design electrical and electronics systems and conduct experiments, analyse and interpret data.*
PEO 4:	*To prepare students to demonstrate for successful career in industry to meet the needs of Indian and multi-national companies.*
PEO 5:	*To develop the ability among students to synthesize data and technical concepts from applications to product design.*
PEO 6:	*To provide opportunity to students to work as a team on multidisciplinary projects and to promote awareness among students for life-long learning and introduce them to professional ethics and codes of professional practice.*

PSOs:

1. *Should be able to clearly understand the concepts and applications in the field of Electronics such as semiconductor technology, signal processing, embedded systems, communication etc. and acquire skills to Identify, formulate & solve problems in related fields of Electronics.*
2. *Should be able to design electronics and computer-based components and systems for applications including signal processing, communication and control systems with the capability to comprehend the technological advancements with the help of modern design tools to analyze and design subsystems/processes for a variety of applications.*
3. *Should be able to understand the impact of engineering solutions in a Global, Economic, Environmental, and Societal context and co-relate the learning to derive solutions to real world problems.*
4. *Should be able to demonstrate skills to communicate in verbal and written form effectively and demonstrate the practice of professional ethics along with the concerns for societal and environmental wellbeing.*

Domain In-charge (Electronic Devices & Circuits Modelling & Simulation):

This domain covers understanding of various devices used in Electronics in terms of principle of operation, applications in the field of Electronic Circuit Design. Enable students to design simple projects and perform analysis of Circuits and Systems.

Also enable students to learn Computer aided simulation and synthesis tool for circuit design and simulation. With the use variety of computer hardware and software applications different projects and research can be carried out. This field is basis of electronics and has lot of research opportunities in India and abroad.

Mrs. Poorva Waingankar

Domain In-charge (Signal Processing & Communication):

The Electronics Engineering is one of the most dynamically changing and ever evolving branch since more than 100 years. Electronics is the foundation on which Information Technology and Computer Engineering has grown. All high-speed networks and computers work on the hardware designed by electronic engineers.

21st century is the century of communication as communication engineering has been growing exponentially in recent years. At TCET, department of electronics Institute developed state-of–art laboratories & centres of excellence to train our students in Electronics Engineering through flexible, adaptive and progressive training programs, Bridge Courses, Various project in signal System and communication Domain and other Domains along with cohesive interaction with the research organizations, academicians and industries and having experience faculties in the department. It is my pleasure to work with imminent students who egger to develop the carrier in Electronics Engineering.

Dr S. C. Patil

Teacher's Words of Wisdom

"Successful teaching is about shaping the information flow so that the student experiences it – moment by moment - at the right level of difficulty"

"Healthy teachers set boundaries and create healthy routines so that their work is meaningful, rich, and energetic, and they can also have healthy lives outside of their classrooms and institutes.

Mr. Vaibhav Gijare

Assistant Professor

"One looks back with appreciation to the brilliant teachers, but with gratitude to those who touched our human feelings. The curriculum is so much necessary raw material, but warmth is the vital element for the growing plant and for the soul of the child."

Mrs. Archana Belge

Assistant Professor

"The dream begins with a teacher who believes in you, who tugs and pushes and leads you to the next plateau, sometimes poking you with a sharp stick called truth."

"The task of the excellent teacher is to stimulate apparently ordinary people to unusual effort. The tough problem is not in identifying winners: it is in making winners out of ordinary people"

Dr S.C. PATIL

Associate Prof, Dy. HOD

Now a day's I am surprised to see students not having a habit of reading. This not only surprises me, but I also feel dreadful. Dear students it is a sincere request to you from a teacher that please develop reading habits in yourself. Books are our best friends. Also, for this you need to be patient first. What I feel is that the root cause behind this is today's generations' impatient behaviour. This is obvious because from the beginning you got things readymade, let it be your toys or let it be your notes. You all are habitual of getting the things served on plate. But it is never late, still you have that energy; you just must concentrate it. Read good books, get your topics cleared by reading. Avoid learning things only through YouTube. I hope this suggestion will be very helpful to you.

Mrs. Sonal Barvey

Assistant Professor

If we can achieve the state of self-mastery, we will more consistently have the personal power and peace of mind we need to get ahead, since we are not giving our energy, and power away to others. If we take responsibility for ourselves, we will realise how much we can affect change in our lives and in the society.

Life has no meaning if we all don't live it whole heartedly. Live life with full of love, happiness will embrace you on its own.

Mrs. Sujata Alegavi

Assistant Professor

ARTICLE SECTION 1

1.1 Evolution of Digital IC Technologies

The first "generation" of computers were relied on vacuum tube devices, after this discrete semiconductor devices, followed by integrated circuits have been evolved. The first integrated circuit was manufactured independently by two scientists: Jack and Kilby of Texas Instruments in 1959. The first IC had small number of devices on a single chip then diodes, transistors, resistors and capacitors, made it possible to fabricate one or more logic gates on a single device. Digital integrated circuits are classified according to the number of transistors integrated on a single chip. The different technologies involved in digital integrated circuits are as follows:

TABLE 1–5 The Intel family of microprocessor bus and memory sizes

Microprocessor	*Data Bus Width*	*Address Bus Width*	*Memory Size*
8086	16	20	1M
8088	8	20	1M
80186	16	20	1M
80188	8	20	1M
80286	16	24	16M
80386SX	16	24	16M
80386DX	32	32	4G
80386EX	16	26	64M
80486	32	32	4G
Pentium	64	32	4G
Pentium OverDrive	32	32	4G
Pentium Pro	64	32	4G
Pentium Pro	64	36	64G
Pentium II	64	32	4G
Pentium II, Pentium III, Pentium 4	64	36	64G

Small-scale integration (SSI):

The first integrated circuits contained only a few transistors, called "Small-Scale Integration" (SSI), they used circuits containing only 10s of transistors on single chip. SSI circuits were crucial to early 1960 through 1963, and the integrated circuits developed in this technology are basic logic gates.

Medium-scale integration (MSI):

In 1960s new technology has been introduced in which the number of transistors involved on the are hundred and named as "Medium-Scale Integration" (MSI). These devices allowed more complex systems to be produced using smaller circuit boards, less assembly work and several other advantages. The integrated circuits developed in this technology are multiplexers and flip-flops. Using the multiplexer any combinational logic can be implemented and using the D-FF any sequential circuit can be implemented hence to design digital systems this technology was popular. This includes encoders, decoders, counters, registers, arithmetic circuits, small memories, and others.

Large-scale integration (LSI):

Further development driven by the economic factors such as time to market and cost because by using MSI chips and bread boarding approach number of years and large cost is required for designing complex digital systems e.g. microprocessor. This leads to the "Large-Scale Integration" (LSI) in the mid-1970s, with tens of thousands of transistors per chip. The devices produced in this technology are programmable logic devices (PLDs) i.e. PAL, PLA and PROM are developed in this technology.

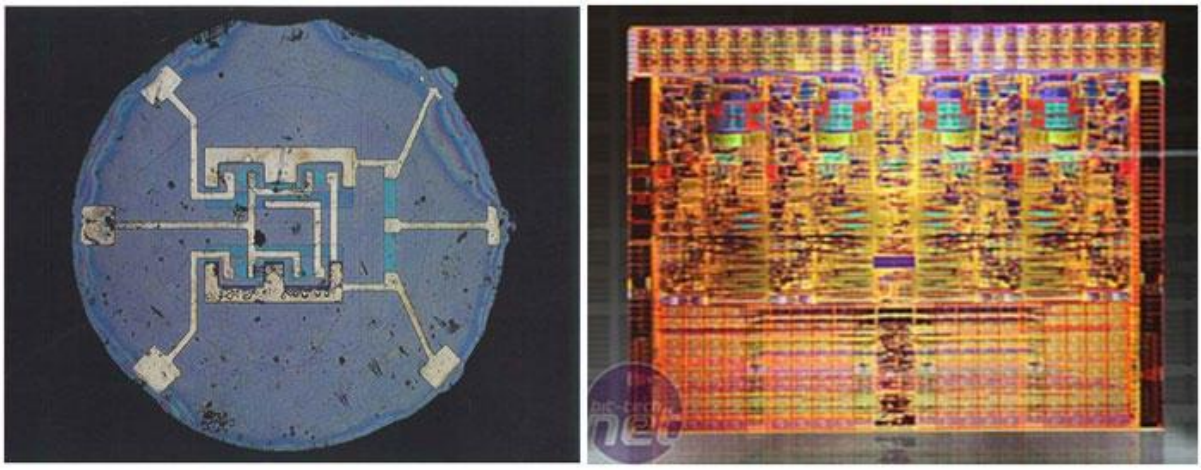
Very large-scale integration (VLSI):

In the year 1980s new step has been developed in the development process that step is the "Very Large-Scale Integration" (VLSI), in which more than 1000 transistors are included on a single chip. This is the technology by which the first microprocessor has been developed. In addition to this one-megabit RAM chip has been developed which contains million number of transistors. This developments in VLSI are mainly because of design rules in CMOS technology, development of Complex Programmable Devices(CPLD)s, Field Programmable Gate Arrays (FPGA) and the Electronic Design Automation (EDA) tools.

Ultra-large-scale integration (ULSI):

It describes very large memories, larger microprocessors, and larger single-chip computers. Complexities of 100,000 equivalent gates and greater are classified as ULSI.

Although the WSI technique failed due to semiconductor level manufacturing issues,



A comparison: First Planar IC (1961) and Intel Nehalem Quad Core Die

Wafer-Scale Integration (WSI):

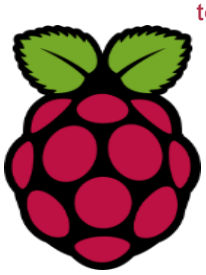
Another technique used in IC industry is the wafer-scale integration (WSI), which uses the complete uncut wafers for the development of processors and memory. The WSI step was taken in 1980s by Gene Amdahl who is failed due to the semiconductor level manufacturing issues.

the advanced tools in semiconductor manufacturing produces another thread on IC complexity, which is known as System-on- Chip (SOC) design. In this SOC, the IC blocks are manufactured as a various chip and have been integrated in a chip. In addition, the printed circuit boards are developed to occupy the chip which involves memory, microprocessors, peripheral interfaces, Input/output logic control, data converters etc. to develop electronic systems.

System-on- Chip (SOC):

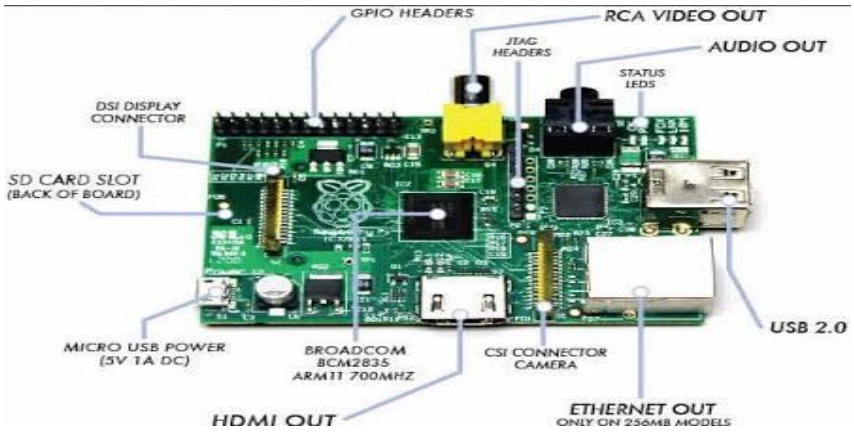
Since the invention of the first IC (Integrated Circuit) in the form of a Flip Flop by Jack Kilby in 1958, our ability to pack more and more transistors onto a single chip has doubled roughly every 18 months, in accordance with the Moore's Law. Such exponential development had never been seen in any other field and it still continues to be a major area of research work technology is evolving rapidly. Currently, we are working on 7nm technology. R&D groups of major VLSI companies are focusing on CNTFET and Three-Valued logic.

1.2 Raspberry Pi



Raspberry pi is a single board computer or a portable computer whose size is equal to an ATM card in your wallet. The portability provided by raspberry pi is its most important and crucial feature. It not as powerful as your regular desktop or laptops, but it can get your most of the basic things done. Casual web-browsing and editing of docs can be easily done on a raspberry pi. It is easy to learn programming using Raspberry Pi.

There are different options for operating system available for the raspberry pi. But the most commonly and widely used OS is, Raspbian. It is very simple and user-friendly OS, best for beginners. Currently raspberry pi 3 and raspberry pi zero w are the latest offerings of raspberry pi foundation. The raspberry pi zero w is even smaller than RPi 3. Its size is almost equal to an average pen-drive.



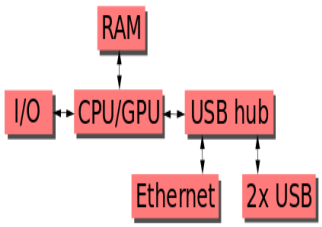
The raspberry pi doesn't have any internal storage, so you will need and external storage card. It should be of at least 8GB and it should be more or above class 10. If your SD card is less than class 10, you might face some loading issues.

Various operating systems for the Raspberry Pi can be installed on a MicroSD, Mini SD or SD card, depending on the board and available adapters; seen here is the MicroSD slot located on the bottom of a Raspberry Pi 2 board.

History:

The first generation (Raspberry Pi 1 Model B) was released in February 2012, followed by the simpler and cheaper Model A. In 2014, the Foundation released a board with an improved design, Raspberry Pi 1 Model B+.

A Raspberry Pi Zero with smaller size and reduced input/output (I/O) and general-purpose input/output (GPIO) capabilities was released in November 2015 for US$5. Raspberry Pi 3 Model B was released in February 2016 and has on-board WiFi, Bluetooth and USB boot capabilities. By 2017, it became the newest mainline Raspberry Pi. On 28 February 2017, the Raspberry Pi Zero W was launched, a version of the Zero with Wi-Fi and Bluetooth capabilities.



Software:

Various operating systems for the Raspberry Pi can be installed on a MicroSD, MiniSD or SD card, depending on the board and available adapters; seen here is the MicroSD slot located on the bottom of a Raspberry Pi 2 board.

