0:09

okay welcome guys

0:14

today we are going to do the first lecture of our interesting class culture

0:21

of science and computation in this class we are going to examine

0:27

the historical uh developments in the computation

0:33

and problems that are

0:42

solvable by computers such as economics problems

0:50

scientific problems astronomical problems biological problems

0:56

structural engineering civil engineering problems accounting banking finance

1:04

so the the purpose of the course is to introduce you

1:09

uh the use of computing in various areas of the life and what are we going to do with our

1:17

computation and we will try to understand

1:24

the perspective of the computing as a whole from the top that's

1:30

what we are going to do through the semester and sometimes we will be inviting

1:35

invited lecturers uh maybe a few times from the industry so

1:41

that you can get some understanding about what they are doing

1:46

in real life feel free to write the chat box so that i can reply or

1:54

comment or you can only write comment as well so i don't have to reply

2:04

so there are some uh

2:10

issues and the you have some future courses that you are going to take the

2:15

idea is to plan your future correctly so that

2:21

you will be successful and in order to do that most people believe

2:26

it is very nice to understand the past and the mistakes done in the past so

2:33

that we don't make those mistakes second time or we extract information from the

2:40

past knowledge that's how we build up information so either positive or negative

2:48

information helps you to organize your future

2:55

it is sometimes difficult i will start this lecture by giving

3:01

examples from the history with with the false

3:06

projections made by famous people one of them is

3:13

since the planning is difficult uh

3:19

i think there is a world market for at least at most five computers uh

3:25

that is uh that sentence is set by chairman of ibm thomas watson in 1943 he

3:33

said at most five computers can be sufficient for the world

3:40

all the world market obviously it was one later

3:45

second one in 1949

3:51

computers in the future may weigh no more than 1.5 tons

3:57

so they say there will be lightweight computers and so

4:04

maximum 1.5 tons so it is very interesting as well

4:14

um this is a very interesting

4:20

false command the chairman editor of prentice hall in 1950

4:29

1957 he said i have traveled the length and bread of

4:35

this country meaning the united states and talk with the best people i can assure you that the data processing data

4:43

processing is a fad that won't last out for a year so

4:49

he says it's a fashion for that year and that fashion

4:55

named as data processing fashion will die away in a year so no more than a

5:02

year people will forget data processing that's what he said

5:07

as an editor of the book company i didn't want to

5:13

accept books in data processing for publishing that was an excuse

5:22

digital equipment corporation which is very famous uh which has been very famous in mainframes and many mini computers mini

5:29

means a little bit smaller than mainframes but bigger than

5:35

personal computers he said there is no reason for anyone would want a computer at their home so

5:42

no need for home computers they said it was after one year after first apple computer

5:49

was built said in 1977 that was one of the computers deck

5:56

tech wax that was mini mainframe built by

6:02

digital on the right side

6:08

and famous bill gates uh when he was young in 1981

6:15

uh when ms dos was first came out

6:20

he said uh 64k ought to be enough for anybody

6:25

in one lecture in one talk company talk uh obviously

6:32

he was wrong but over the years we suffered a lot from the intel 64k architecture barrier

6:41

lately it is no more an issue

6:54

more interesting notes knowledge beatles

6:59

was uh bits were rejected

7:04

by the recording company which is very famous deca a recording company

7:10

they said they don't like their music and guitar music is on the way out

7:15

so they said guitar is quickly

7:21

dying out fashion and [Music] guitar music is has no

7:28

future that's what they said in 62 so they don't accept it and that was

7:35

beatles so the motivation is

7:42

history of computers uh let's let's talk about history of computers

7:47

uh so that it can help you to understand where we are

7:55

now and keep in mind that the this history of computer thing

8:02

is only for this lecture the first week

8:07

uh in the coming weeks uh we will not be

8:13

going through history of computing but we will be discussing different subjects

8:20

of computation obviously they may they may include

8:28

historical information as well but that won't be

8:34

similar to history of science or history of computation that will be different

8:42

so famous computers uh

8:48

how about the early days let's go about birthdays um

8:55

on the on the left uh we have we are seeing two different

9:00

abacus versions one of them is chinese one of them is

9:06

japanese

9:13

at the top area of each abacus is used for fives one hand or two hand so it's basically

