

Binary and Hexadecimal

- Base 2 (binary) : 16 | 8 | 4 | 2 | 1
- Base 10 (denary) : 1000 | 100 | 10 | 1
- Base 16 (Hexa) : 256 | 16 | 1

Converting Hexa \rightarrow Binary

¹² C	/	¹³ D
1101		1110
1101 1110		

- 1 kilobyte = 1000 byte
- 1 megabyte = 1000 000 bytes
- 1 gigabyte = 1000 000 000 bytes
- 1 tera byte 1 000 000 000 000 bytes E.g.

1 bit = 1 binary dig - 1/0

1 byte = 8 digets - 10011111

HTML code represents colours e.g # FF 80 00 in hexa

ASCII are numbers (hexa) that represent characters e.g 25 = %

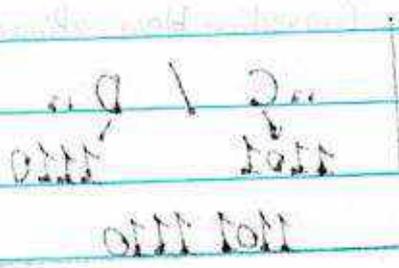
Communication and internet technologies

- Simplex data transmission: 1 direction - sender to receiver
- Half-Duplex data trans: Both directions not at same time-
- Full-Duplex data trans: Both directions simultaneously
- Serial data trans: Data sent one bit at a time over one wire or channel
- Parallel data trans: Several bits of data sent - usually 1 byte - over several wires or channels same time.

1.1.1.1

B I R G R D

H exa d e c i m a l



- Base 2 (Binary) : 10101111
- Base 10 (Decimal) : 100000000000
- Base 16 (Hexa) : 22011011

1 bit = 1 binary digit
 1 byte = 8 bits

- 1 Kilobyte = 1000 bytes
- 1 Megabyte = 1000000 bytes
- 1 Gigabyte = 1000000000 bytes
- 1 Terabyte = 1000000000000 bytes

ASCII are num bers (1 byte) that represent characters and 256 bits
 HTML code represents colour and # FF 00 00 in hexa

Common with ASCII

ASCII

- Single byte characters: character set
- Multi-byte characters: character set
- Unicode: character set

ASCII is a 7-bit character encoding standard
 Unicode is a multi-ethnic standard

1.1A

- Asynchronous data trans: data sent in an agreed bit pattern, sent with control bits.

- Synchronous data trans: continuous stream of data - Timing signals

USB = asynchronous

• four wire shielded cable

• 2 for power and the earth

• 2 for data transmission

Error-checking methods:

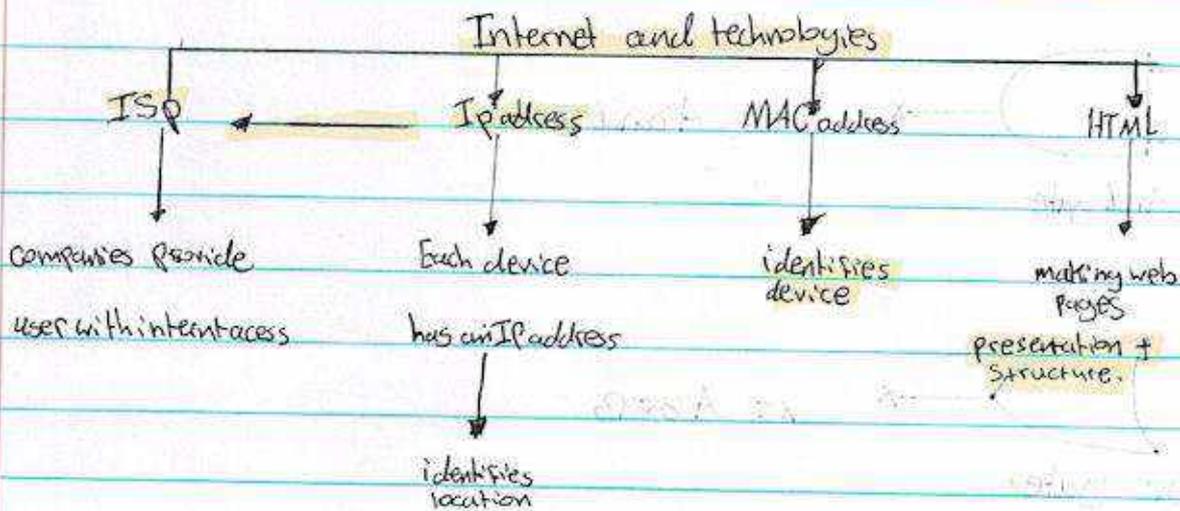
1. Parity checking - Even and odd parity 7-8