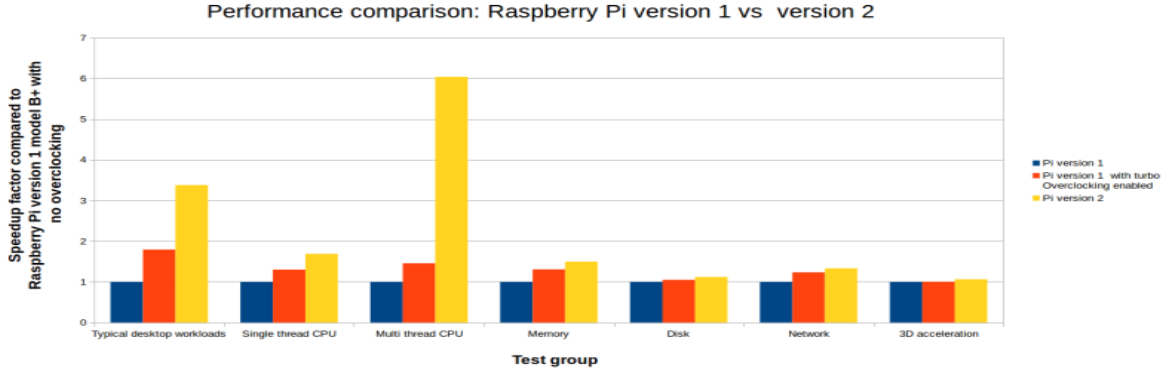
Hardware:

The Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity and peripheral-device support.

The block diagram shown above depicts Models A, B, A+, and B+. Model A, A+, and the Pi Zero lack the Ethernet and USB hub components. The Ethernet adapter is internally connected to an additional USB port. In Model A, A+, and the Pi Zero, the USB port is connected directly to the system on a chip (SoC). On the Pi 1 Model B+ and later models the USB/Ethernet chip contains a five-point USB hub, of which four ports are available, while the Pi 1 Model B only provides two. On the Pi Zero, the USB port is also connected directly to the SoC, but it uses a micro USB (OTG) port.

Performance:

The Raspberry Pi 3, with a quad-core ARM Cortex-A53 processor, is described as 10 times the performance of a Raspberry Pi 1. This was suggested to be highly dependent upon task threading and instruction set use. Benchmarks showed the Raspberry Pi 3



to be approximately 80% faster than the Raspberry Pi 2.

There are also dozens of cross-cultural applications like science and music (electronic sound effects). All over the world are experimenting with Raspberry Pi and can hold Raspberry Pi event. Where people of ages are learning together what can be done with a Raspberry Pi. In schools using Raspberry Pi students can learn programming as part of ICT.

Applications:

1. Raspberry Pi Tablet

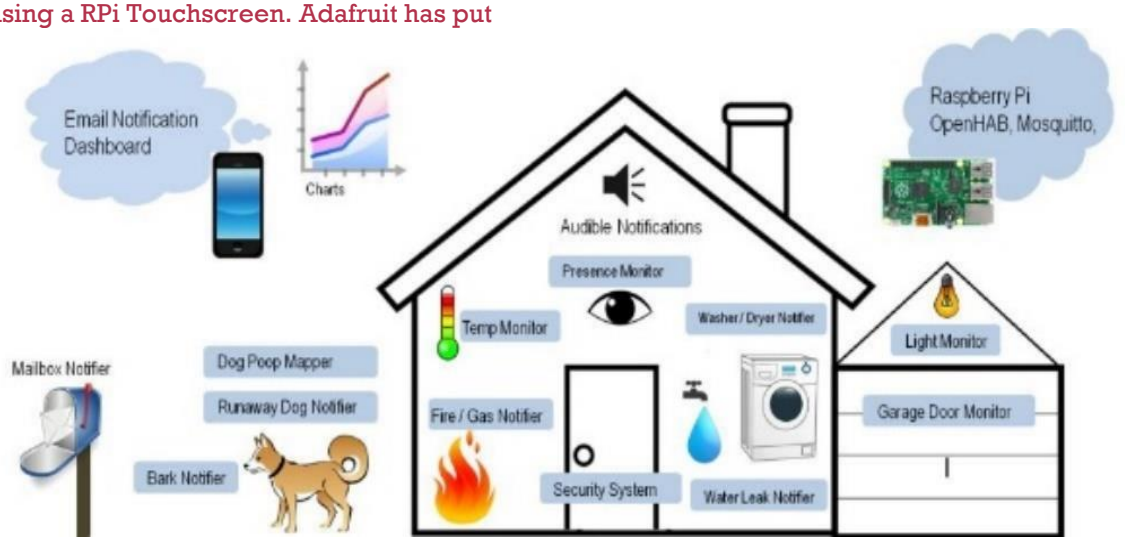
You can transform your RPi into a tablet using a RPi Touchscreen. Adafruit has put together a simple guide and parts to help you building your own tablet without struggling and with a great final result.

2. Low-Cost Desktop PC

The Raspberry Pi can make a useful desktop computer if set up properly. To turn your raspberry pi into a desktop PC you'll need other gadgets than RPi itself such as a screen, a mouse, a keyboard

and if you want, an extra storage device.

You also need to install an operating system like Raspbian or any other operating systems available for RPi. Some apps such as email and web browsing apps are included and many other are available for RPi.



3. Home Automation systems

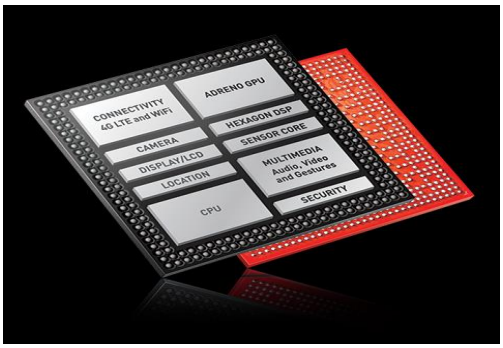
The Raspberry Pi can host a powerful home automation application. You can attach sensors, a camera, relays, etc. And you can monitor and control your house remotely. To extend its capabilities you can also add Arduinos or other similar boards.

1.3 Snapdragon

Snapdragon is a suite of system on a chip (SoC) semiconductor products designed and marketed by Qualcomm for mobile devices. The Snapdragon central processing unit (CPU) uses the ARM RISC instruction set, and a single SoC may include multiple CPU cores, a graphics processing unit (GPU), a wireless modem, and other software and hardware to support a smartphone's global positioning system (GPS), camera, gesture recognition and video.

Snapdragon semiconductors are embedded in devices of various systems, including Android and Windows Phone devices. They are also used for netbooks, in cars, wearable devices and other devices.

The first Snapdragon product to be made available to consumer device manufacturers was the QSD8250, which was released in November 2007. It included the first 1 GHz processor for mobile phones. Qualcomm introduced its "Krait" microarchitecture in the second generation of Snapdragon SoCs in 2011, allowing each processor core to adjust its speed based on the device's needs. At the 2013 Consumer Electronics Show, Qualcomm introduced the first of the Snapdragon 800 series and renamed prior models as the 200, 400 and 600 series. Several new iterations have been introduced since, such as the Snapdragon 805, 810, 615 and 410. Qualcomm re-branded its modem products under the Snapdragon name in December 2014.



Incredible mobile experiences:

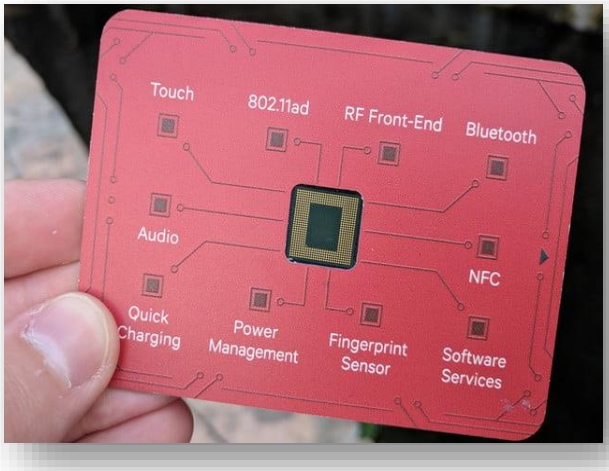
Snapdragon mobile platforms are designed to support experiences you have to see to believe. From the lightning-fast streaming of video and audio, to alternate reality exploration, to machine learning capabilities that can personalize your experience the robust processing strength, ground breaking battery efficiency and superior connectivity of our mobile platform help bring innovative user experiences to life.

Meet the Qualcomm Snapdragon 845, the power behind next-gen phones:

The highly anticipated and heavily rumoured Qualcomm Snapdragon 845 processor is finally here. The new chip is set to power the next generation of high-power, flagship-quality smartphones in 2018, likely starting with the likes of Xiaomi and Samsung, both of which took the stage at Qualcomm's Snapdragon

Already, developers are building ways to take full advantage of the new chip. Elliptic Labs, for example, announced that its Magic Snap Ultra Sound sensor technology leverages the device's new Neural Processing Engine, allowing you to create gestures in the air around the phone to control the device itself. With the Snapdragon 845, Qualcomm has focused on five key areas of development. We'll run through each one below.

get better, and faster. Qualcomm is following Huawei's innovation with the Kirin 970 and its Neural Processing Unit (NPU), which enables A.I. scene recognition and settings adjustment in the camera app on the Huawei Mate 10.



The chip also offers improved voice recognition and low-power voice processing, and Qualcomm will work with Chinese internet technology company Baidu on providing A.I. voice control for mobile and other Snapdragon 845-powered devices used in the home. Using Baidu's conversational A.I. platform Duer OS, expect low-power voice activation controls to arrive in more devices, particularly those made in China, ready to wake up phones using a simple command.

To make developing apps and tools for the Snapdragon 845's A.I. easier, Qualcomm has included support for Google's TensorFlow and Facebook's Caffe frameworks. Those frameworks, coupled with the Snapdragon Neural Processing Engine, should make for a much smarter smartphone.

Artificial Intelligence:

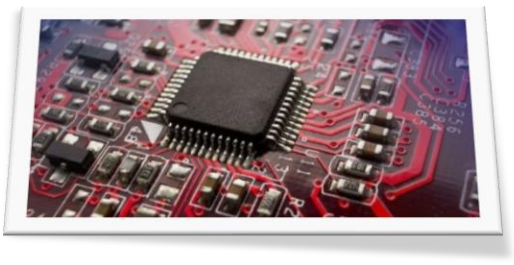
According to Qualcomm, the Snapdragon 845 is the third generation of mobile artificial intelligence platform. In the Snapdragon 845, Qualcomm has improved neural network performance by a factor of three. That's a big deal as artificial intelligence gets increasingly powerful, especially on mobile devices, devices will need to be able to handle the extra workload.

More advanced artificial intelligence also plays a role in better image processing. Google made headlines with the Pixel 2 for using one single camera to produce excellent portrait mode photos, thanks largely to artificial intelligence that can detect backgrounds and blur them to create a bokeh effect. With the Snapdragon 845, those kinds of image-processing systems will only

Qualcomm Snapdragon 845 may power future Chromebooks:

The Snapdragon 845 platform, Qualcomm's latest 64-bit chipset, was revealed in Hawaii earlier in December. It's built on Samsung's 10nm LPP FinFET process technology and it's is expected to power a number of 2018's most powerful phones. A recent discovery in the Chromium repository suggests it may also power some of the next Chromebooks, too.

The Chromium repository is the codebase where the open source files and documentation for Chrome lives. It's maintained by Google and aims to help third-parties create products for the Chrome OS. Yesterday, the folks over at XDA Developers spotted references to a new board overlay there, called "cheza," for a reference device that would work alongside a chip known as "chipset-qc845." This is believed to denote the Snapdragon 845, and it's a moniker that appears several times throughout the repository, while Qualcomm is also specifically mentioned.



long-term Chromebook support.

This would be the first Qualcomm Snapdragon-powered Chromebook to hit the market, following speculation (which originated from Google employees) that Qualcomm wouldn't be involved in the Chromebook market due to its reluctance to deliver

Things might have changed since those reports, however, as Qualcomm recently announced support for Windows laptop systems (the first of which were just seen earlier this month). These computers are said to come with up to 25-hour battery life and house LTE connectivity features that would also go down well on Chromebooks. Though the new Chromium commits don't necessarily mean that a Snapdragon-powered Chromebook is in the works, it's a firm indication.

1.4 TITAN V BY NVIDIA

The NVIDIA Titan V may be the most important Titan yet for the company. Not just because it's the newest, or because it's the fastest – and oh man, is it fast – or even because of the eye-popping $3000 price tag, but because it's the first card in a new era for the Titan family. What sets the Titan V apart from all of its predecessors is that it marks the first time that NVIDIA has brought one of their modern, high-end compute-centric GPUs to the Titan family, and what that means for developers and users alike. NVIDIA's massive GV100 GPU, already at the heart of the server-focused Tesla V100, introduced the company's Volta architecture, and with it some rather significant changes and additions to NVIDIA's compute capabilities, particularly the new tensor core. And now those features are making their way down into the workstation-class (and aptly named) Titan V.

Volta, an Nvidia-developed GPU microarchitecture codename, succeeds Pascal and was announced as a future roadmap ambition in March 2013. The architecture is named after Alessandro Volta, the physicist, chemist, and inventor of the electrical battery. The Nvidia Titan V is the first consumer grade graphics card which uses the Volta microarchitecture. The first graphics card to use it is the Tesla V100, e.g. as part of the Nvidia VGX-1 system.

The Pascal-based GP100 chip was released on 20 June 2016, and the Volta-based GV100 chip was released on 21 June 2017. It is the first chip to feature Tensor cores.As of December 2017, Nvidia claims that the Titan V is the most powerful PC graphics card on the market.

NVIDIA GPU Specification Comparison

	Titan V	Titan XP	GTX Titan X (Maxwell)	GTX Titan
CUDA Cores	5120	3840	3072	2688
Tensor Cores	640	N/A	N/A	N/A
ROPs	96	96	96	48
Core Clock	1200MHz	1485MHz	1000MHz	837MHz
Boost Clock	1455MHz	1582MHz	1075MHz	876MHz
Memory Clock	1.7Gbps HBM2	11.4Gbps GDDR5X	7Gbps GDDR5	6Gbps GDDR5

Memory Bus Width	3072-bit	384-bit	384-bit	384-bit
Memory Bandwidth	653GB/sec	547GB/sec	336GB/sec	228GB/sec
VRAM	12GB	12GB	12GB	6GB
L2 Cache	4.5MB	3MB	3MB	1.5MB
Single Precision	13.8 TFLOPS	12.1 TFLOPS	6.6 TFLOPS	4.7 TFLOPS
Double Precision	6.9 TFLOPS (1/2 rate)	0.38 TFLOPS (1/32 rate)	0.2 TFLOPS (1/32 rate)	1.5 TFLOPS (1/3 rate)
Half Precision	27.6 TFLOPS (2x rate)	0.19 TFLOPs (1/64 rate)	N/A	N/A
Tensor Performance (Deep Learning)	110 TFLOPS	N/A	N/A	N/A
GPU	GV100 (815mm2)	GP102 (471mm2)	GM200 (601mm2)	GK110 (561mm2)
Transistor Count	21.1B	12B	8B	7.1B
TDP	250W	250W	250W	250W
Manufacturing Process	TSMC 12nm FFN	TSMC 16nm FinFET	TSMC 28nm	TSMC 28nm
Architecture	Volta	Pascal	Maxwell 2	Kepler
Launch Date	12/07/2017	04/07/2017	08/02/2016	02/21/13
Price	$2999	$1299	$999	$999

The Titan family has already been pushing towards compute for the past few years, and by putting the compute-centric GV100 into the card, NVIDIA has essentially ushered that transition to completion. The Titan V now gets all of the compute capabilities of NVIDIA's best GPU, but in turn it's more distant than ever from the graphics world. Which is not to say that it can't do graphics – as we'll see in detail in a bit – but this is first and foremost a compute card. In particular it is a means for NVIDIA to seed development for the Volta architecture and its new tensor cores, and to give its user base a cheaper workstation-class alternative for smaller-scale compute projects. The Titan family may have started as a card for prosumers, but the latest Titan V is more professional than any card before.