9:21

started from the hands uh bottom area is used for one so it is

9:28

started from the hand analogy it's one two three four one one end and it is on

9:35

the other side another on the other side so uh

9:42

upper side is for hands lower side is for fingers so that's how

9:48

they made analogy with the hand calculation to the

9:53

uh device and it is like having how many

9:59

it is like having like 10 or so people

10:05

using fingers together and

10:11

yeah from that's from the book and it says 1998

10:18

written in the abacus as the digits

10:28

abacus is still used in some areas today

10:33

because people are used to it in japan schools have abacus

10:40

contests abacus use contests for gaming or for festival thing

10:47

you have tons of calculations to be done by the abacus and children are

10:54

using abacus to solve it it is very fast and it's also it also

11:00

helps you to visualize the quantities and much better so

11:06

it is it's much better for your brain and in japanese

11:11

abacus festivals what i have seen is they use abacus without abacus so

11:19

they use their fingers they memorize all the table

11:27

they simulate the abacus function the children

11:33

in their head without abacus presence but that's also

11:39

possible in some societies it's still basic computation

11:45

there are videos on the youtube

11:51

where you can see obviously being used in on the market

11:56

by the people

12:06

second interesting devices

12:11

slide rule uh slide rule uh was very famous until i

12:17

was a student uh in 1980s people have been using it in 1970s it was being used

12:24

and it is used for multiplication division roots

12:30

algorithms and trigonometry

12:35

it is based on the original work of the napier

12:42

and the basic principle of this slide rule is

12:49

logarithm turns multiplication into addition

12:54

division into subtraction subtraction is

13:02

mapped to sliding the number axis

13:08

so if you can subtract and add multiple things together on top of each other

13:13

uh you can do multiplication and division and using taylor expansion

13:19

again with the tables with the table uh

13:27

with the linearization not the trailer expansion you can find logarithms and trigrammatical

13:36

functions using the slide rule you can compute actually

13:41

the original idea is to convert

13:49

higher degree functions using logarithm to addition i did additive

13:54

operations it was an engineering tool

14:00

for years for tens of years in the world

14:05

all kinds of engineering and accounting areas

14:13

were using this as the as a calculator

14:18

actually some people preferred it over the calculator up over the electronic calculator because

14:25

they said it is more reliable they see what they are doing as they are doing

14:34

this is one advertisement uh this is one advertisement

14:41

having a computer by ibm having a computer means

14:47

150 extra engineers so by the engineer

14:54

the advertisement cons contains slide rules

15:00

slide rules sliders so each engineer is symbolized with the slide rule because the computation was

15:06

done with the slide rule

15:11

after 1970s a electronic scientific calculator that

15:16

can take sine cosine logarithm etc uh mate

15:22

made this obsolete

15:37

but the original calculator calculator

15:42

when we go back 16 20 3

15:48

shift card calculator shikhart made a calculator like

15:54

like the one in the picture

16:02

it was able to make simple calculations using

16:08

mechanical using mechanical interaction

16:15

until trees after three centuries

16:23

then it is rediscovered in 1957. so it was an original idea

16:31

but has no impact in development of the recent calculators it's a historical

16:37

information pascal has famous

16:42

pascaline device shown below the pascal the famous pascal

16:50

he worked in the device for three years between 1643

16:56

1642 and 1645 three years and the device

17:02

is a mechanical calculator it is it looks like it is

17:07

similar to 20th century mechanical calculators it

17:13

can add and subtract by rotation of the knobs so it is possible to make addition and

17:20

subtraction this is the close-up

17:27

this is the close-up of the machine and these are the displays and this is input and these are