2. Automatic Repeat Request (ARQ): Acknowledgement - Timeout - retransmit

3. Checksum: Block of data with value twice compared

4. Echo check: Data sent to device then back to be compared

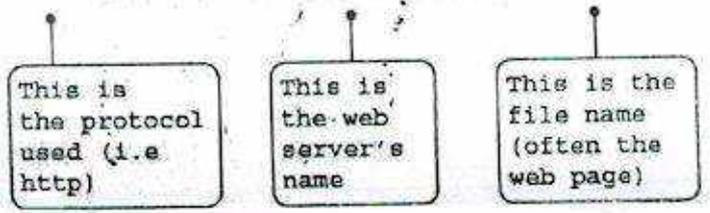
Internet service providers



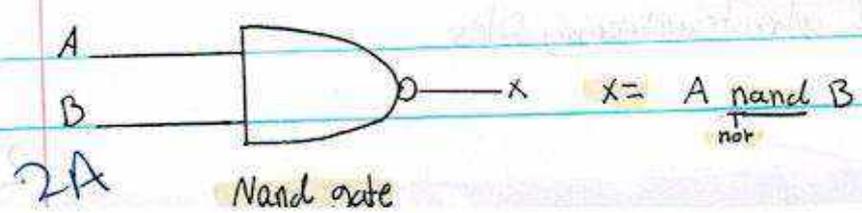
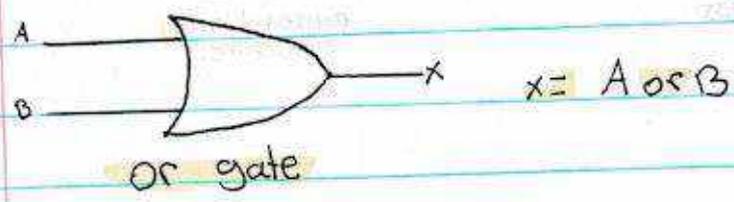
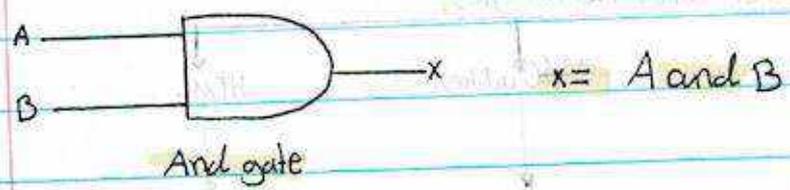
HTTP = set of Rules obeyed when transferring files

Web browser: display web page on computer screen. interpret + translate HTML.

http://www.hoddereducation.co.uk/igcse_computer_science



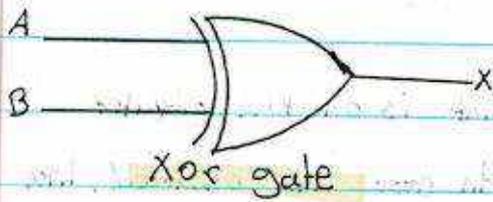
Logic gates + Logic Circuits



2A

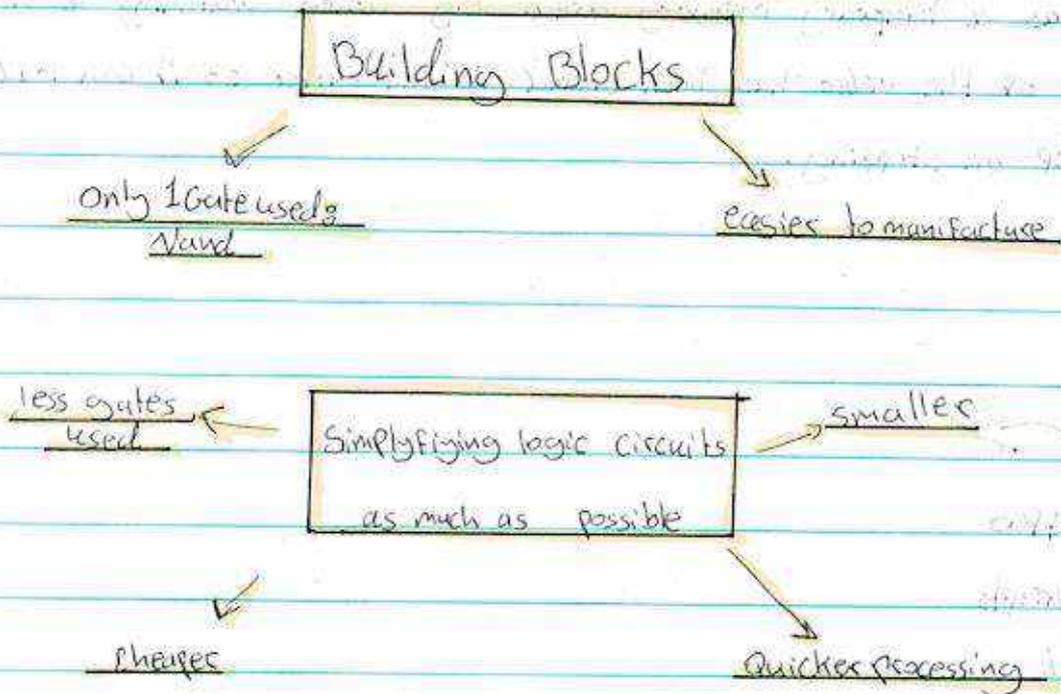


$$X = A \text{ NOR } B$$



$$X = A \text{ XOR } B$$

Electronic companies use 2 methods to simplify logic circuit designs:



operating system

comp architecture

operating system = software in background. manages many functions.