Putting this into context of what it means for existing Titan customers and it means different things for compute and graphics customers. Compute customers will be delighted at the performance and the Volta architecture's new features;

	NVIDIA TITAN V
Graphics Processing Clusters	6
Streaming Multiprocessors	80
CUDA Cores (single precision)	5120
FP64 Cores (double precision)	2560
Texture Units	320
ROP Units	96
Base Clock	1200MHz
Boost Clock	1455MHz
Memory Clock (HBM2)	850MHz
L2 Cache Size	4608KB

Total Video Memory	12,288MB HBM2
Memory Interface	3072-Bit
Total Memory Bandwidth	652.8 GB/s
Texture Filtering Rate (Bilinear)	384 Giga Texels/sec
Fabrication Process	12 nm
Transistor Count	21.1 Billion
Connectors	3 x Display Port, 1 x HDMI
Form Factor	Dual Slot
Power Connectors	One 8-Pin, One 6-Pin
Recommended Power Supply	600 Watts
Thermal Design Power (TDP)	250 Watts
Thermal Threshold	91°C

The TITAN V is outfitted with a die cast aluminium body which is machine finished and heat treated for additional strength and rigidity. The top edge of the card features an embossed, gold "TITAN" logo and the thermal solution is like the TITAN Xp's. There is a relatively large vapour chamber on-board, topped with an array of copper heatsink fins, and a radial fan that draws in air from inside the chassis and vents it out though the back. At the rear of the card, a second, small heatsink helps wick heat away from the VRM.

The TITAN V features a 16-phase digital power array for its GPU and memory and the card has a 250W TDP, which is typical of NVIDIA's high-end TITANs. Like the TITAN Xp, the TITAN V requires two supplemental power connectors, one 6-pin and one 8-pin. The outputs on the TITAN V are just like the last few high-end offerings from NVIDIA and consist of a trio of full-sized Display Ports and an HDMI 2.0b output. The Display Ports enable support for 4K displays at 120Hz, 5K displays at 60Hz, and 8K displays at 60Hz (using two cables and multi-stream transport). Up to four display outputs can be used simultaneously for multi-monitors, VR setups, and the like.

1.5 Gordon Moore

Early Life

Gordon Earle Moore is an American businessman, co-founder and chairman emeritus of Intel Corporation, and the author of Moore's law. Moore was born in San Francisco, California, and grew up in nearby Escudero. His father was the county sheriff. He attended Sequoia High School in Redwood City. Initially he went to San Jose State University. After two years he transferred to the University of California, Berkeley, from which he received a B.S. degree in chemistry in 1950.

In September 1950, Moore matriculated at the California Institute of Technology. Moore received a Ph.D. degree in chemistry and minor in physics from Caltech in 1954. Moore conducted postdoctoral research at the Applied Physics Laboratory at Johns Hopkins University from 1953 to 1956.

Scientific Career

Moore joined MIT and Caltech alumnus William Shockley at the Shockley Semiconductor Laboratory division of Beckman Instruments, but left with the "traitorous eight", when Sherman Fairchild agreed to back them and created the influential Fairchild Semiconductor Corporation.

In 1965, Moore was working as the director of research and development (R&D) at Fairchild Semiconductor. He was asked by Electronics Magazine to predict what was going to happen in the semiconductor components industry over the next ten years. In an article published on April 19, 1965, Moore observed that the number of components (transistors, resistors, diodes or capacitors)[1] in a dense integrated circuit had doubled approximately every year, and speculated that it would continue to do so for at least the next ten years. In 1975, he revised the forecast rate to approximately every two years. Carver Mead popularized the phrase "Moore's law." The prediction has become a target for miniaturization in the semiconductor industry and has had widespread impact in many areas of technological change.

In July 1968, Robert Noyce and Moore founded NM Electronics which later became Intel Corporation. Moore served as executive vice president until 1975 when he became president. In April 1979, Moore became chairman and chief executive officer, holding that position until April 1987, when he became chairman. He was named chairman emeritus in 1997. Under Noyce, Moore, and later Andrew Grove, Intel has pioneered new technologies in the areas of computer

memory, integrated circuits and microprocessor design.

In 2000 Betty and Gordon Moore established the Gordon and Betty Moore Foundation, with a gift worth about $5 billion. Through the Foundation, they initially targeted environmental conservation, science, and the San Francisco Bay Area.

The foundation gives extensively around environmental conservation, supporting major projects in the Andes-Amazon Basin and the San Francisco Bay area, among others. Moore was a director of Conservation International for some years. In 2002 he and Conservation International senior vice president Claude Gascon received the Order of the Golden Ark from Prince Bernhard of Lippe-Biesterfield for their outstanding contributions to nature conservation.

In 2011, Moore's genome was the first human genome sequenced on Ion Torrent's Personal Genome Machine platform, a massively parallel sequencing device. Ion Torrent's device obtains sequence information by directly sensing ions produced by DNA polymerase synthesis using ion-sensitive field effect transistor sensors.

Awards and Honours

Moore has received many honours. He became a member of the National Academy of Engineering in 1976.In 1990, Moore was presented with the National Medal of Technology and Innovation by President George H.W. Bush, "for his seminal leadership in bringing American industry the two major post-war innovations in microelectronics - large-scale integrated memory and the microprocessor - that have fuelled the information revolution."

In 1998 he was inducted as a Fellow of the Computer History Museum "for his fundamental early work in the design and production of semiconductor devices as co-founder of Fairchild and Intel. "In 2001, Moore received the Other Gold Medal for outstanding contributions to progress in chemistry and science. Moore is also the recipient of the Presidential Medal of Freedom, the United States' highest civilian honour, as of 2002.He received the award from President George W. Bush. In 2002, Moore also received the Bower Award for Business Leadership.

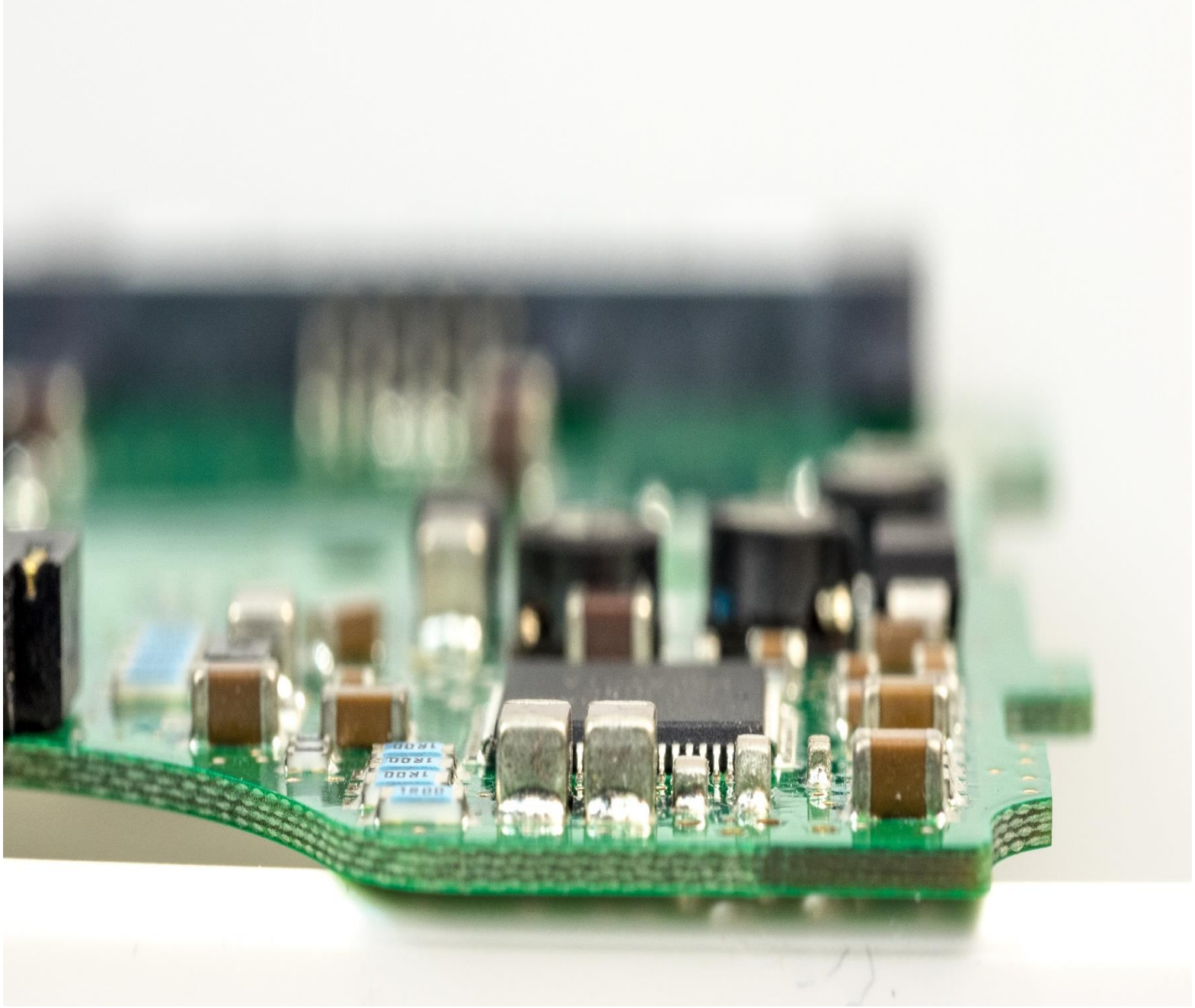
In 2003, he was elected a Fellow of the American Association for the Advancement of Science. Moore was awarded the 2008 IEEE Medal of Honour for "pioneering technical roles in integrated-circuit processing, and leadership in the development of MOS memory, the microprocessor computer and the semiconductor industry." Moore was featured in the documentary film *Something Ventured* which premiered in 2011.

In 2009, Moore was inducted into the National Inventors Hall of Fame. He was awarded the 2010 Future Dan David Prize for his work in the areas of Computers and Telecommunications. The library at the Centre for Mathematical Sciences at the University of Cambridge is named after him and his wife Betty, as are the Moore Laboratories building (dedicated 1996) at Caltech and the Gordon and Betty Moore

Materials Research Building at Stanford.

The Electrochemical Society presents an award in Moore's name, the Gordon E. Moore Medal for Outstanding Achievement in Solid State Science and Technology, every two years to celebrate scientists' contributions to the field of solid state science. The Society of Chemical Industry (American Section) annually presents the Gordon E. Moore Medal in his honour to recognize early career success in innovation in the chemical industries.

PROJECT SECTION



INTERESTING PROJECT IDEAS

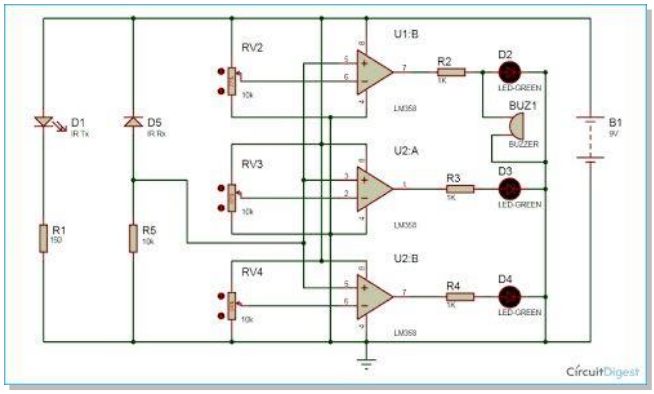
1.1 Reverse Parking Sensor

Parking sensor circuit mainly consists of two sections, one is transmitter section and the other is receiver section. The transmitter section uses NE555 timer IC as an astable multi vibrator for driving the IR transmitter. The transmitter frequency is set to be 120Hz.

The IR pulses transmitted by the IR transmitter are reflected because of the obstacle and received by the IR receiver.

The received signal is amplified by the U2: A. The output voltage of the Peak detector (R4 and c4) is proportional to the distance between car bumper and obstacle. The output voltage of the peak detector is given to the inputs of three comparators U2: B, U2: C and U2: D. These comparators switch the status LED's according to the input voltage and the reference voltage.

Reverse Parking Sensor Circuit Diagram:



Circuit Components:

Transmitter:

- NE555 timer
- IR transmitter
- Electrolytic capacitor – 1uF, 16V
- Resistors – 10k, 1k, 330 ohms

Receiver:

- LM324 IC (low power quad op-amp)
- IR receiver
- 1n4148 diodes – 2
- Electrolytic capacitors – 100u (2), 10u, 47p, 1u
- LED's – 3 (5mm)
- 1k resistors – 7

- 1M ohm resistors – 2
- 4.7k, 1.5k resistors
- 12V DC battery
- Connecting wires

Reverse Parking Sensor Circuit Design:

In transmitter section, a 555 timer is operated in astable mode to generate a signal with frequency of 120 Hz. The 4th pin of 555 timer is connected to supply to avoid sudden resets. The output pulse is produced at 3rd pin of 555 timer. Here resistors R1, R2 and C1 set the output frequency of 555 timer. The received by the IR receiver is amplified the by the operational amplifier U2: A. Resistor R4 and C4 forms peak detector to detect peak of the amplified signal.

Op – amp as Comparator:

Op-amp has two inputs (non-inverting and inverting) and one output. The output of operational amplifier is high when non-inverting voltage is greater than inverting voltage. The output voltage is low, when inverting voltage is greater than non-inverting voltage.

In the above circuit the voltages at non-inverting pins of comparators acts as a reference voltage and inverting input voltages at comparators are compared with reference voltages to produce the output. Here resistors R8 to R11 are used to set different reference voltages at their non-inverting pins. Resistors R12, R13 and R14 are used to protect the LED's from high voltages.