17:34

outputs so you can make addition and subtraction

17:42

using this machine

17:49

basically the slide rule is mechanized so mechanical slide rules

17:57

same principle apply with the mechanics as well with this slide rule

18:03

you do it manually and you look at it in detail

18:13

leibniz german philosopher and mathematician as he was working on addition and

18:19

additional multiplication using pascal's calculator he was the first one to describe the

18:26

pinwheel calculator in 1685. so that's before

18:32

french revolution and invented the labels wheel used in the arithmometer arithmeometer

18:39

i don't know what this the first mass produced mechanical calculator

18:44

so add subtract add in this way

18:49

subtract in this way change digit add subtract change digit add subtract

18:58

labels was also famous for the

19:03

improvement in the binary number system which is the foundation of all digital

19:09

computation today so it's before french revolution german

19:19

this is interesting

19:26

jacquard uh 1752 1834 so it is

19:34

during the revolution uh it's it played an important role in the

19:41

development of the earliest programmable law law means documentation

19:48

loom which in turn played an important role in the development of other programmable machines such as computers

19:54

so i have a video of this it had

19:59

>> Jacquard loom video (22 şubattaki derste, önemli bir ara izle)

used punch cards to control

20:05

the development of

20:10

the fabric later uh charles babbage

20:17

had one of these pictures of this loom and charles babbage

20:24

who invented analytical engine charles babbage

20:33

had some influence from this jose maria charles jacquard

20:40

jacquard loom device and i have the image for that i have the video for that

20:47

hope it works if you don't hear sound let me know if you hear sound

20:54

sound is okay please write sound is okay [Music]

21:00

can you hear sound okay

21:10

this is a mechanical jacquard loom this technology was developed in france in

21:16

1803 by a weaver named joseph maurizio card

21:21

the key thing about this loom is that it controls every warp thread the threads that go

21:27

from the front to the back of the loom individually because it can do that the loom can

21:34

create very complex fancy patterns in the cloth more quickly and with greater

21:40

accuracy than the technology available before this loom was developed

21:46

these cards are what carry the instructions that are read by the apparatus on the

21:52

second floor that tells the loom what pattern to create

21:57

the holes in the cards are read by a series of pins up in the apparatus and

22:03

those tell the apparatus which threads down here should be raised for each pass of

22:09

my shuttle across the war some of you might recognize these cards

22:16

as looking similar to computer punch cards back in the early days of computer

22:21

technology punch cards carried instructions that told the early computers what kind of

22:29

calculations to do so this loom is the great great great grandfather of

22:35

the computer technology that we all use today and that technology started with a machine that produces

22:43

cloth [Music]

22:56

[Music]

23:02

so as you see from here there are punch cards that control

23:11

the fabric pattern it controls the

23:18

looms and so that you don't have to memorize how to make

23:25

the pattern it is automatically done by anybody it is it can be operated by

23:33

anybody who can push and pull the

23:39

device later this enabled this kind of approach enabled

23:45

automated powered machines that

23:52

produce those fabrics with the patterns on it piece of pins up in the apparatus

24:01

okay so

24:08

a french inventor uh an entrepreneur best known for designing

24:14

patenting and manufacturing first commercially successful make a successful mechanical calculator that's

24:21

what i have said before uh arithmetic

24:27

arrhythmia uh was manufactured from 1851 to 1915.

24:33

[Music] during that time there were about 5 000

24:38

machines 75 years it is 75 years there were about 5 000 machines built

24:45

built during that time so it is arithmetic eventually about 20 european companies

24:51

built clones of the arithmeometer until the beginning of world war ii so arithmetic is

24:57

very uh famous device

25:06

invented by a french invented charles savier thomas de calmer

25:20

babbage who had the idea of jacquard loom

25:28

talk about something programmable something programmable something something

25:33

that executes not programmable but executes a predefined program some device

25:39

that can execute a program and the programs are all those cards cards are programs so it