Windows, Unix, Dos, android ios

- Rom - Read only memory
- Ram - Random access memory

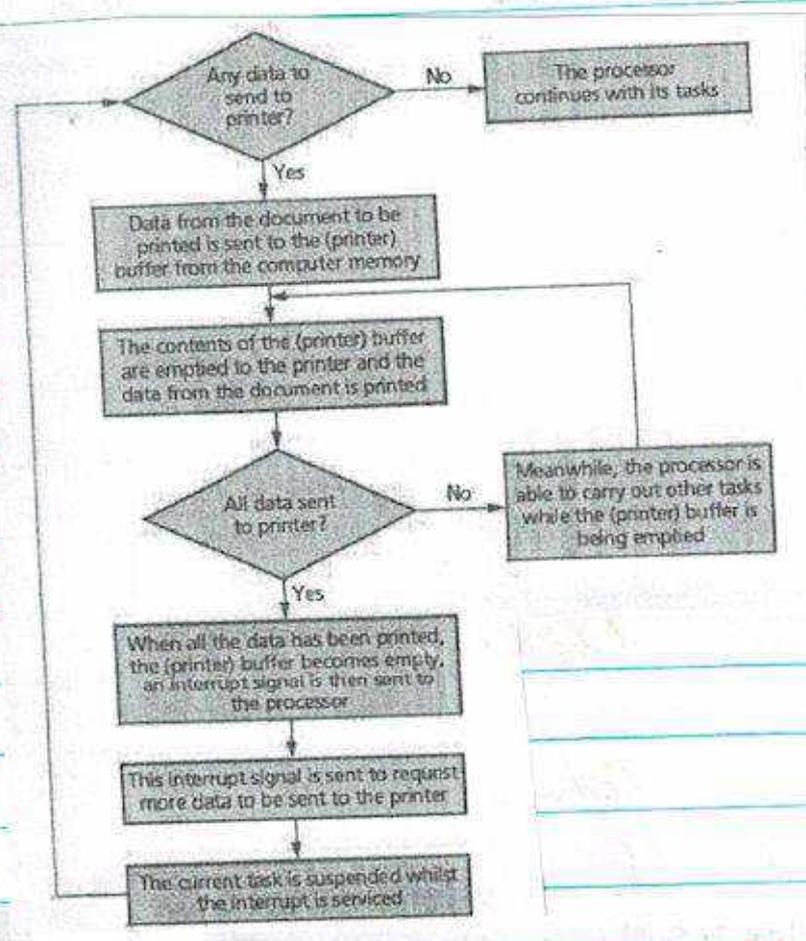
- Interrupts :

• A signal sent that temporarily stops what is on the computer and turns the attention to the interrupt e.g. An error has occurred, like a paper jam.

- Buffers :

• Used as a temporary memory area. e.g. when watching a video some of the video has been stored in the buffer so it can load and doesn't keep on stopping.

How buffers and interrupts are used when doc is sent to printer



- Computer architectures

o 1945 John von Neumann developed the idea of a stored program computer known as the von Neumann architecture.

x The idea was to hold programs + data in a memory, data would then move between memory unit and processor.
linked together by connections (Buses)

- Buses move data around computer and also send out control signals:

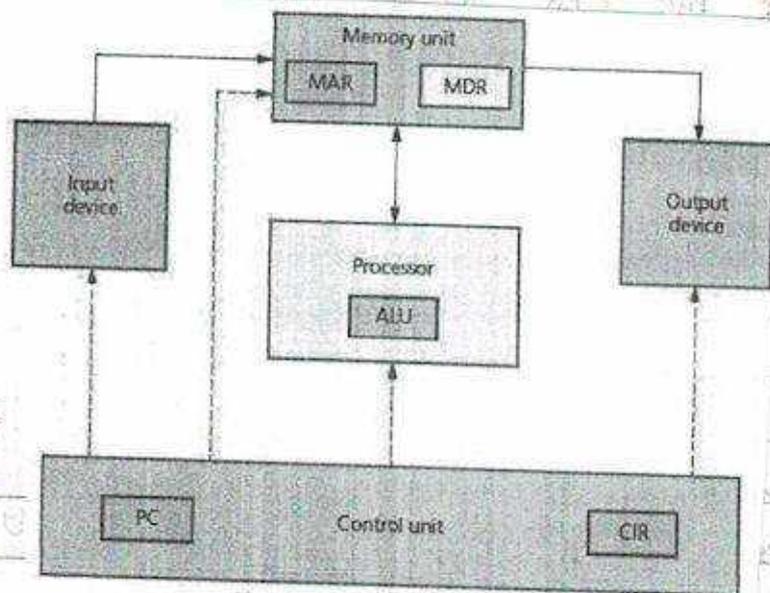
x Address bus: Carries signals relating to addresses between processor + memory, is unidirectional.

x Data bus: Sends data between processor + memory unit + input/output devices, is bi-directional.

x Control bus: Carries signals relating to the control + coordination of all activities within computer, is unidirectional.

Slightly more detailed von Neumann Architecture.

Key
Data →
control →



- Addresses = location of where data can be found in computer memory. Each is unique

- Registers = A high-speed storage area. All data must be represented in a register before it can be processed.

- MAR: memory address register
- MDR: memory data register
- ALU: arithmetic and logic unit

- PC: Program counter
- CIR: Current instruction register

Processor: Contains ALU (Arithmetic + logic unit) → Allows the operations to be carried out.