HOW TO OPERATE THIS REVERSE PARKING SENSOR CIRCUIT?

1. Give the connections according to the circuit diagram.
2. Arrange transmitter and receiver in such a way that IR receiver should receive the IR rays when obstacle is present.
3. Switch on the supply and place the obstacle beyond 25cm, now you can observe that no LED will glow.
4. Reduce the obstacle distance to 25 cm, now you can observe that D7 led will glow.
5. Now reduce the distance to below 20 cm, then both D7 and D6 LED's will glow.
6. Still if you reduce the distance to 5 cm, then all LED's will turn on.

REVERSE PARKING SENSOR CIRCUIT APPLICATIONS:

- This circuit can be used in auto mobiles to park the vehicle safely.
- We can use this circuit to measure the distance.

- We can also use this circuit as IR Liquid Level Detector by making few modifications.

LIMITATIONS OF THIS CIRCUIT:

- IR receiver may receive the normal light. As a result, parking sensor may not work properly.
- We should arrange IR sensors accurately; otherwise they may not detect the obstacle.

1.2 Bluetooth Controlled Appliances

Home Appliances

Operating conventional wall switches is difficult for physically handicapped or elder people. This project provides the solution to this problem by integrating all the electrical appliances to a control unit that can be operated by an Android application on a device (Android smart phone or Tablet). The proposed system controls the electrical loads based on the data transmitted by the Android device. An Android application should be installed in user's mobile or tablet to control the electrical loads. Using this Android application user can send the commands to the Bluetooth module to control the electrical loads. Wireless technology used in this project is Bluetooth. It can also be called as "Bluetooth Controlled Electronic Home Appliances" or "Android based Home Automation System" or "Remote Password Operated Electronic Home Appliances Control System".

Circuit Principle

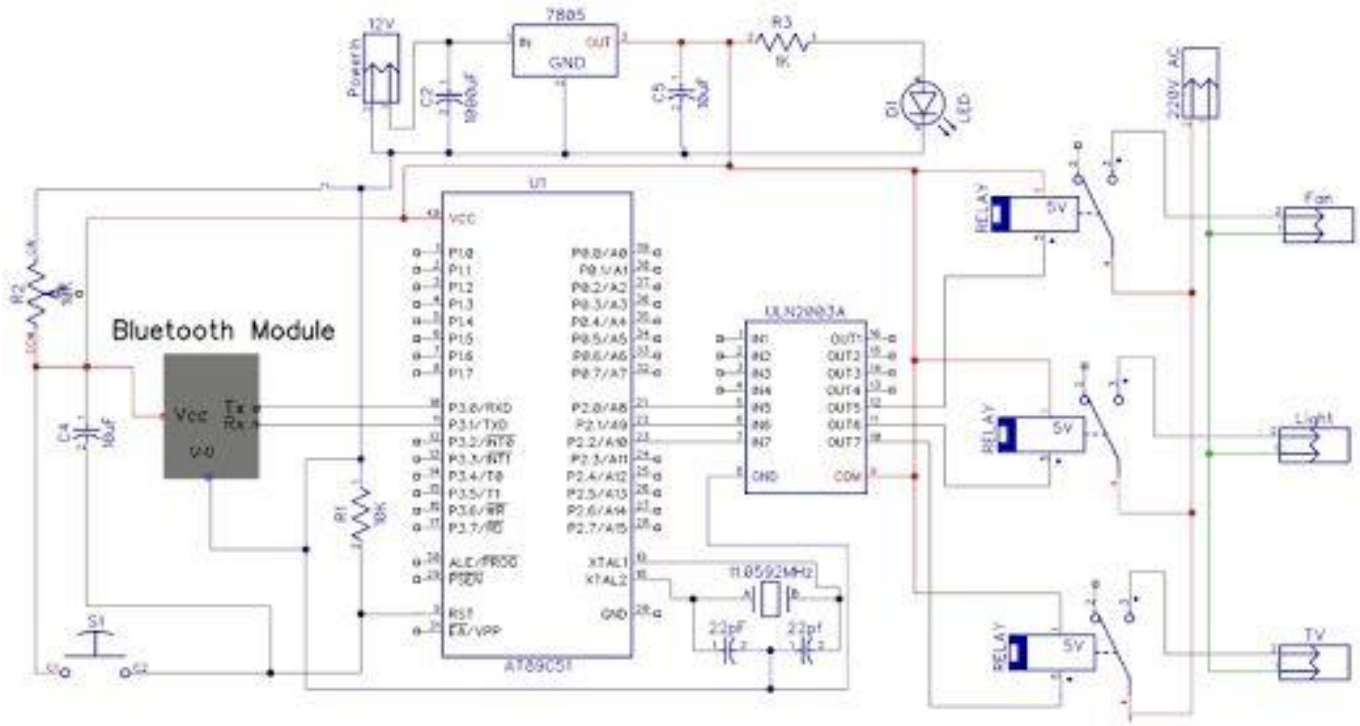
In this project, a Bluetooth module is interfaced to 8051 Microcontroller. This Bluetooth Module receives the commands from the Android application that is installed on the Android device, using wireless communication (Bluetooth Technology). The program which is written to the 8051 microcontroller communicates with Bluetooth module serially to receive the commands. Microcontroller switches the electrical loads automatically based on the commands received from the Bluetooth.

COMPONENTS REQUIRED:

HARDWARE REQUIREMENTS

- 8051 Microcontroller (AT89C51)
- 8051 Development Board
- 8051 Programmer (Programming Board)
- Programming Cable
- 16 × 2 LCD Display

- 10KΩ Potentiometer



- Bluetooth Module (HC – 05)
- 4 – Channel Relay Module
- Loads (like Light Bulb, Fan, etc.)
- Power Supply
- Connecting wires
- If 8051 Development Board isn't available, then you might need the following
  - 10µF Electrolytic Capacitor
  - 2 x 10KΩ Resistors (1/4 Watt)
  - 2 x 33pF Ceramic Disc Capacitors
  - 0592 MHz Quartz Crystal
  - Push Button
  - 1KΩ x 8 Resistor Pack

  If Relay Module isn't available, then you can build the 1 – channel relay circuit (for 1 load) using the following
  - 5V or 12V Relay
  - BC547 NPN Transistor
  - 1N4007 PN Junction Diode
  - 1 KΩ Resistor (1/4 Watt)

SOFTWARE REQUIREMENTS:

- Keil µVision IDE
- Willar Software
- Proteus (for Circuit Diagram and Simulation)
- Android Application installed on Android Device.

How Bluetooth Controlled Electronic Home Appliances Circuit Works?

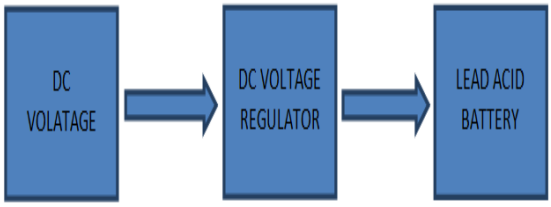
1. Write the program to the project in Keil software and create. hex file.
2. Burn program to the controller with help of 8051 Programmer and Willar Software.
3. Now, give the connections as per the circuit diagram.

4. While making the connections, ensure that there is no any common connection between DC and AC supplies.
5. Use 5V power supply circuit to provide regulated 5V DC to the microcontroller.
6. Switch on the both AC and DC supplies.
7. Now relay output pins gets 230V. So, do not touch the load connected pins.
8. Install the "**Bluetooth Controller**" application on your Android Device (Mobile Phone or Tablet) from the following link https://play.google.com/store/apps/details?id=apps.BT&hl=en
9. Now pair the Android device with Bluetooth module.
10. Configure the Bluetooth Controller App as per the 8051 Program.
11. Send data to switch ON or OFF the electrical loads.

1.3 Lead Acid Battery Charger Circuit

To charge a battery from AC we need a step-down transformer, rectifier, filtering circuit, regulator to maintain the constant voltage then we can give that voltage to the battery to charge it. Think if you have only DC voltage and charge the lead acid battery, we can do it by giving that DC voltage to a DC-DC voltage regulator and some extra circuitry before giving to the lead acid battery. Car battery is also a lead acid battery.

As seen in the DC voltage is given to the DC voltage regulator here we use LM317 which is a DC voltage regulator. The regulated DC out voltage is given to battery. There is also a trickle charge mode circuitry which will help to reduce the current when the battery is fully charged.



BLOCK DIAGRAM OF CHARGER FOR LEAD ACID BATTERY

COMPONENTS OF LEAD ACID BATTERY CHARGER CIRCUIT:

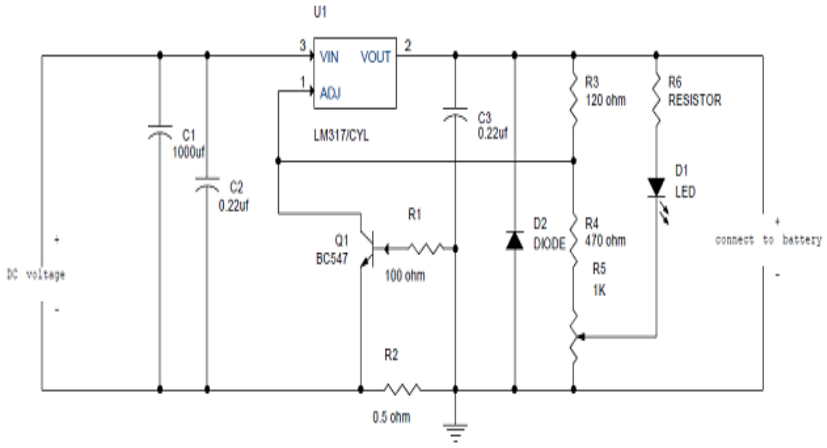
LM317: LM317 is voltage regulator invented by Robert C. Dobkin and Robert J. Widlar in 1970.the main function of this voltage regulator is to regulate the voltage and give the constant voltage without any noise disturbance; for example, if we have 42v and we want only 10v so to get this output we will give 42v to a voltage regulator and uninterrupted 10v. For

LM317 there is no maximum voltage unless the difference between the input and output voltage should not exceed maximum differential voltage. The maximum differential voltage is around 40V and also it give exceed output current of 1.5A for 1.2v to 37V .it has three pins input, output and adjustable pin. In the adjustable we can adjust the difference between the input and output voltages. Minimum voltage should be 18V which is given as input voltage to the regulator.

Lead Battery: Lead Battery is a rechargeable battery introduced in 1857 by Gaston Planet. The main advantages of Lead battery is it will dissipate very little energy (if energy dissipation is less it can work for long time with high efficiency),it has very low energy to weight ratio, it can deliver high current's and very low cost.

Lead Acid Battery Charger Circuit Diagram:

The circuit diagram can be seen below:



Circuit Explanation:

- The DC voltage is connected to the V_{in} of the LM317 in between we have connected the capacitors will be opened but if it had any AC noise it will remove it.
- The V_{out} of the LM317 is given to the battery which is to be charged, pin1Adjustment pin of the LM317 is connected to the transistor Q1, Resistor R1, R2, R5 which will help to adjust the regulator.
- The output of regulated voltage and current is controlled by the transistor Q1, resistor R1 and R2 and potentiometer R5. Potentiometer is used to set the charging current. Resistor R2 will have more current when the battery is getting charged. This will help to conduct the transistor Q1. The conduction of Q1 will help to adjust the voltage of LM317.
- TRICKLE CHARGE MODE: in this mode if the battery is charged the reverse current will flow. If the LED is glowing, then we can say that battery is charged. The diode D2 will protect the LM317 from the reverse current.

When the battery is fully charged it will reduce the charge current.

NOTE:

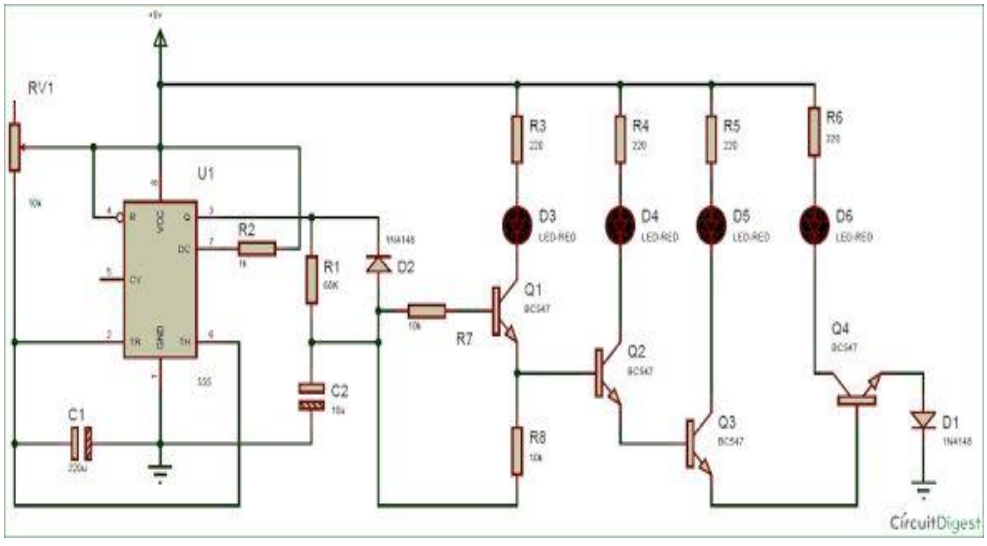
1. The battery should be charged with 1/10th it's charging current.so the voltage regulator must generate 1/10th of the charging current produced by the battery
2. Heat sink should be attached to the LM317 to the get the better efficiency.

1.4 Bike Turning Signal Circuit

BIKE TURNING SIGNAL CIRCUIT PRINCIPLE:

The objective of this circuit is to indicate left or right turn for bike/vehicle. Two identical circuits are needed, one is for left and the other is for right. The main heart of this circuit is a 555 timer. Here, this 555 timer acts as an astable multi vibrator. It generates the pulse signal with variable width. Using this variable width of the pulse, we can set different time delays for the LEDs (ON and OFF for LEDs).

The circuit consists of two 47k resistors, which are connected to a 555 timer and these are used to set the time delay for LEDs. 1n4148 signal diode is connected in reverse bias at the output to maintain constant current at the output. BC547 (NPN) Transistor switches the LED's ON and OFF based on the base currents. 330-ohm resistors are used to drop the voltage otherwise LEDs may get damaged. Here we can vary the time width of output pulse by varying the resistance or capacitance value.