25:46

can process those cards invented

25:51

difference engine and analytical engine difference engine and analytical engine

26:01

and that was the actually first proper analytical engine actually first proper

26:12

model of the computer analytical engine is later implemented

26:18

because it was too hard to implement later implemented difference engine was

26:23

also making some computation and i have the video for you and difference engine

26:30

babbage couldn't finish it in his lifetime his son finished it

26:37

probably they were rich or had enough money for building those kind of things or some

26:45

having some grant from the rich so they were able to make

26:50

the difference engine after it's that and the analytical engine was also

26:56

done later an analytical engine can be simulated in animations i've seen certain videos

27:04

who is done as graduation projects so people can make a analytical

27:10

can simulate analytical engine as animation animation projects

27:16

so it is basically a mechanical mechanical fixed code

27:21

microprocessor

27:27

anything you see in microprocessors actually can be

27:32

implemented mechanically the problem is

27:37

it will be expensive it will require energy and it will

27:43

create errors it will stick etc so you need to have

27:49

oil in certain places so it has to be very precise and expensive

27:54

in the early days they did they did it there were computational devices like that but

28:02

later everything is electronic

28:08

this is the difference engine difference engine was never fully built

28:13

babbage drove up on blueprints drawings for it while still an undergrad in

28:19

cambridge university in england so but while while it was in process of being

28:25

manufactured he got better idea and left the work of a

28:31

difference engine and he moved to the analytical engine

28:41

analytical engine uh later built

28:46

completely by shoots george

28:52

and edward schutz based on the charles babbage design

28:58

and there was a film footage also existing

29:04

about the machine made by george and edward schwartz

29:10

there are also later machines built by other enthusiasts

29:17

to replicate the famous machine

29:24

let's see how it looks like

>> Difference and Analytical Engines video var izle (22 şubat dersinde)

29:40

charles babbage was the only child of a tyrannical london banker a bully at home

29:45

but his money kept his son and heir financially comfortable for life cambridge educated in mathematics and

29:52

supremely self-possessed charles became an iconoclastic writer and habitual inventor

29:58

in 1832 the drawing room of his london home became a showcase for demonstrations of a small section of his

30:05

difference engine a far from finished device by which he intended to revolutionize calculation

30:12

by mechanizing it at his soirees london's intellectual

30:17

society watched what you see now as babbage cranked its handle

30:22

this machine produced a series of polynomial calculations that were repeatable and error-free

30:29

most astonishing it was automatic any of his illustrious guests might have

30:35

operated the handle as well as charles babbage perhaps the geologist charles lyle

30:41

or charles darwin or charles dickens

30:46

once set the machine seemed able to proceed to think on its own

30:53

but what was called the beautiful fragment of the machine babbage had intended to build

30:59

was all he ever finished of it in fact his imagination had already

31:05

moved on to an even more ambitious mechanism one that would make obsolete the

31:11

abandoned machine the analytical engine would be a general

31:16

purpose calculating automaton for most of 30 years he would revise and

31:23

improve his notional design only a few partial sections of it were built

31:28

this one after babbage's death by his son the analytical engine was an

31:35

ever-evolving machine each breakthrough elegantly drawn up annotated to describe mechanical motions

31:42

with a coding system that babbage claimed was his finest invention

31:48

the analytical engine may be the most intricate operating mechanism ever fully realized with paper and imagination

31:55

alone in 1846 babbage abruptly changed course

32:02

as if determined to make good on an old obligation he worked for two years to complete a full set of drawings for

32:08

difference engine number two it would require 8 000 parts only a

32:14

third as many as the first he offered it to the government but did

32:19

not protest when it declined to build it and the drawings were carefully put away

32:25

eventually they came from the babbage estate to rest in the library of the science museum in london

32:35

more than 130 years later in 1985 the museum's new curator of computing

32:42

doran suede became convinced the institution could build difference engine number two

32:48

after all with the intact drawings it seemed feasible and within financial reach

32:54

it took 17 years and drama to rival babbages so long ago

33:02

and it works just as babbage designed it

33:07

every turn of the engine's driving handle is carried through gears rods levers and springs to release and