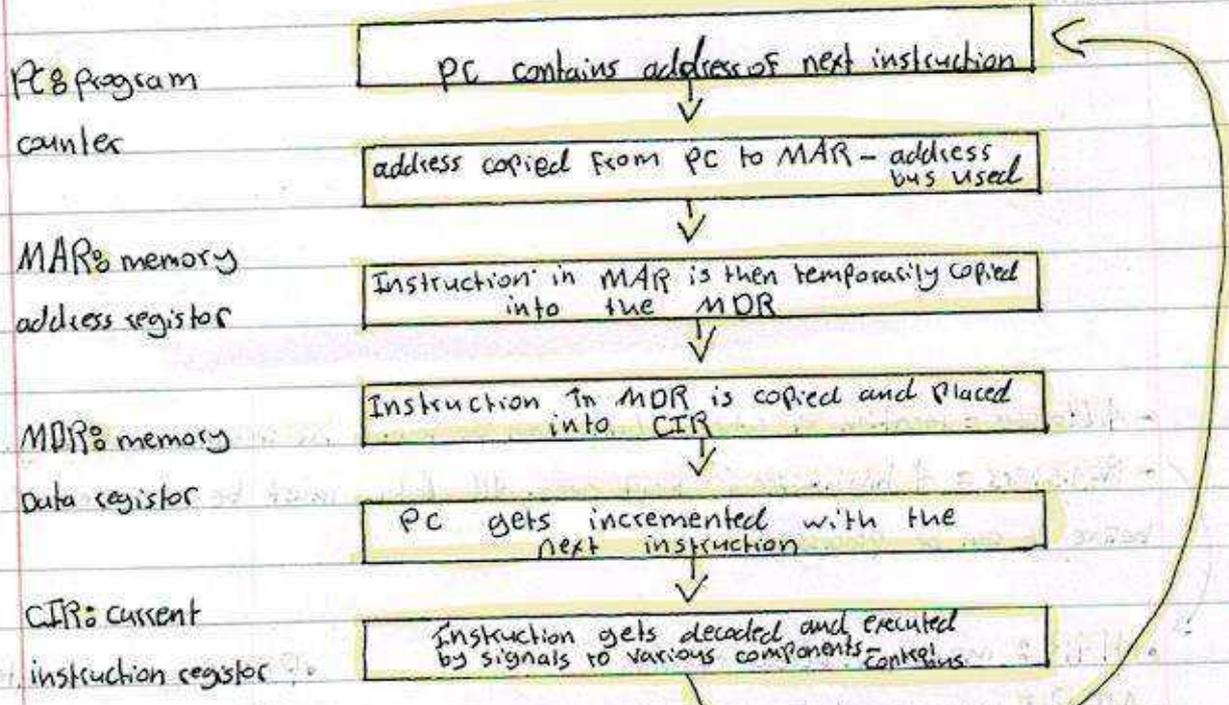
Reads instruction from memory → Control Unit: Contains CIR (current instruction register) and the PC (program counter). It controls memory, processor and input/output devices.

The CIR contains the current instruction — The PC contains the address of the next instruction.

During the process signals are generated along the control bus that tells other components what to do.

Fetch - execute cycle:

- Processor gets some data + instructions from memory and stores them in suitable register (address + data bus used). Each instruction needs to be decoded then executed.
- Instruction is taken from memory address in the PC, then it gets stored in the CIR and get decoded. The PC gets incremented with the next instruction. The processor passes the decoded instructions as a set of signals to the right/appropriate components, which allows each instruction to be carried out in its logical sequence.



CCDs
Charge couple
device

Input + output devices

Inputs: Convert external data into form computer can understand + process.
Outputs: Show results of computers process in a form which is humanly understandable.

Input:

- o Scanners
- o Barcode readers/scanners
- o QR code readers
- o Digital cameras
- o sensors
- o key boards
- o pointing device - mouse -
- o microphones
- o touch screens
- o interactive white board.

- 2D scanners ^{→ printer}

x Generally used to input hard-copy docs, gets converted into electronic form.
x Computers with OCR (Optical character recognition) software allow the scanned docs text to be converted into text file format meaning it can be edited and manipulated.

x Airports use 2D scanners to scan passports. They use OCR to produce digital images which represent passport pages. The 2D photograph in passport is scanned and stored as jpeg image. Passengers face is photographed then gets compared to the passport image.

- o Distance between eyes
- o width of nose
- o shape of eyebrows

Used to identify face.

- 3D scanners

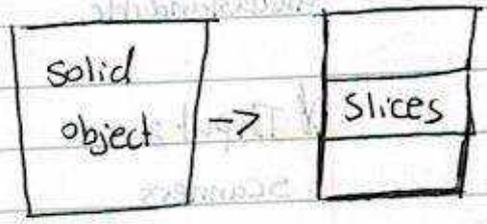
x Scan solid objects + produce a 3D image. Scanners take images from diff angles. Digital image is formed.

x Scanned images can be used in CAD or get sent to a 3D printer

x CT (Computed tomographic) scanners used to create a 3D image of solid object.
 x An image of the solid gets built up by a series of thin 2D slices, these 2D slices make up a representation of the 3D solid object.
 x Each slice is built up by use of x-rays, Radio Frequencies or gamma imaging.
 Each slice is stored as a digital image.

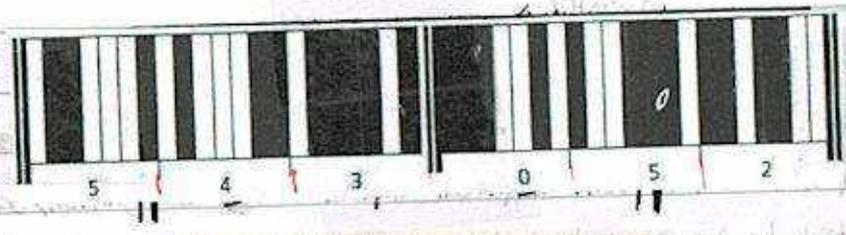
x Types of tomographic scanners:

- o X-Rays — CT scanners
- o Radio Frequencies — MRI
- o Gamma Rays — spect



- Barcode Readers / scanners: - holds up to 30 digits

x Series of dark and light parallel lines of varying thickness and pattern.
 x numbers 0-9 represented by unique series of lines.



x left has an odd number of dark elements and always begins with a light bar. Right has an even number of dark elements and always being with a dark bar.

x The barcode gets scanned/read by a Red LED. The light areas is reflect back but the dark areas reflect little to no light. reflected light read by sensors and a pattern is generated, then converted into digital data.