CIRCUIT COMPONENTS:

- Resistors – 3 (47 k ohm)
- Resistors – 5 (10 k ohm)
- Resistors -5 (330 ohm)
- Capacitors – 2 (100uF)

- Transistors – 5 (BC547)
- LED's – 10 (5 mm)
- IC – 1 (NE555)
- Diodes – 2 (1n4148)
- Battery – 1 (12V)

The obtained pulse from the 555 timer is applied to the transistors to switch the LEDs ON and OFF with some delay. Here the operating voltage of LEDs is around 2 to 3v but from battery, we get 12v supply. So, we need to drop the remaining voltage. To drop this voltage, we are using resistors in series with LEDs.

HOW TO OPERATE THE CIRCUIT?

- Initially feed 12v power supply to the circuit.
- Now observe the LED's they will glow with some delay.
- If you want, set the different time delays for LEDs, and then vary the resistance or capacitance value.
- Now you can see the change in time delay.
- By varying the capacitance value also, you can see the in-time delay of LEDs.

APPLICATIONS OF BIKE TURNING SIGNAL INDICATOR CIRCUIT:

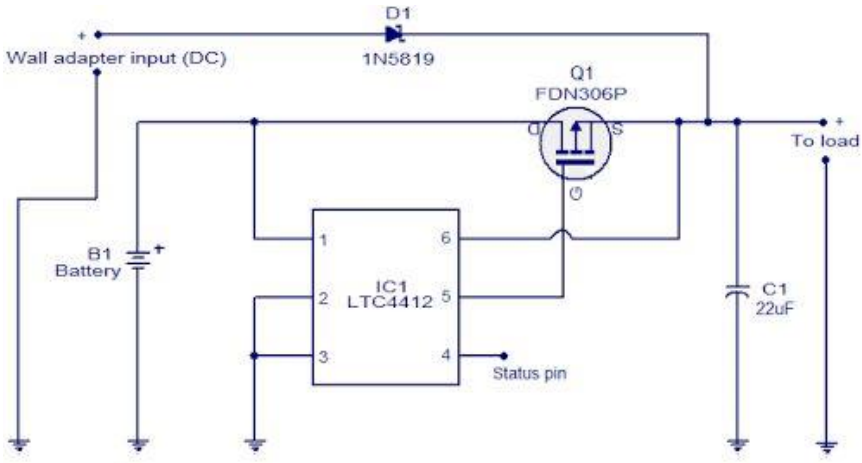
- It is used to indicate left turn or right turn for a motor bike or vehicle.
- We can also use this circuit as an LED knight rider circuit.

1.5 AUTOMATIC CHANGEOVER SWITCH

CIRCUIT PRINCIPLE:

This circuit is based on the principle of bi-stable mode operation of 555 Timer. In this mode, the Timer output is either high or low depending upon the status of trigger and reset pin. The Timer output is connected to a transistor which acts as a switch, being on or off depending upon the Timer output. Two LEDs in series are used as a load. In case of transistor being switched off, LEDs are driven by the AC-DC power supply whereas in case of transistor being switched on, LEDs are driven by the battery.

AUTOMATIC CHANGEOVER SWITCH CIRCUIT DIAGRAM:



AUTOMATIC CHANGEOVER SWITCH CIRCUIT DESIGN:

Designing the circuit involves two basic parts –

1. Design of AC – DC Power Supply:

It is the design of a basic AC to DC power supply system using transformer and bridge rectifier. The first step involves selection of the voltage regulator. Since here, our requirement is to drive two LEDs in series along with a Schottky diode, we settle down with LM7809 voltage regulator producing a voltage of 9V. Since input voltage to the regulator must be at least 12V, we settle down with an input voltage of about 20V.

The next step involves selecting the transformer. Since primary voltage is 230V and required secondary voltage is about 20V, we can settle with a 230V/20V basic transformer. The third step is the selection of diodes for bridge rectifier. Since peak voltage across the transformer secondary is around 28V, the total PIV of the bridge would be around 112V. Hence, we need diodes having PIV rating more than 112V. Here we select 1n4007 having PIV of about 1000V.

The final step involves selection of filter capacitor. For a capacitor, peak voltage of 26V and minimum regulator input voltage of 12V, the allowable ripple is about 14V. The capacitance value is then calculated by the formula, $C = I (\Delta t/\Delta V)$, where I is sum of quiescent current of voltage regulator and required load current. Substituting the values, we get a value of about 17uF. Here we select a 20uF electrolyte capacitor.

2. Design of Bi-stable Multi-Vibrator Circuit using 555 Timer:

When a 555 Timer is configured in bi-stable multi-vibrator; its output is either high or low logic signal. Here we use the simple logic that when trigger pin is grounded, output is a high logic signal and when reset pin is grounded, output is low logic signal. Here the output of 555 Timer is connected to the base of transistor BC547.

AUTOMATIC CHANGEOVER CIRCUIT OPERATION:

The circuit operation commences once the switch S1 is at any of its position. When the switch S1 is at position 1, reset pin of the 555 Timer is grounded. Internally this reset pin is the reset pin of the SR Flip flop and hence the output of 555 Timer is a low logic signal. Now since base emitter junction of Q1 is reverse biased, it is in cut off position. The load LEDs are connected directly to the output of the voltage regulator through the Schottky diode. Here is where the operation of AC to DC power supply circuit comes to play. AC power is first stepped down by the transformer and then converted to unregulated and fluctuating DC voltage by the bridge rectifier. The AC ripples from the fluctuating DC voltage is removed by the filter capacitor. This unregulated DC voltage is then converted into a regulated DC voltage by the voltage regulator.

When switch S1 is at position 2, trigger pin of 555 Timer is grounded. This causes the output of the 555 Timer to be a logic high signal. The base emitter junction of Q1 is thus forward biased and the transistor is driven to saturation, thus being in on position. Here we should note two things – First, the Schottky diode now does not conducts as the voltage difference between both cathode and anode of the diode is zero, i.e. there is no potential difference at the junction. Secondly, the LEDs are now biased through the resistor and the transistor and driven by the battery voltage.

APPLICATIONS OF AUTOMATIC CHANGEOVER SWITCH:

1. This circuit can be used as a home lighting system with few modifications.
2. It can be used to drive other DC loads like a DC motor of any electronic appliance or other toy applications.

LIMITATION OF THIS CIRCUIT:

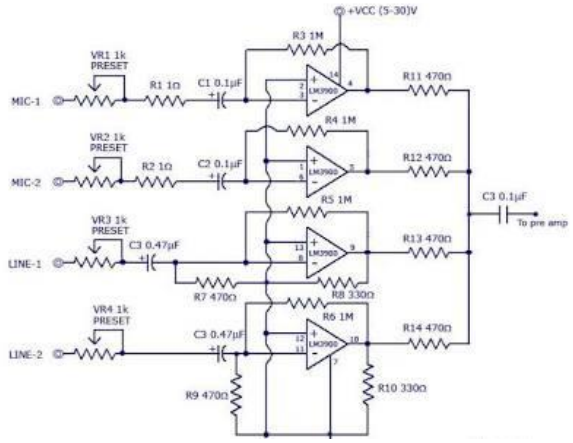
This is a theoretical circuit and may require few changes when implemented on PCB.

1.6 Multi-Channel Audio Mixer Circuit using LM3900

Audio mixing is the process of combining multiple audio channels into one or more audio channels. In this process source signals, frequency content, dynamics, level and panoramic position are manipulated. This audio mixing process is used in sound recording in order to produce the output which is more appeal to listeners.

This audio mixing is also done in studios in order to produce album or single. Generally audio mixing process is carried out by the mixing engineer. Currently artists and engineers are using PC (personal computer) for audio mixing. This article describes you how to design a multi-channel audio mixer using lm3900 quad amplifier. This audio mixing circuit has 2 MIC inputs and 2-line inputs. If you want to increase the input channels according to the application, then add same circuit in parallel with the existing circuit. Before going to know about this circuit, get an idea about how simple audio tone control circuit works.

Circuit Diagram of Multi-Channel Audio Mixer using LM3900:



Circuit Diagram of Multi-Channel Audio Mixer using LM3900

Circuit Components:

- LM3900 Quad operational amplifier
- 1k PRESET – 4
- MICs – 2
- 0.47uF Electrolytic capacitor – 2
- 0.1uF Electrolytic capacitor – 2
- 0.1uF capacitor – 1
- 1Ω Resistor (1/4 watt) – 2
- 1M ohm resistor (1/4 watt) – 4
- 470-ohm resistors (1/4 watt) – 6

- 330-ohm resistors (1/4 watt) – 2
- Connecting wires.
- Power supply circuit

MULTI-CHANNEL AUDIO MIXER USING LM3900 CIRCUIT DESIGN:

The main component in this circuit is lm3900 quad operational amplifier. Each input channel of audio mixer is connected the inverting terminal of op amp. The operational amplifier of each stage amplifies every input signal separately. The output of each op amp is given to single output line with resistance of 470 ohm. This circuit does not have low input impedance to mix ideal audio input channels. Here polarized capacitors C1 to C4 are connected to the input channels used for decoupling purpose. Capacitor C5 is the decoupling capacitor at the output. Here variable resistor is connected to each input channel. This variable resistor is used to adjust the volume of corresponding input channel.

LM3900 QUAD OPERATIONAL AMPLIFIER:

This IC consist of 4 high gain, independent, frequency compensated Norton amplifiers. These operational amplifiers are designed to operate for wide range of voltages. These amplifiers provide good response for almost all signal frequencies. This IC is able to provide wide band width and large output voltage swing. This IC has Inbuilt short-circuit protection.

Multi-Channel Audio Mixer Circuit Features:

1. Wide supply voltage range
2. Low input current (30nA)
3. Open loop gain is very high
4. simple design
5. Good frequency response
6. Low noise
7. Output short circuit protection

HOW TO OPERATE MULTI CHANNEL AUDIO MIXER CIRCUIT USING LM3900?

1. Initially give the connections as per the circuit diagram.
2. While giving the power supply, make sure that output is well regulated.
3. Now give the audio inputs.

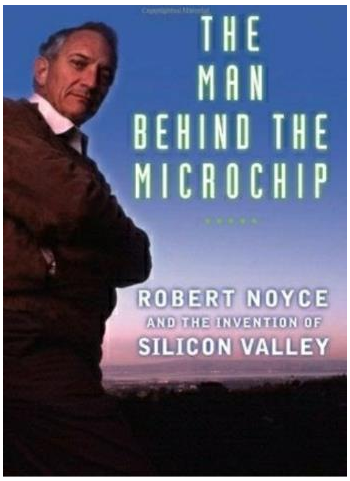
4. At the output of audio mixer, you will get mixed audio signal.

- This audio mixer is used in sound recording to produce the audio which is more appealing to the listeners.

Robert Noyce

Robert Noyce was born on 12-December-1927. He was also known as "Mayor of Silicon Valley". He was one of the very first scientists to work in the area—long before the stretch of California had earned the Silicon Valley name. He was American engineer, who co-founded Fairchild Semiconductor in 1957 and Intel Corporation in 1968. He is also credited (along with Jack Kilby) with the realization of the first integrated circuit or microchip that fuelled the personal computer revolution and gave Silicon Valley its name.

Robert Noyce as an Electronic engineer:

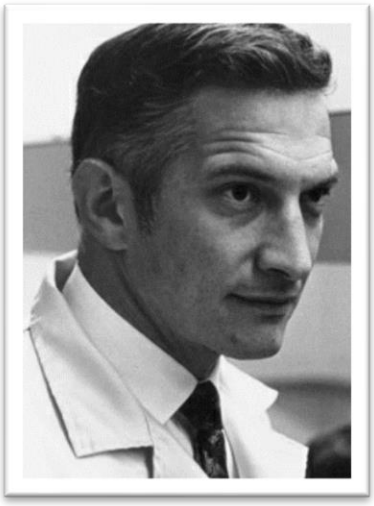


Noyce grew up in chandler Arizona and attended the school in USA. While in high school, he exhibited a talent for mathematics and science. He graduated from Grinnell High School in 1945 and entered Grinnell College in the fall of that year. He was the star diver on the 1947 Midwest Conference Championship swim team. He graduated Phi Beta Kappa with a Bain physics and mathematics in 1949.He also received a signal honour from his classmates: The Brown Derby Prize, which recognized "the senior man who earned the best grades with the least amount of work". Noyce had a mind so quick that his graduate school friends called him "Rapid Robert. "He received his doctorate in physics from MIT in 1953.

After graduating from MIT in 1953, Noyce took a job as a research engineer at the Philco Corporation in Philadelphia. He left in 1956 to join William Shockley, a co-inventor of the transistor and eventual Nobel Prize winner, at the Shockley Semiconductor Laboratory in Mountain View, California. Noyce left a year later with the "traitorous eight" upon having issues with Shockley's management style and co-founded the influential Fairchild Semiconductor Corporation. Noyce and Gordon Moore founded Intel in 1968 when they left Fairchild

Semiconductor. Arthur Rock, the chairman of Intel's board and a major investor in the company, said that for Intel to succeed, the company needed Noyce, Moore and Andrew Grove. And it needed them in that order. Noyce: the visionary, born to inspire; Moore: the virtuoso of technology; and Grove: the technologist turned management scientist. At Intel, he oversaw Ted Hoff's invention of the microprocessor, which was his second revolution.

Noyce was a holder of many honours and awards. Noyce received the Franklin Institute's Stuart Ballantine Medal in 1966. He was awarded the IEEE Medal of Honour in 1978 "for his contributions to the silicon integrated circuit, a cornerstone of modern electronics. "In 1979, he was awarded the National Medal of Science. President Ronald Reagan awarded him the National Medal of Technology in 1987. The National Academy of Engineering awarded him Charles Stark Draper Prize in 1989.In 1990 Noyce – along with, among others, Jack Kilby and transistor inventor John Bardeen – received a "Lifetime Achievement Medal" during the bicentennial celebration of the Patent Act.



Noyce suffered a heart attack at age 62 at home on June 3, 1990, and later died at the Seton Medical Centre in Austin, Texas.

Tips on Circuit Designing

Electronics Design can cover a vast array of technical options. A schematic drawing is only one part of creating a design in electronic engineering. Your schematic should be able to be read and understood by others in the electronic engineering field. If you are good with your schematic, the reader of your design should be able to understand at least the objectives of your design. This can be done successfully if you follow five simple tips.

Tip 1 – Block Diagram

The first part in your electronics design schematic should be a block diagram. This diagram should be an extract from your document showing the hardware design. This section should not take long to add and is like an outline for an essay. It gives you the ability to provide an overview of your architecture, as well as giving your reader a reference. Great block diagrams will include page numbers to your schematic sections.

Tip 2 – Name the Nets

Even though it can be a time-consuming process, you need to name every net you have on the board, as well as state its purpose. The reason naming the nets is vital is because you will need them to debug your program and allow simulation runs. Regardless of what anyone else tells you, naming them is needed on every electronics design schematic created.