33:15

arrest precisely aligned number wheels a helical arrangement of steel fingers

33:21

continually pulls the register towers to find and perform the carrying of tens

33:29

in its continuing sweep upward it is mesmerizing [Music]

33:38

the intricate printing section can be programmed for one two or three column output for two font sizes at once for

33:45

variable margins and column gaps even word wrap where necessary it prints hard copy on paper and

33:52

simultaneously impresses the same output into a tray of plaster to produce a stereotype

33:59

a mold for casting a full page printing plate when a tray is full the printer pauses

34:07

the entire machine in the spring of 2008 a clone of de2

34:14

commissioned by nathan mirwald was completed at the science museum and shipped to california

34:21

at the computer history museum it would charm new thousands of discerning eyes

34:26

today the crotchety proud genius who never managed to prove it during his lifetime has a fair claim to honor as a

34:34

pioneer in the history of intelligent machines justice's parlor guests in 1832

34:40

suggested his difference engine continues to inspire the admiration of his

34:45

intellectual heirs a celebrated and unique icon to chroniclers of computing

34:53

charles babbage remember never saw it except in his stubborn prescient dreams

35:06

okay

35:17

so how was it it's a big

35:24

mechanical device so as i said many things uh many many calculations

35:32

that we do today the registers binary numbers decimal numbers whatever

35:38

can be implemented mechanically the only problem is to the mechanical power and the

35:45

cost for fabrication as you said even with today's

35:52

standards it took 17 years to build it the replication

35:57

the museum of course the lady ada

36:04

was the helper of charles babbage

36:09

she documented the work of the babbage and it wasn't she was an assistant

36:18

so we know babbage through ada

36:25

and ada wrote the programs to be run on babbage's analytical machine

36:30

so what made her the first computer programmer but since

36:39

since the machine was not built during the babbage's time ada was

36:45

unable to see the output of the programs so

36:50

there was a there were programs written fixed programs written but not

36:59

executed in the lifetime the programs were like a jacquard bloom

37:06

fabric machine viewing machine different cards different cards each

37:14

card contain commands and a series of cards will execute certain

37:20

operation on the data

37:27

then then electron mechanical

37:32

things came up the electromechanical things are

37:38

somewhat improved version of analytical engine the old mechanical

37:46

pascaline and the arithmeometer

37:52

adding changing digits subtracting

37:59

shifting multiplication and then shifting back so multiplication

38:04

division addition and subtraction can be done by this machine quite easily

38:14

if you are interested more there are a lot of videos to teach how to use it

38:21

and but basically it is the

38:27

shift of digit that makes the difference

38:35

for example when you are multiplying

38:40

55 by 67

38:46

one idea is you add

38:52

you add 55 67 times

38:57

if you rotate 67 times and if you have a display

39:02

up here containing one two three four if you have a

39:08

revolutionary counter if you rotate it 67 times and write

39:14

51 here the result will show at the end

39:21

55 times 55 times 67 the result will show that

39:27

right if you rotate 67 times but

39:33

when you want to do things a little bit faster the decimal point shifting

39:40

is important when you shift decimal point

39:45

instead of 60 times

39:50

you rotate six times then you rotate back

39:56

shift back seven more so what 10 20 30 40 50 60

40:05

shift one two three four five six seven so that makes 67

40:12

that's why long multiplications such as

40:21

is somewhat easy because you start with this rotate six times

40:27

then shift again rotate seven times shift again rotate four times shift again

40:33

rotate two times and then it is finished it is similar to what we

40:39

do in the paper and pencil calculations

40:47

when you are multiplication when you are doing multiplication two times one two times five

40:53

two times four eight two times three six and then four times

40:58

one four so you shift right and then you add so

41:05

this shift is implemented mechanically

41:10

also in the babbage's analytical engine so mechanical shifting

41:16

is done the level acts on another part of the system

41:25

that makes you a mechanical calculator and the famous budget

41:30

facet calculators

41:36

used until 1980s

41:42

because people consider those were very safe because they are

41:48

doing it manually there is no possibility of having an error

41:54

they were trustable machines at the beginning electronic calculators

42:00

were expensive in the government offices etc everywhere those facet machines were