- QR Codes: - holds up to 7000 digits

x made up of matrix of filled in dark squares on a light background.
 x modern phones with built in camera facility or an app that makes it quicker to scan the QR code. The QR code may contain a website link.

x Scanning a QR code automatically keys in a website address for us.

x QR codes can store website addresses - Urls that appear in places.

x very effective for advertising.

Another type

- Digital cameras

- x Old traditional cameras used film to record photos, + you had to print photo in order to see results.
- x Modern cameras simply link to a computer system (USB/bluetooth) and you can see results there.
- x Cameras are controlled by a microprocessor which can automatically carry out:
 - o Adjust shutter speed
 - o focus image
 - o operate flash
 - and so on.

Photo is captured when light passes through lenses onto a light sensitive cell.

cell is made up of tiny elements called pixels.

- Keyboards

- x used for data entry.
- x Connected by USB or wireless. on mobile its touchscreen
- x Each character has an ASCII value
- x frequent use can lead to RSI → Ergonomic keyboards can help this.

- Pointing devices

- x 'Clicking' usually done with pointing device or touchscreen
mouse - Tracker ball

x connected wirelessly or with USB

- x Tracker balls are usually seen in an industrial environment. → less likely to get RSI

optical mouse
used led
to detect
movement

- Microphones

- x input sound to computers

o Voice over

o speech recognition - spoken key words recognised

o voice recognition - voice is recognised/detected + converted into digital

either built in / USB
or wireless

- Touch screens

x Simple & touch

Major types of touch screen on mobile phones

		Benefits	Drawbacks
Capacitive	Electric current on top layer	<ol style="list-style-type: none">1. Medium cost2. screen visibility is good in strong light3. permits multi-touch4. very durable	<ol style="list-style-type: none">1. allows only bare fingers to touch it or a special stylus
Infra- Red	Heat sensitive (needs warmth to touch) and optical (uses sensors in the form of a grid)	<ol style="list-style-type: none">1. both systems allow multi-touch2. optical allows bare fingers-gloved-stylus3. has good durability	<ol style="list-style-type: none">1. expensive2. heat sensitive only allows bare fingers3. both systems have mid screen visibility in strong lighting
Resistive	Upper layer of polyester and bottom of glass. When touched top and bottom create a circuit.	<ol style="list-style-type: none">1. inexpensive2. possible to use bare fingers-gloved-stylus	<ol style="list-style-type: none">1. screen visibility is poor in strong light2. doesn't permit multi-touch3. screen durability is mid

- Sensors

x Reads or measures physical properties: Temperature - Pressure - and so on.

x Analogue \rightarrow not discrete or exact / Digital \rightarrow Discrete/exact

x These physical quantities need to be converted into a digital format for computer to understand \rightarrow ADC = physical values to discrete digital values

DAC = Digital to Analogue

x Monitoring \rightarrow Simply 'watching' / no effect

Control application \rightarrow Does/sends signal for action / has effect

e.g. Turning street lights off during day and on at night

• Changing traffic lights.

e.g. monitoring intruders in burglar alarm system

• monitoring patient in hospital for vital signs - heart rate \rightarrow temp e.c.t

-Interactive whiteboards:

- x allows computer images to be displayed using digital projector
- x Allows user to write on it. The writing or drawing produced is then stored in an electronic form.
- x possible to run software on
- x Can interact simply by using fingers.

1. Introduction

2. Literature Review

3. Methodology

4. Results

5. Discussion

6. Conclusion

7A

8

9

Output Devices :

- o inkjet printers
- o Laser printers
- o 3D Printers
- o 2D/3D Cutters
- o actuators
- o loud speakers
- o LCD/LED monitors
- o Projectors

- Inkjet printers & liquid ink

x has a print head which consists of ~~nozzles~~ nozzles that produce ink droplets on to the paper. ink droplets produced in two diff. ways :

1. Thermal bubble

2. Piezoelectric - crystal at each nozzle - electric charge/vibration; ink forced to eject.

x Stepper motor + belt that moves print head assembly across page - side to side.

- Laser printer

x Uses toner - powdered ink -

x Uses a printing drum

x Has a fuser - set of heated rollers -

x makes use of properties of static electricity to produce text/images

x Prints whole page in one go

x Very Fast.

- 3D Printers

x used in computer-aided design (CAD).

Additive manufacturing

x produces solid objects that built up layer by layer using powdered resin, powdered metal, paper or ceramic powder.

x subtractive method = carving an object out of a solid - CNC -

x Direct 3D printing = inkjet technology

X Binder 3D printing = Uses 2 passes for each layer:

1. Sprays dry powder
2. Sprays a binder (type of glue) to form a solid layer

- 2D, 3D cutters:

Similar

- o 2D = Recognise an object in x-y direction
- o 3D = Recognise an object in x-y-z direction

o 3D cutters (laser) cut the following:

- Glass
- Polymer
- Crystal
- Wood
- Metal

o Controlled by computers

o Produce intricate designs

- Actuators:

o Used in control applications, sensors, devices like ADC, DAC.

- Loud speaker/headphones:

o Sound produced by passing digital data through DAC then an amplifier and sound comes out from a speaker.

o Sound produced by voltage differences vibrating a cone in speaker:



- LCD, LED:

o Liquid crystal diode - LCD =

o light emitting diode - LED =

o The front layer of a monitor is made up of LCD-Tiny diodes grouped together (pixels). The three colours are: Red, Green, Blue, when four: yellow

- o Modern LCD monitors are back lit using LEDs.
- o Before LED CCFI was used - cold cathode fluorescent lamp -
- o CCFI use two ~~flu~~ fluorescent tubes behind the screen.
- o Advantages of LEDs
 - x Reach maximum brightness immediately (no need to 'warm up')
 - x Whiter light = sharpens image, more vivid colours. (CCFI = yellowish tint)
 - x Thinner monitors
 - x last ~~indefinitely~~ indefinitely. = More reliable + consistent product.
 - x consume very little power

- o OLEDs - organic light diodes - might be used in future cus it uses organic materials to create semi-conductors that are flexible.
- o Electric field applied to electrodes that give off light.
- o OLEDs is a self contained system (no need for LCD tech)
- o Advantages of OLEDs
 - x Layers are thinner, lighter, more flexible
 - x light emitting layers are lighter
 - x Brighter light than LED
 - x Generate own light (no need for backlighting)
 - x Use less power
 - x large field view.