Tip 3 – Make it Flow

When you create an electronics design, make it flow. This may mean you have to create dozens of pages to show the design and organize the blocks. You should never try to shortcut with your schematics. When you try to condense your plans, they can be very hard to follow. This means it may not be able to be recreated.

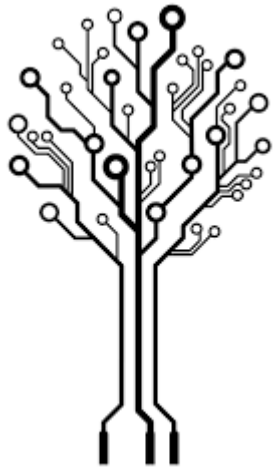
Tips 4 – Visible Connectors

You need to make your connectors appear as connectors. Your electronics design schematic should have pins in order and draw the connector. If they are easy to identify, then they will be easier to follow. You will also allow all readers to know exactly which pin you are looking for.

Tips 5 – Keep Notes

In electronics design you never, ever throw out your notes. Whatever you are thinking and utilizing when planning your electronics design, you need to make available to the readers. If you need to, create a separate document and attach it to the design. Ideas for notes include why you included a component, or why you did not include a component. What your logic table settings are, and any considerations with the power supplies should be made are two other items that should be included in your notes.

If you have done a great electronics design, then anyone can at least pick it up and understand where you were going with the schematic. If you follow these tips, then you will have a design that people can understand, simulate, and reproduce. You will also have a plan that you can quickly debug if needed.



Another key tip in electronics design is using the right tools for creating your schematics drawings. The option to create your own schematic is not available in some of the PCB design software. You can always hand sketch out your schematic or even "bread board" your design by using wires and components to manually create your design. This works great for simple electronics design. However, when using more complex components and surface mount components creating a printed circuit board from your schematic will be a much better option.

ARTICLE SECTION 2

2.1 Kotlin

What is Kotlin?

Kotlin is a general purpose, open source, statically typed "pragmatic" programming language for the JVM and Android that combines object-oriented and functional programming features. It is focused on interoperability, safety, clarity, and tooling support. Versions of Kotlin for JavaScript (ECMAScript 5.1) and native code (using LLVM) are in the works.

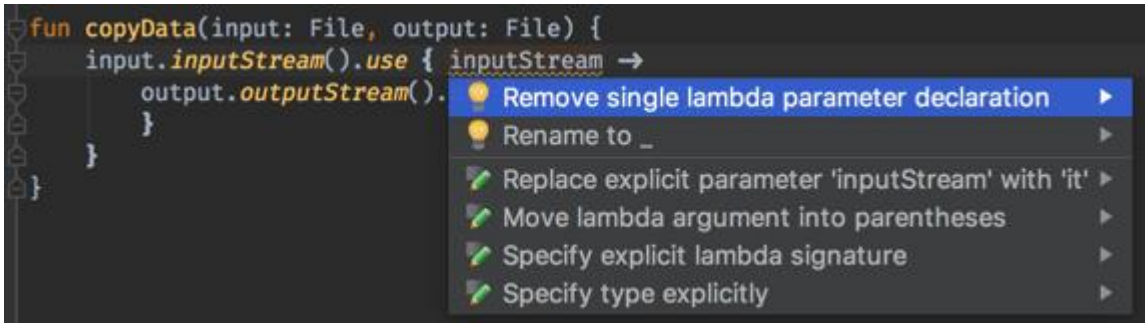
Origin of Kotlin

Kotlin originated at JetBrains, the company behind IntelliJ IDEA, in 2010, and has been open source since 2012. The Kotlin team currently has more than 20 full-time members from JetBrains, and the Kotlin project on GitHub has about 100 contributors. JetBrains uses Kotlin in many of its products including its flagship IntelliJ Idea.

Why use Kotlin for Android Development?

Concise: Drastically reduce the amount of boilerplate code you need to write.

Safe: Avoid entire classes of errors such as null pointer exceptions.



Versatile: Build server-side applications, Android apps or front-end code running in the browser.

Interoperable: Leverage existing frameworks and libraries of the JVM with 100% Java Interoperability.

Safety features in Kotlin:

Speaking of avoiding common errors, Kotlin was designed to eliminate the danger of null pointer references and streamline the handling of null values. It does this by making a null illegal for standard types, adding nullable types, and implementing shortcut notations to handle tests for null.

Kotlin for Android

Up until May 2017, the only officially supported programming languages for Android were Java and C++. Google announced official support for Kotlin on Android at Google I/O 2017 and starting with Android Studio 3.0 Kotlin is built into the Android development toolset. Kotlin can be added to earlier versions of Android Studio with a plug-in.

Kotlin compiles to the same byte code as Java, interoperates with Java classes in natural ways, and shares its tooling with Java. Because there is no overhead for calling back and forth between Kotlin and Java, adding Kotlin incrementally to an Android app currently in Java makes perfect sense. The few cases where the interoperability between Kotlin and Java code lacks grace, such as Java set-only properties, are rarely encountered and easily fixed.

Which is preferable Kotlin or Java?

Interoperable with Java: When it comes to give a try to a new language, interoperability is a great thing which can help you. Interoperable, means you can reuse any Java class ever written, all Java code can work with Kotlin and vice versa. Learning Kotlin for a Java developer shouldn't be too hard. Everything you can do with Java, you can do in Kotlin. If you do not know how to do it in Kotlin, then just do it in Java and let the

Kotlin plugin convert it to Kotlin. Make sure that you see what happened to your code, so that the next time you can do it yourself.

Null Safety: Kotlin's type system is aimed at eliminating the danger of null references from code, also known as The Billion Dollar Mistake.One of the most common pitfalls in many programming languages, including Java is that of accessing a member of null references, resulting in null reference exceptions. In Java this would be the equivalent of a Null Pointer Exception or NPE for short.

One basic program in Kotlin

```
"Hello, World!"


// Hello World Program


fun main (args: Array<String>) {

println ("Hello, World!")

}
```

Output:

```
Hello, World!
```

How this program will run?

```
// Hello World Program
```

Any line starting with // is a comment in Kotlin (like Java). Comments are ignored by the compiler. They are intended for person reading the code to better understand the intent and functionality of the program. To learn more, visit Kotlin comments.

```
fun main (args: Array<String>) {... }
```

This is the main function, which is mandatory in every Kotlin application. The Kotlin compiler starts executing the code from the main function.

The function takes array of strings as a parameter and returns Unit. You will learn about functions and parameters in later chapters.

For now, just remember that main function is a mandatory function which is the entry point of every Kotlin program. The signature of main function is:

```
fun main (args: Array<String>) {
    ... .. ...
}
println ("Hello, World!")
```

The println () function prints the given message inside the quotation marks and newline to the standard output stream. In this program, it prints Hello, World! and new line.

2.2 Wireless Sensing Network (WSN)

Wireless sensing network (WSN) refers to a group of spatially dispersed and dedicated sensors for monitoring and recording the physical conditions of the environment and organizing the collected data at a central location. WSNs measure environmental conditions like temperature, sound, pollution levels, humidity, wind, and so on.

A Wireless sensor network can be defined as a network of devices that can communicate the information gathered from a monitored field through wireless links. The data is forwarded through multiple nodes, and with a gateway, the data is connected to other networks like wireless Ethernet.

Potential Applications

Engineers have created WSN applications for areas including health care, utilities, and remote monitoring. In health care, wireless devices make less invasive patient monitoring and health care possible. For utilities such as the electricity grid, streetlights, and water municipals, wireless sensors offer a lower-cost method for collecting system health data to reduce energy usage and better manage resources. Remote monitoring covers a wide range of applications where wireless systems can complement wired systems by reducing wiring costs and allowing new types of measurement applications. Remote monitoring applications include:

- Environmental monitoring of air, water, and soil
- Structural monitoring for buildings and bridges
- Industrial machine monitoring
- Process monitoring
- Asset tracking

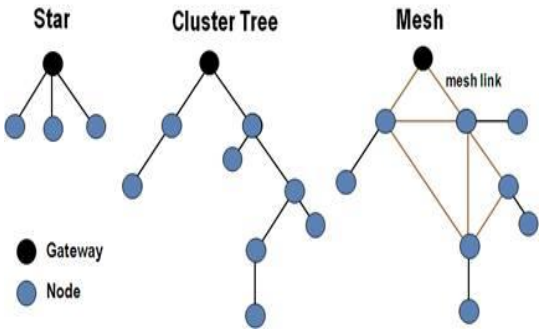
WSN SYSTEM ARCHITECTURE

WSN System Architecture Combines Wired and Wireless

Wireless technology offers several advantages for those who can build wired and wireless systems and take advantage of the best technology for the application. To do this, you need a flexible software architecture like the NI LabVIEW graphical system design platform. LabVIEW offers the flexibility needed to connect a wide range of wired and wireless devices.

WSN NETWORK TOPOLOGIES

WSN nodes are typically organized in one of three types of network topologies. In a star topology, each node connects directly to a gateway. In a cluster tree network, each node connects to a node higher in the tree and then to the gateway, and data is routed from the lowest node on the tree to the gateway. Finally, to offer increased reliability, mesh networks feature nodes that can connect to multiple nodes in the system and pass data through the most reliable path available. This mesh link is often referred to as a router.



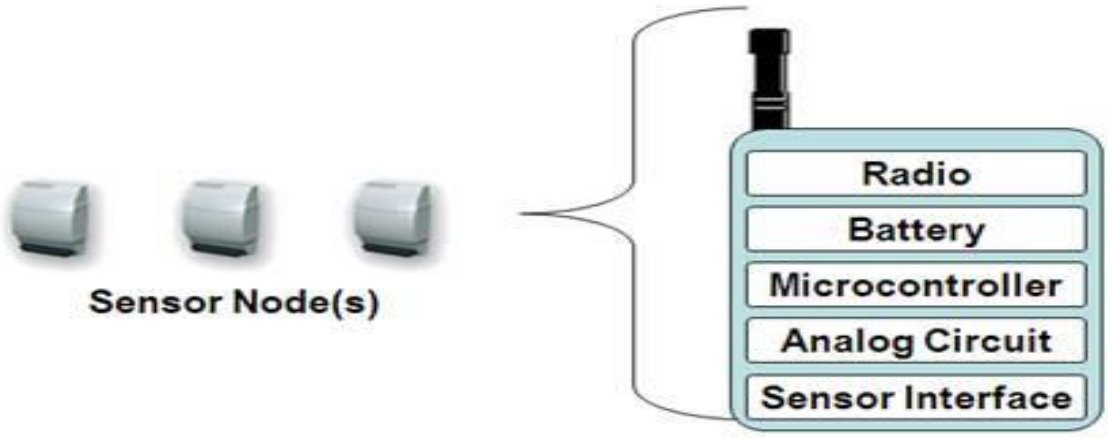
Common WSN Network Topologies

COMPONENTS OF A WSN NODE

A WSN node contains several technical components. These include the radio, battery, microcontroller, analog circuit, and sensor interface. When using WSN radio technology, you must make important trade-offs. In battery-powered systems, higher radio data rates and more frequent radio use consume more power. Often three years of battery life is a requirement, so many of the WSN systems today are based on ZigBee due to its low-power consumption. Because battery life and power management technology are constantly evolving and because of the available IEEE 802.11 bandwidth, Wi-Fi is an interesting technology.

The second technology consideration for WSN systems is the battery. In addition to long life requirements, you must consider the size and weight of batteries as well as international standards for shipping batteries and battery availability. The low cost and wide availability of carbon zinc and alkaline batteries make them a common choice.

To extend battery life, a WSN node periodically wakes up and transmits data by powering on the radio and then powering it back off to conserve energy. WSN radio technology must efficiently transmit a signal and allow the system to go back to sleep with minimal power use. This means the processor involved must also be able to wake, power up, and return to sleep mode efficiently. Microprocessor trends for WSNs include reducing power consumption while maintaining or increasing processor speed. Much like your radio choice, the power consumption and processing speed trade-off is a key concern when selecting a processor for WSNs. This makes the x86 architecture a difficult option for battery-powered devices.



WSN Sensor Node Components

Limitations of Wireless Sensor Networks

1. Possess very little storage capacity – a few hundred kilobytes
2. Possess modest processing power-8MHz
3. Works in short communication range – consumes a lot of power
4. Requires minimal energy – constrains protocols
5. Have batteries with a finite life time
6. Passive devices provide little energy

Wireless Sensor Networks Advantages and Applications

- These networks are used in environmental tracking, such as forest detection, animal tracking, flood detection, forecasting and weather prediction, and in commercial applications like seismic activities prediction and monitoring.
- Military applications, such as tracking, and environment monitoring surveillance applications use these networks. The sensor nodes from sensor networks are dropped to the field of interest and are remotely controlled by a user. Enemy tracking, security detections are also performed by using these networks.
- Health applications, such as Tracking and monitoring of patients and doctors use these networks.
- The most frequently used wireless sensor networks applications in the field of Transport systems such as monitoring of traffic, dynamic routing management and monitoring of parking lots, etc., use these networks.
- Rapid emergency response, industrial process monitoring, automated building climate control, ecosystem and habitat monitoring, civil structural health monitoring, etc., use these networks.

2.3 Kirin Processor

After years of rapid growth, HI Silicon is now the number one IC design company in China, and in 2013 generated $1.4 billion USD. The company was formed in Shenzhen in 2004 and has since set up offices in: Beijing, Shanghai, Silicon Valley (USA) and Sweden. They predominantly produce the Kirin series of processors for Huawei which is known for appearing in the Honour and Huawei Ascend series of phones. It is possible we may even see a Kirin Processor in the upcoming Nexus which is rumoured to be manufactured by the Chinese company. While nothing has been officially confirmed, a Kirin chip in the upcoming nexus would make an interesting advancement for the brand. This would be a large blow for competitor Qualcomm who has made the possessors for the previous models. Much like we saw with the Xiaomi in our article, Huawei's approach with HI Silicon appears to be growing the brand internally and locally until it is big enough and ready to branch out in to the larger world. Despite recent rumours, both Huawei and HI Silicon companies have confirmed that there are no current plans to separate.

The most recent addition to the Kirin family is the 930 which features a 64-bit array of 8 cores clocked made default at 2.0 GHz and can handle cameras up to an impressive 32mp. The 930 also has a much smaller process size of just 16nm compared to the Snapdragon 805's 28nm. This chip has been confirmed to be in the Huawei Media Pad X2 which was announced during MWC. So, whilst yes, the 930 is just another high-end processor, what it represents is something far more important: a shift in market shares and where companies source their products from.