- DLP:

- o Digital light projector.
- o Uses millions of micro mirrors.
- o Number of micro mirrors + arrangement determines resolution of image.
- o Micro mirrors tilt towards light they're on, tilt away they're off. - light/dark pixel -
- o Can switch on/off several thousand times creating various grey shades - grey scale -
- o Bright white light passes through a colour filter on the way to DLP chip. White light split into Red - Green - Blue. DLP projector create over 16m colours.
- o Grey scales interpreted as colours.

- LCD Projectors:

o older than DLP.

o High-intensity beam of light passes through an LCD display then onto a screen.

x Beam of light generated from a bulb or LED inside projector body.

x Beam of light sent to group of chromatic-coated mirrors which reflect the light back at different wave-lengths.

x Reflected light has wavelengths corresponding to Red - Green - Blue.

x These colours pass through LCD screens (three), these show image as millions of pixels in a grey scale.

x Coloured light pass through these screens and a Red - Green - Blue image emerges.

x Images are combined using special prism. Final image consists of millions of colours.

Memory + Data storage

- Different file formats are used in computer systems:

o MIDI - musical instrument digital interface -

o MP3

o MP4

o Jpeg

o text + number format

- MIDI:

o Storage of music files

o Don't contain sounds

o A communication protocol allows electronic musical instruments to interact.

o Uses 8 bit serial transmission + one start one stop bit. Asynchronous.

o A MIDI file consists of a list of commands that instruct a device on how to produce a sound/music.

o Each command has a sequence of bytes

o 1st byte = status byte that informs MIDI what function to perform

o Status byte has the MIDI channel encoded. MIDI has 16 diff channels 0-15.

o Examples of command codes:

x Note on/off.

x Key pressure.

o Two bytes are required:

x Pitch bytes tells what note to play

x Velocity bytes tells how loud to play.

* File extension = **.Midi**

o Whole piece of music will be stored as a series of commands

o A computer can send out data on all 16 midi channels at same time + can create an electronic orchestra.

o MIDI files are smaller than MP3 so it's ideal for devices with memory problems.

- **MP3 (MPEG-3) , MP4 (MPEG-4)**

o MP3 uses Audio compression to convert music + other sounds into MP3 format.

o the compression will reduce the size by 90% e.g. 80MB music CD → 8MB using mp3

o Files from internet or CDs converted to mp3.

o CD is converted using a file compression software.

o Reduces by 90% cuz it removes the sounds that the human ears can't hear.

o uses lossy compression

o MP4 allows the storage of multimedia files - music, videos, photos.

- **Jpeg (Joint photographic experts group)**

o Changing / Reducing image resolution

o File extension = **JPEG**.

o lossy compression

o X3 (each pixel occupies 3 bytes).

x the human eye is very limited to detect very slight changes.

- Text + number file formats:

o Text is usually stored in ASCII format

→ The word computer

Denary

67 79 77 80 85 84 69 82

or

Hexa

0x43 0x4F 0x4D 0x50 0x55 0x54 0x45 0x52

o Text files use lossless compression. It uses complex algorithms that work on repeated sections e.g

• $OU = 4$

• $OW = 1$

'Do you know How you would'
'Do y4 kn1 H1 y4 w4ld'

- Lossless File Compression:

o Data that is compressed can be uncompressed without losing any data.

- Lossy File Compression:

o Compressing data by removing irrelevant/unnecessary bits of data, you can't get it back.

Memory + Storage:

- Primary Memory:

o RAM - Random access memory -

x Temporary memory - memory lost when power off -

x Stores Data, files, part of OS that are currently in use

x can be written, read, edited.

o The larger the size of RAM the faster the computer will operate.

o Buffers often use RAM

o Two types of RAM:

x DRAM (Dynamic) - Cons -

consists of transistors + capacitors

like a switch, allows chip

control circuitry to read the capacitor /

change the value

holds numbers
the bits of info

o needs to be constantly refreshed

Advantages:

- x less expensive than SRAM
- x consumes less power
- x has a higher storage capacity

x SRAM (Static):

- o Doesn't need to be constantly refreshed
- o Use of "Flip Flops" which hold each bit of memory
- o Much faster - 25 ns -

o ROM - Read only memory:

- x Permanent memory - memory stays even when turned off -
- x Used to store start up instructions - computer first switched on -
- x can only be read - can't be changed/edited.

- Secondary Storage:

o HDD - Hard disk drive:

- x Store data on computer
- x Stored in digital format on magnetic surfaces on disk (platters)
- x A number of read-write heads can access all of the surfaces
- x Data is stored in sectors + tracks.

↓
on a track will contain a fixed number of bytes

- x has very slow data access. (latency)

o SSD - solid state drive:

- x Don't have latency issue
- x No moving parts
- x All data retrieved at same rate
- x Data stored by controlling the movement of electrons in NAND chips.
- x Some SSD devices use EEPROM that use NOR chips. (faster)
- x expensive - Allows data to be read + erased in single bytes at a time.
- x NAND only allows blocks.

x Main benefits of SSD are

- More reliable
- lighter
- Don't hv to 'get up to speed' to work properly
- less power consumption
- Very thin
- Data access faster than HDD.

- Off-line storage

o CD/DVD disks

x Both described as optical storage devices.

Red x Laser used to read/write data in disk surface

x use a thin layer of metal alloy or light-sensitive organic dye to store data.

x Data stored in 'pits' + 'bumps'.

x DVD uses Dual-layering which increases storage capacity. Two individual recording layers.

More data stored

x The shorter the wavelength of laser light, the greater the storage capacity.



- DVD-Rams

x Use a number of concentric ~~tracks~~ tracks which allows simultaneous read + write operations to take place.

x has great longevity (30 years+) . ideal for archiving.

- Blue-Ray disks

x Blue laser is used to carry out read + write operations

x Blue laser light allows 'pits' + 'bumps' to be smaller. (more storage)

x Blu-Ray uses one layer so doesn't suffer from birefringence.

x comes with a secure encryption system

- USB Flash :

- o Memory sticks / flash memory use solid-state tech.
- o Connect to a computer through USB port
- o Small + light weight
- o XD + SD cards are same as memory sticks.
- o Each memory card is made up of NAND chips.
- o When solid-state memories are removed before being made safe data on it can be corrupted.

- Removable HDD :

- o Similar to HDD but can be connected to computer using USB ports

- When estimating the size of a text file each character = 1 byte.

High + low level language

- High-level languages :

- o Portable + can be used on different devices
- o Easier to read / understand cuz closer to human lang / less errors
- o Quicker to write
- o Easier to debug
- o Maintain once in use
- o Easier to learn

o IDE

- Low-level languages :

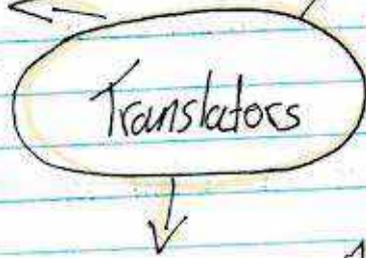
- o Machine code (1,0)
- o Closer to computer lang
- o No translation needed
- o Quicker to execute
- o Harder to debug
- o More errors

- Assembly Language

- o low-level lang
- o specific to hardware/drivers
- o Takes up little memory
- o performs task quickly
- o LDA, ADD

→ Assembler

- translates assembly lang
- translates low-lvl lang
- translates all at once
- executable file produced



→ Interpreter

- Easy debugging
- Reads lines one by one
- Portable to different devices

↘ together improve speed of development

→ Compiler

- produces an executable file
- translates all at once
- Quicker
- Difficult to debug
- 1 error can lead to many

- Syntax errors

- o if a syntax error is found the code will not be translated + a list of all the errors is produced

- Logic errors

- o if a program doesn't do what it's supposed to there's a logic error

→ IDE!! - Integrated Development Environment

- /// High level language
- /// Syntax checking
- /// Easy access to use libraries

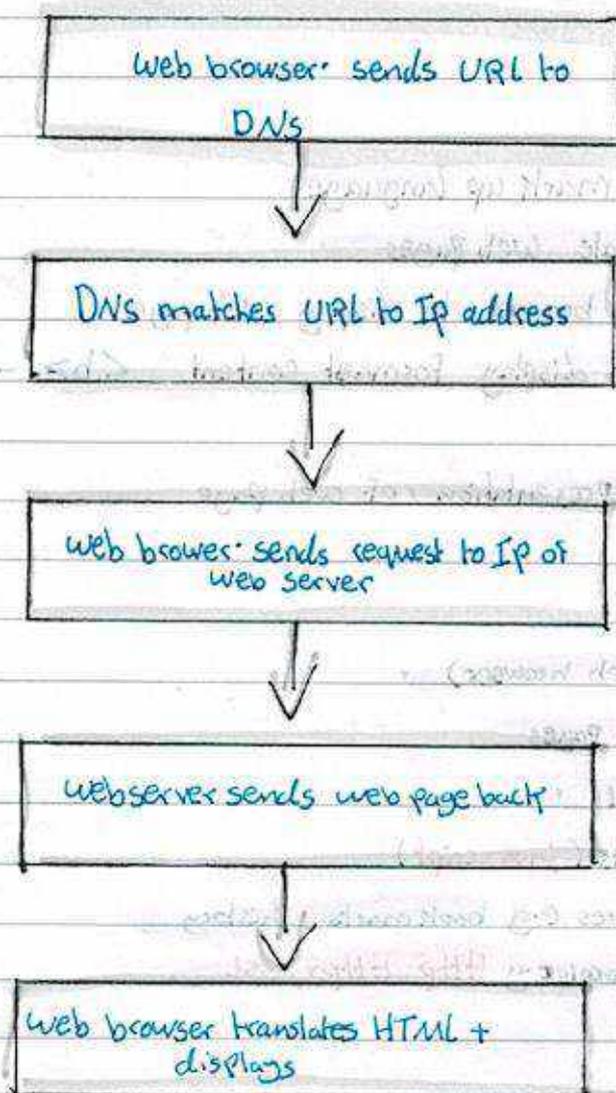
Proxy :

- Speeds things up by caching opening a website

Firewall :

- Security + rules/conditions
- Blocks malicious software

- Web browser uses URL to access web page :



DNS : Domain name system. Naming database where internet domain names are located + translated into IP addresses

open source

Shareware: Trial version of full software - use full need: payment

Freeware: Software can be copied + shared without owner permission

Free ware: ~~Free ware~~ owner still has copy right but gives away free copies.