With HI Silicon's processors proving that they can stand their ground in their parent company's products, the time may have come for them to start to expand to other companies' products. A recent report by Strategy Analytics has shown that just three companies account for 86% of the cellular processor market share. They are Qualcomm with 66%, MediaTek with 15% and Spectrum Communications with 5%. HI Silicon announced last year that they are to start selling to other companies which means we could start to see their chips appearing in far more devices over the coming year. This can be seen with the similar progression of the Exons SoC which now appears in the Maize MX series. With several large companies in china starting to make an appearance in the western world, it may not be too long before we see a market share that looks completely different to what we have now.

With HI Silicon's products becoming more popular, most manufacturers will be on the lookout. It is commonly known that competition is good for both the consumer and business as it stops stagnation. Whatever happens, it's no longer just Qualcomm's game, they could be in for a rough few years ahead.

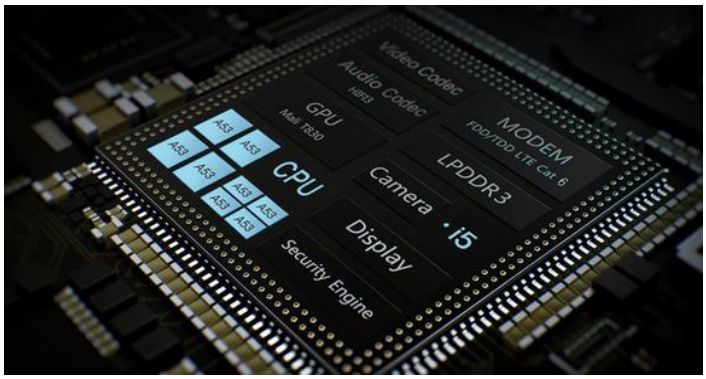
Kirin 650 Vs Snapdragon 820 Processor:

Based on one to one comparison, the Snapdragon SOC's will be ahead of Kirin SOC's. The primary reason for this (if we compare the midrange series of both i.e. 6XX series) is GPU used as the daring of Qualcomm has more number of Glops and have better processing capacity thereby making heavy tasks and intensive gaming like a breeze on those devices.

For e.g. Snapdragon 625 and Kirin 655. The 625 is based on 14nm process and 655 on 16nm. Here smaller the no. better the efficiency, hence the 625 will lead to a better battery life (slightly better) than the device with 655. Also, the 625 has adreno 506 GPU which has more Glops than the mail t830 GPU in the 655.This makes the GPU on 625 better. Now, the number of cores remain same here i.e. 8 although the clock speed varies yet both will perform almost the same in day to day usage with noticeable difference in heavy graphics demanding tasks with 655 slowing down a bit.

Speaking of flagship SOC's, both Qualcomm and HI Silicon (Kirin SOC's) manufacture powerful SOC's with 835 the flagship from Qualcomm and Kirin 960 from HI Silicon. Both perform extremely well and the GPU on both are highly powerful, however the 835 is based on 10nm process whereas the 960 is based on 16nm. Here, the efficiency is better with 835 yet not much noticeable differences can be observed.

Overall, the Snapdragon SOC's are better (only when compared fairly with 600 and 800 series) however, Huawei's devices are well optimized and their SOC's are not far behind.



In comparison, Honour's Kirin 650 processor uses a newer and more advanced 14nm Fine plus manufacturing process. We've already spoken a lot about the various advantages of the newer 16nm process. It offers a great improvement in terms of performance while at the same time being more efficient. The Kirin 650 consumes around 70% less power compared to conventional 28nm chipsets and offers up to 60% better performance too compared to the Kirin 620 chipset.

The Snapdragon 650/652 has a configuration consisting of 4 A-53 cores clocked in at 1.4GHz and 4 A72 cores clocked in at 1.8GHz. The Kirin 650 utilizes 2 sets of A53 cores but is clocked in at a higher clock speed of 1.7GHz and 2GHz. As a result, the power efficiency is much higher on the Kirin 650. There is also an i5 co-processor which is a low power consuming unit that assists the main processor by helping it perform certain complex calculations and operate in a low power always sensing mode.

The Snapdragon 650/652 comes with an Adreno 510 GPU clocked in at 550MHz while the Kirin 650 has a faster Mali T830 MP2 GPU clocked in at 600MHz. The new Mali T830 MP2 GPU offers a 100% increase in terms of performance compared to its predecessor, the Kirin 620.There is support for dual-channel LPDDR3 RAM and an eMMC 5.1 flash-based storage that allows for much faster data read and write speeds. It goes a long way in assisting the processor performs tasks faster and more efficiently. The new Kirin 650 chipset has an ISP that provides dedicated hardware-level graphics processing that ensures better quality photos that creates more dynamic and natural looking images as well as a dedicated DSP that handles post-processing of images and videos captured.

The Kirin 650 also supports hybrid focus technology and can smartly choose between various scene modes intelligently. The processor offers a fast and fluid User Experience while being efficient too as was shown in our battery test results. The Honour 5C managed to get a much better battery life of 16 hours and 48 minutes in our tests.

Huawei Consumer Business Group unveiled a new era in smartphone innovation. In a keynote address, Richard Yu, CEO of Huawei Consumer Business Group revealed Huawei's vision for the future of artificial intelligence with the launch of the Kirin 970. By combining the power of the cloud with the speed and responsiveness of native AI processing, Huawei is bringing AI experiences to life and changing the way we interact with our devices.

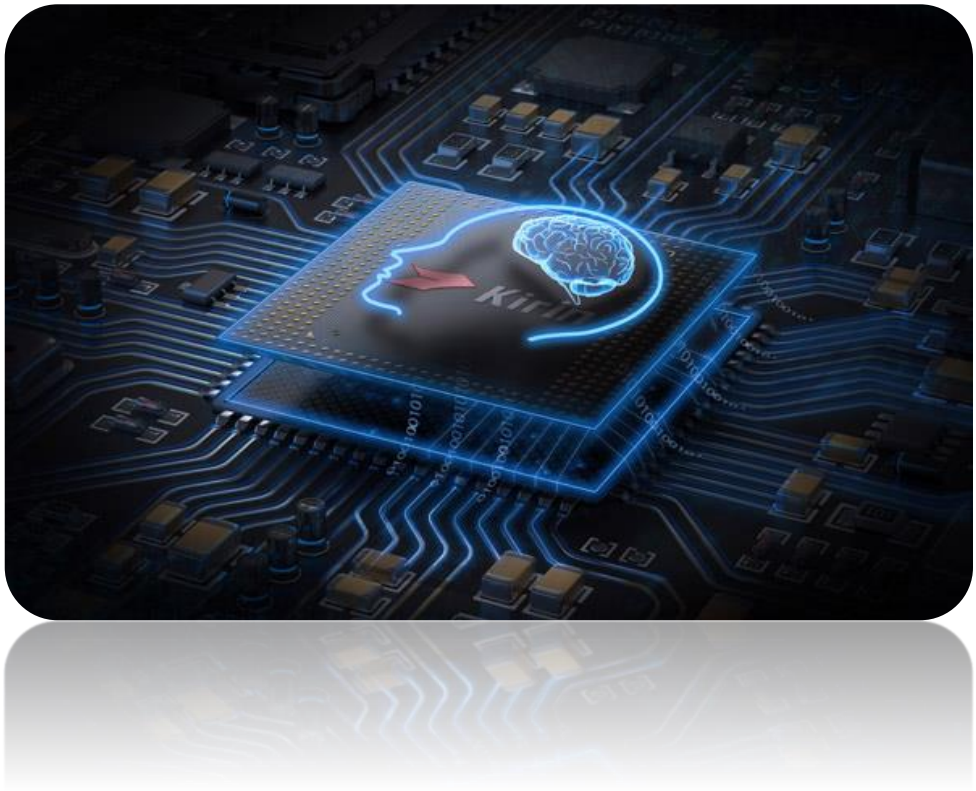
"As we look to the future of smartphones, we're at the threshold of an exciting new era," Yu said. "Mobile AI = On-Device AI + Cloud AI. Huawei is committed to turning smart devices into intelligent devices by building end-to-end capabilities that support coordinated development of chips, devices, and the cloud. The goal is to provide a significantly better user experience. The Kirin 970 is the first in a series of new advances that will bring powerful AI features to our devices and take them beyond the competition."

After years of development, Cloud AI has seen broad application, but user experience still has room for improvement in areas such as latency, stability, and privacy. The goal is for Cloud AI and On-Device AI to complement each other. On-Device AI offers strong sensing capabilities, that are the foundation of understanding and assisting people. Sensors produce a large amount of real-time, scenario-specific, and personalized data. Supported by strong chip processing capabilities, devices will become more cognitive of user needs, providing truly personalized and readily accessible services.

The Kirin 970 is powered by an 8-core CPU and a new generation 12-core GPU. Built using a 10nm advanced process, the chipset packs 5.5 billion transistors into an area of only one cm^2. Huawei's new flagship Kirin 970 is Huawei's first mobile AI computing platform featuring a dedicated Neural Processing Unit (NPU). Compared to a quad-

core Cortex-A73 CPU cluster, the Kirin 970's new heterogeneous computing architecture delivers up to 25x the performance with 50x greater efficiency. Simply put, the Kirin 970 can perform the same AI computing tasks faster and with far less power. In a benchmark image recognition test, the Kirin 970 processed 2,000 images per minute, which was faster than other chips on the market.

New developments in AI require joint effort across the entire value chain, involving tens of millions of developers, and the experience and feedback of hundreds of millions of users. Huawei is positioning the Kirin 970 as an open platform for mobile AI, opening the chipset to developers and partners who can find new and innovative uses for its processing capabilities.



2.4 Dual Cameras in Smartphone

Going by the textbook definition a dual camera phone refers to a Smartphone which has dual cameras on the rear. The built in dual camera is a dual lens camera which is also called stereo Camera and makes the picture more vivid or detailed or both in various scenarios. Dual -cameras have seemingly become essential for phones today. What started as a high-end, premium feature is today available for the lowest prices. But, not all dual-camera implementations are the same. In fact, many of them are no different from single cameras.

The Depth

Here the primary camera is accompanied by a second camera whose only function is to 3D map the area in front of the camera. The secondary camera in this system works similarly. With the second camera, the system can now tell roughly how far the objects in front of it are with respect to each other. This information is then used to separate the foreground subject from the background. The most common use of this technique is to create a shallow depth of field effect also now known as the portrait mode. It first figures out the borders of the foreground subject and then applies an iris blur effect on everything else giving the illusion of shallow depth of field. Shallow depth of field systems with a dedicated depth sensor are one of the rarest types of dual camera systems. The first popular use of it was seen on the HTC One M8 but these days only the most basic smartphones, such as the Honor 6X or the Lenovo K8 Plus can be seen using a dedicated depth sensor lens.

The Monochrome

A slightly more popular implementation of the secondary sensor is the monochrome camera. Both cameras, in this setup, usually have identical sensors, apertures, lenses and focusing systems but the second sensor lacks an RGB colour filter. This means that the sensor cannot capture colour information but, on the upside, because there is one less thing blocking the sensor, the monochrome camera can capture more light. Every time

you take a picture; the camera system combines the output of both cameras by

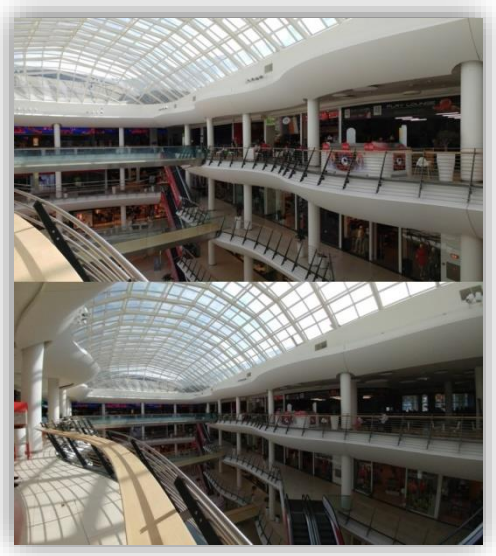
layering them into one image having greater detail and reduced noise. This is especially useful in low light conditions due to lack of light to be captured. On the other hand, the monochrome sensor can be used as a standalone camera for black and white photography.

Monochrome shot

One of the first examples of this system was the Huawei P9. There is no real disadvantage to this system. It's the only one system among others discussed here that tries to do anything about the actual image quality instead of adding additional features.

The Wide Angle

A wide-angle camera is pretty much what it sounds like. A larger focal length (or a smaller aperture) gives the secondary camera a crazy wide field of view that allows the user to capture a much wider area. The early iterations of this system did have its disadvantages like the ultra-wide-angle lens image quality was nowhere near as good as the primary camera and had significant barrel distortion due to the narrow aperture but with good implementation, this system does have the potential to be a really cool second camera system.



Comparing normal and wide angle

Debuted first on the LG G5, we have mainly seen this on LG phones, with Motorola recently incorporating it in the X4. The wide-angle lens gives a unique perspective that you simply don't get at all on a smartphone camera.

4. The Telephoto

The most common of all the dual camera systems today is the telephoto camera where the primary camera is paired with a second camera that has a telephoto lens that lets you zoom into your subject. Zooming on smartphones has largely been digital until now but with this you 2x (taking the example of iPhone 7 Plus) lossless optical zoom into your subject. Shooting with a telephoto lens also has other advantages. Telephoto lenses are more suitable for portraits than wide angle as they have less distortion and are more flattering to the subject and so manufactures do implement a background blur effect for this system. The combination of a telephoto lens and background blur gives far superior results than just applying background blur on wide-angle images.

2x optical zoom shot

Of course, this system too has its disadvantages. So far none of the manufacturers have been able to get complete parity between the two cameras. It's even worse in lowlight, where due to the smaller aperture of secondary camera, it can't gather enough light resulting in large amount of noise in the image.

But Are They Here to Stay?

At the beginning of this article we mention dual camera setup as an essential feature for a smartphone in 2018, at least for flagship phones dominating to the market. But is that true? The current craze for dual-camera smartphones was predictable as early as the spring of last year. But something worth noticing is that the best what a smartphone camera can offer still comes from a single camera setup. 2016 was the year for dual cameras, the one where iPhone joined the fray; still Google's Pixel had arguably the best camera. The following year, every company tried to get it out in every price segment of the market leading in disappointing results. Here too instead of the dual camera hype, Pixel 2 beat everyone else to retain the crown for itself with the Galaxy S8 and HTC U11 formidable competitors if not the best, all of which sport a single camera. The upcoming Galaxy S9 implements variable apertures eliminating the need of secondary camera for specific cases. This begs the question is the trend of dual cameras here to stay? Only time can tell.

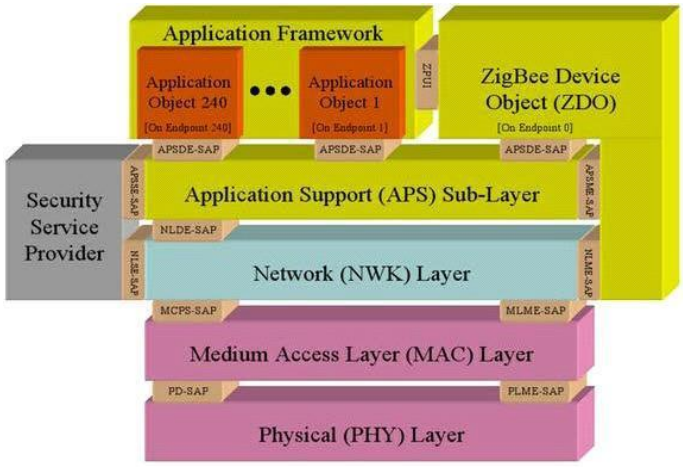
2.5 zigbee

Zigbee is the wireless technology which connects the devices in zigzag manner like bee, thus the name Zigbee. ZigBee is a wireless technology developed as an open global standard to address the unique needs of low-cost, low-power wireless M2M networks. The ZigBee standard operates on the IEEE 802.15.4 physical radio specification and operates in unlicensed bands including 2.4 GHz, 900 MHz and 868 MHz

The 802.15.4 specification upon which the ZigBee stack operates gained ratification by the Institute of(IEEE) in 2003. The specification is a packet-based radio protocol intended for low-cost, battery-operated devices. The protocol allows devices to communicate in a variety of network topologies and can have battery life lasting several years.

Architecture

Zigbee system structure consists of three different types of devices such as Zigbee coordinator, Router and End device. Every Zigbee network must consist of at least one coordinator which acts as a root and bridge of the network. The coordinator is responsible for handling and storing the information while performing receiving and transmitting data operations. Zigbee routers act as intermediary devices that permit data to pass to and for through them to other devices. End devices have limited functionality to communicate with the parent nodes such that the battery power is saved as shown in the figure. The number of routers, coordinators and end devices depend on the type of network such as star, tree and mesh.



Uses

Zigbee specification is intended to be simpler and less expensive than other wireless personal area networks (WPANs), such as Bluetooth or more general wireless networking such as Wi-Fi.

Zigbee is used by a variety of cable and telecommunication companies in their set-top boxes, satellite transceivers and home gateways to provide home monitoring and energy management products to their customers

Utility companies can use Zigbee in their smart meters to monitor, control, inform, and automate the delivery and use of energy and water.

Zigbee is perfectly suited for controlling home appliances remotely as a lighting system control, appliance control, heating and cooling system control, safety equipment operations and control, surveillance, and so on.

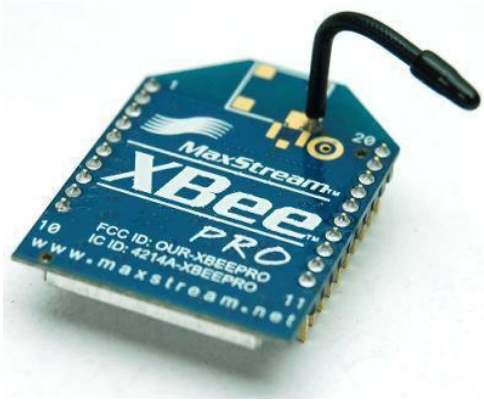
Zigbee supports several devices, including intelligent shopping carts, personal shopping assistants, electronic shelf labels and asset tracking tags.

Projects on Zigbee

Smart Car: Smartcard shown here has many features like theft detection, car location using latitude and longitudinal values. It uses GPS module for locating the car, an ultrasonic sensor to detect the theft of the vehicle.

Smart Traffic Light: The smart traffic light is a prototype. It switches on the street lights, only when they are needed. This system initially checks for the light intensity i.e. day or night, if the intensity is less it switches on. It also checks if anyone is present on the road or not using PIR sensor. If there is no one on the road lights are switched off.

Smart Traffic Light: The smart traffic light is a prototype. It switches on the street lights, only when they are needed. This system initially checks for the light intensity i.e. day or night, if the intensity is less it switches on. It also checks if anyone is present on the road or not using PIR sensor. If there is no one on the road lights are switched off.



What is Bluetooth?

Ever wondered what Bluetooth is? Who owns it? How a device is declared Bluetooth compatible? Well… Bluetooth is an IoT (Internet of Things) Protocol, just like WIFI, standardized by the IEEE and managed by the Bluetooth Special Interest Group (SIG). In simple terms, it is a network in which physical objects can exchange data internally or with other connected machines. The Bluetooth SIG oversees development of the specification, manages the qualification program, and protects the trademarks. A manufacturer must meet Bluetooth SIG standards to market it as a Bluetooth device.

The latest one…

Bluetooth 5.0 is the latest edition of this ubiquitous network unveiled in a media event in London on 16thJune, 2016. Advertised improvements include 2x faster. The Bluetooth pairing process is significantly is faster and the delay in input and the desired result is much less noticeable for more professional tasks. Next is range which is advertised to be 4 times Bluetooth 4.0. The theoretical maximum range of Bluetooth 4.0 is 50 metres with a direct line of site and 10 metres indoors. Bluetooth 5.0 quadruples it up to a theoretical maximum of (you guessed it!) 200 metres straight and 40 metres indoors. The data through put is about 8 times its predecessor with a lot of real world implications such as Bluetooth beacons and dual pairing. Bluetooth 5 coexists with other technologies, such as Wi-Fi and LTE, to provide more robust connections

Real World Improvements

Bluetooth 5.0's new features are mainly focused on emerging Internet of Things technology.

Adoption of Beacon devices: Beacons are small wireless devices that are fitted into Bluetooth 5 which constantly transmit radio waves. Beacons devices decrease the chances of poor connection.

Increased number of "Advertising packets": This increased number of AP makes Bluetooth 5 more reliable as it asks the name of a device before pairing it. The increased number of packets should allow the pairing process to be a faster, more reliable action, which will also help with the stability of the connection.

Better IOT: Bluetooth 5 offers the flexibility to make IoT solutions better because of 2x speed, 4x range, 8x data capacity. It offers better IoT connection as the range increased up to 4 times. So not only home but whole building, industry, factory, office surrounding would be possible to connect properly.

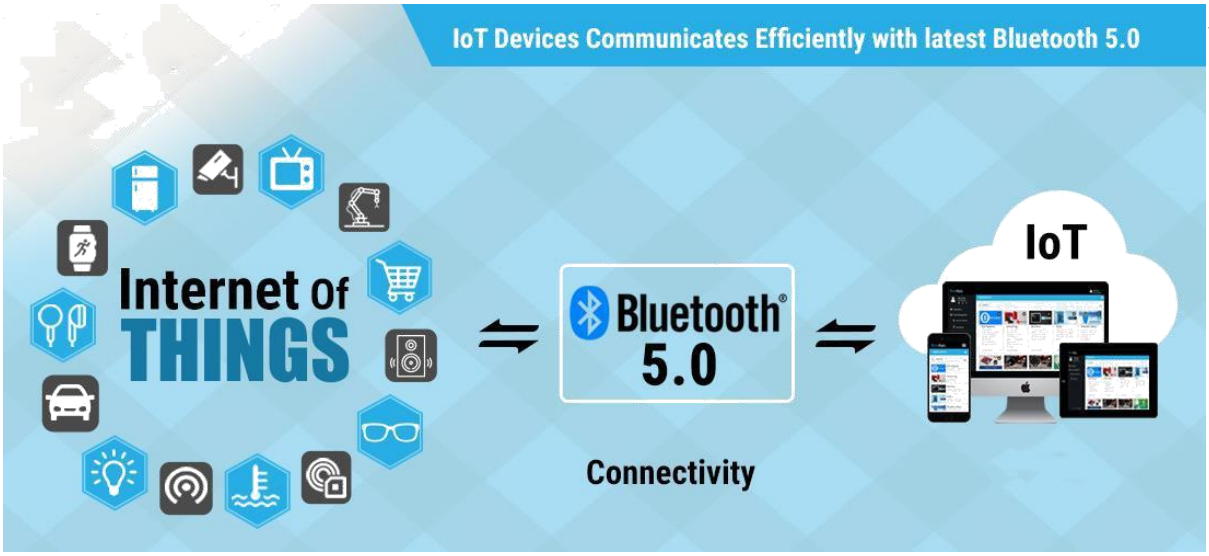
Available Everywhere: It includes update which helps to reduce interference of other wireless technologies as Bluetooth devices can coexist within the increasingly complex global IoT environment. It matches the install base of Bluetooth technology with over 10 billion devices which no other wireless device can provide ever.

Improved Location Awareness: This feature provides users personalized experiences. Bluetooth always roams with a device. Bluetooth can provide more granularities. Every cell tower's location is fixed and typically has a known, highly precise set of coordinates available.

Better Audio Quality: As speed is increased it would be possible to have better sound quality than its earlier version. The stereo sound would become possible in speakers. And fewer chances of disturbance and connection failure.

Location based services: This wireless technology also improves location-based services. Now moving around not only your home but in a shopping mall would also possible for you without breaking the connections.

Quick data transfer: Data transfer speed has increased 8 times, so much more data transfer would possible in short time.



What does it bring for you?

Samsung Galaxy S8 was the first smartphone to implement this protocol. Samsung took advantage of the faster data throughput to create feature called Dual Audio. It basically can send signal to 2 different audio output sources to give a stereo effect.

The increased range of Bluetooth 5.0 means that there will be less distortion in the music, that you are hearing, will you be away from your smartphone. The lower latency means more responsiveness and better use case of Bluetooth in critical situations such as medical cases and security setup

Bluetooth 5.0 is being implemented in almost all latest electronic devices trying to achieve the wireless future thus making Bluetooth more and more powerful

FACEBOOK SCANDAL HITS 87 MILLION USER

Facebook has revealed that 87 million users could have been affected by the Cambridge Analytica scandal, nearly 40 million more than previously estimated. The figure includes more than a million users from the UK with the majority of those potentially affected in the US.

The social media firm's boss Mark Zuckerberg said Facebook "didn't do enough" to protect its users, at a press conference on Wednesday. "We didn't take a broad enough view of what our responsibility is. That was a huge mistake. It was my mistake," he said. The 87 million figure is an estimate and Facebook says they "don't actually know" the true total. Alongside profiles in the UK and US, more than a million Filipino and Indonesian people may have had their data shared improperly.

In a blog post Facebook outlined a number of proposed changes to its terms of service in the wake of the privacy row. The company explained that it had disabled a feature that had previously allowed people to search for users by their mobile number or email address, if they chose to allow it in their settings. "I would assume if you had that setting turned on that someone at some point has access to your public information in some way," said Zuckerberg.
He also said that he is still the right person to lead Facebook. "I think life is about learning from your mistakes and working out what you need to do to move forward."

WHAT IS THE CONTROVERSY ABOUT?

Facebook has faced intense criticism after it emerged that it had known for years that Cambridge Analytica had collected data from millions of its users but had relied on the London-based firm to self-certify that it had deleted the information.

Cambridge Analytica: The story so far

Cambridge Analytica said it had bought the information from the creator of the This Is Your Digital Life app without knowing that it had been obtained improperly. The firm says it deleted all the data as soon as it was made aware of the circumstances. But Channel 4 News has since reported that at least some of the data in question is still in circulation despite Cambridge Analytica insisting it had destroyed the material. During Mr Zuckerberg's press conference, Cambridge Analytica tweeted it had only obtained data for 30 million individuals - not 87 million - from the app's creator, and again insisted it had deleted all records.

The latest revelations came several hours after the US House Commerce Committee announced that Facebook's

founder, Mark Zuckerberg, would testify before it on 11 April.

Facebook's share price has dropped sharply in the weeks since the allegations emerged.

WIDE-RANGING CHANGES:

In his Wednesday blog post, Mr Schroepfer detailed new steps being taken by Facebook in the wake of the scandal.

They include:

- A decision to stop third-party apps seeing who is on the guest lists of Events pages and the contents of messages posted on them
- A commitment to only hold call and text history logs collected by the Android versions of Messenger and Facebook Lite for a year. In addition, Facebook said the logs would no longer include the time of the calls
- A link will appear at the top of users' News Feeds next week, prompting them to review the third-party apps they use on Facebook and what information is shared as a consequence

FAKE NEWS:

The Cambridge Analytica scandal follows earlier controversies about "fake news" and evidence that Russia tried to influence US voters via Facebook. Mr Zuckerberg has declined to answer questions from British MPs.

When asked about this by the BBC, he said he had decided that his chief technology officer and chief product officer should answer questions from countries other than the US. He added, however, that he had made a mistake in 2016 by dismissing the notion that fake news had influenced the US Presidential election.

"People will analyse the actual impact of this for a long time to come," he added.

"But what I think is clear at this point is that it was too flippant, and I should never have referred to it as crazy."

Glimpses of Sojourn 2018

Achievements

Name	Event Name	Level	Achievements
Ayush Mehta TE	Circuit Designing	Department	Third Place
Hrishikesh Manjrekar TE	Circuit Designing	Department	Third Place
Archana Yadav TE	Multicon 2018	Department	Third Place
Utkarsh Somvanshi TE	Enertia	Department	First Place
Aditi Jain TE	Excelsior 2017	Inter-College	Second Place
Hrishikesh ManjrekarTE	Multicon 2018	Inter-College	Third Place
Ankita Jha TE	Sojourn	Inter-Department	First Place
Mandar Ingle TE	Photography event Sunburn	City / District	Second Place
Ashima Saxena SE	Sojourn	Inter-Department	First Place
Sonal Mishra SE	Sojourn	Inter-Department	First Place
Archit Jhunjhunwala SE	Debate competition	Department	First Place

Akshay D. Prabhu TE	ESSAY WRITING Competition because of National Voter's Day	Inter-Department	First Place
Akshay D. Prabhu TE	Indian Engineering Olympiad 2018	National	Secured 99th All India Rank in Indian Engineering Olympiad 2018 for ECE STREAM.
Jayank Panchal SE	6th Sense robotic workshop	Department	Learnt a lot
Tanish Kandivlikar SE	INTRA Dance	Department	First Place
Vishnu Nair BE	Multicon - 2018	Department	Participation
Sayali Narhede BE	ThrowBall	Inter College	Third Place

Deepak Verma Sumit Pai Krishna Vishwakarma Kajal Pandey Rohit Varma Harprit Wadekar (SE)	Smart India Hackathon Hardware Edition	National Level	Currently in Phase 2