Mac address: Not given by network - given by manufacturer.

- Unique number for device
- 48-64 bits (12-16 hexa digits)
- First 6 → 8 manufacture code
- Last 6 → 8 Device serial number

Represents physical hardware

HTML:

- Hyper text mark up language
- Used to create web pages
- Translated by browser to display web pages
- Uses tags to display format content `` - ``
- CSS
- Structure + presentation of web page

Browser (web browser)

- Displays web pages
- Translates HTML
- Translates scripts (javascript)
- provides features e.g. bookmarks, history
- identifies protocols e.g. `Http`, `Https`, `SSL`

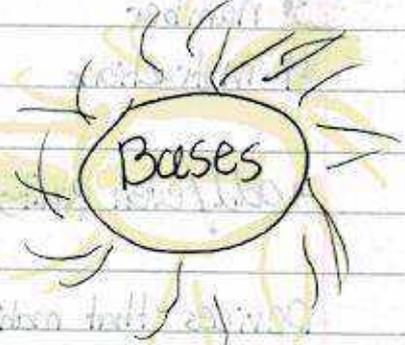
Nibble = Half a byte

4 bits = 1 Hexadecimal number

Decimal - Denary = Base 10 (0-9)

Binary = Base 2 (1, 0)

Hexadecimal = Base 16 (F6)



- 1 Byte = 8 Bits
- 1 KB = 1000 Bytes
- 1 MB = 1000 KB
- 1 GB = 1000 MB
- 1 TB = 1000 GB

o A Bitle is a digit in a Binary number

o Capacitors in Computer Circuits can't represent more than 2 states - on/off. Binary numbers are only 2 - 1/0 - which can be represented by having an electrical charge or none.

o Binary instead of Denary cus Denary requires more states and....

Decimal $\xrightarrow{\text{into}}$ Hexadecimal \Rightarrow
1 | 16 | 256

→ Protection
- Firewall:

1. Stops harmful Programs from entering Computer.
2. Stops unwanted Users from connecting to network
3. Protects Computer from internet threats.

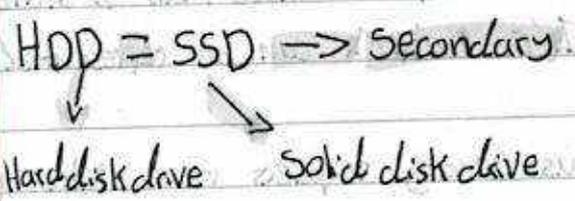
Representation/uses of Binary numbers

1. Data
2. ASCII Value
3. Number
4. instructions

- odd/even parity - validation

Devices that make use of interrupts

1. printer
2. Hard drive
3. USB
4. mouse



Why Hexadecimal is used

1. Shorter
2. easier to type
3. less likely to make mistakes
4. easier to convert
5. less space

• prevent

o Hacking:

- The act of gaining illegal access to a computer system without consent.
- Use Anti hacking software
- Firewall, Proxy servers

o Viruses:

- Program or code that duplicates itself and can delete/corrupt files or slow down/shut down a computer.
- Anti-virus software (detects, informs and doesn't allow viruses in)

o Phishing:

- A legitimate looking email is sent with a link or attachment that needs to be clicked on
- Be cautious when opening emails
- ISPs filter out phishing emails

o Pharmings

- Malicious code installed on hard drive of computer or webserver which will redirect the user to a website without consent.
- Anti spyware can detect and remove pharming
- Be alert and ~~to~~ on lookout for clues that you're being watched.

o spywares

- Software that gathers information by monitoring key presses on the keyboard, info gets sent back to owner of software.
- Anti spyware software — official testable ones—
- Mouse to ~~key~~ click keys.
- 2-step authentication.

o Ethical issues:

o Tracking:

- The act of sending illegal access to a computer system without consent.
- Use of tracking software.
- Firewall, proxy server.

o Virus:

- Program or set of instructions that can duplicate itself and can delete/corrupt files or slow down/shut down a computer.
- Anti-virus software (detects, removes and prevents other viruses).

o Spyware:

- A legitimate looking email is sent with a link or attachment that needs to be checked on.
- The recipient when clicking email.
- Type takes out identifying email.

o Adware:

- Advertisements are included on pages of computer or internet sites.
- Content the user is to interact without consent.
- Anti spyware can detect and remove spyware.
- The effect and to no look out for ones that have been infected.

o Phishing:

- Technique that gathers information by masquerading as a trustworthy entity in an electronic communication.
- This type of attack is often used to obtain sensitive information such as usernames, passwords, and credit card details.
- This is done by impersonating a trustworthy entity in an electronic communication.
- This is done by impersonating a trustworthy entity in an electronic communication.

Capacitors = store charges

- Capacitive technology:

- x Touch screen
- x Has an electric current which is on the layer above the device display.
- x When touched the human body conducts the electricity, the electric current gets interrupted when touched
- x Durable, supports multi-touch, Accurate compared to resistive, can't be used with gloves on, Expensive to manufacture.

- Lossy compression → lossless compression is the opposite.

x A method of Reducing things to a smaller size by removing irrelevant or less important details.

Images

- o Reduce resolution
- o Reduce number of colours or pixels

Video

- o Reduce resolution
- o Reduce frame rate
- o Shorten the video

Audio

- o Reduce frequencies
- o Shorten the audio

→ you lose data that you can't return

- Fire wall:

- x Protection - security devices for your device/internet from cyber attacks.
- x Filters the network traffic and sees what's allowed and not to get into your device/network

1. Primary = Immediate - Ram/Rom

2. Secondary = slower - SSD/HDD

3. offline = DVD/Ram