42:05

used when i was when i was in high school for example

42:10

they were in news in 19 early 1980s

42:18

more computer-like operation was invented by

42:24

hollywood hollywood is a genius guy statistics

42:44

hollywood was working in ibm

42:52

working sunday

43:01

um

43:13

there was no ibm i'm sorry

43:19

he his company was the origin of the ibm that's how we

43:27

say that in 1880s in 1889

43:36

they were making uh

43:41

population counting and other census counting operations in united states successful census counting

43:48

how many people what is the education etc so hollywood

43:55

in 1880 census took seven years to be processed so it took seven years to

44:00

process all the data coming from different cities hollywood

44:05

deduced that the next census would take longer than 10 years because they were asking more questions

44:10

in the senses in the counting

44:16

so he invented a machine he made a machine

44:22

to make operations quicker and automated so he invented the census counting

44:29

machine which i have next slide this was the hollywood tabulator

44:38

it could be german or german origin because the name is

44:43

hermann but in united states

44:50

the sciences counting tabulator was the information was coming and as cards

44:57

like punched cards and the punch card was placed in the

45:02

machine when you push the arm down

45:08

the punch card is read taken in information is taken in and

45:17

counting values the correct counting values

45:23

whatever it is i don't know is updated so the information storage is

45:28

updated uh when the card is read from the machine so this is

45:35

this image is original photograph when the machine was in use

45:46

it was very successful it was very very successful

45:54

and the this was the original punch card for the whole tabulator

46:02

and that is actually the origin of the ibm part punch card this is ibm punch card

46:08

using a card to contain a certain piece of information

46:13

it goes back actually to jacquard and charles by budget etc but this type of

46:19

card containing information and the machine readable

46:25

operation the cars that are not connected with wires

46:31

charles babbage's machine is like jacquard fabric machine

46:37

the cars were connected by wires in this one

46:43

because it was mechanical to too mechanical these in these cars are separate

46:48

and there is a card reader and this one was card reading was done manually later

46:54

in the ibm card reading was automated

47:01

so previous one was seven years but

47:06

1890 census took just three months to process even though quite a bit my data was correct than

47:14

ever before so it was really fast operation compared to the previous

47:22

census in the united states

47:28

this company a holistic company a tabulating machine company

47:37

became computer tabulating recording company in 1913 before world war one

47:45

and after merging with another company that produced a similar product computer

47:52

tabulating and recording company and then in 1924

47:59

the company was renamed as international business machines so these

48:05

were the original logos and this is the first logo of the ibm

48:11

then 1956 and 1972 logos of the

48:18

international business missions so origin of the ibm therefore goes back to hollywood

48:24

u.s census counting machine card reader

48:33

germans didn't stop uh during those times

48:38

conrad to say i have covered this

48:44

a little while ago in the previous lectures i think

48:59

he was a statistical guy again with another task

49:05

and he went to

49:11

military and military said german government said

49:18

it is not more important such computer is not more important so

49:23

we don't have money for that that is what he got as an answer obviously it was

49:29

very incorrect it was very wrong

49:36

to say died very in late time in 1995

49:42

so uh on the internet there are very a lot of

49:48

resources containing conduct conrad

49:54

which is very nice and he made a complete

50:01

computing machine program called and data were stored on punch cards

50:06

punch film not cards like cinema film so

50:11

but punched still with the holes on it

50:18

this was an electrical electrical machine not mechanical

50:23

it's an electromechanical combination with relays etc so the relay

50:28

was significant in these machines

50:36

on the same in the same years those relays were also used in

50:41

telephone exchanges telephone exchanges were very complicated with relays and

50:46

electromechanical devices selecting the target subscriber

50:52

so that kind of mechanism was a start-up point for some certain

50:59

inventors of this kind

51:07

i can

51:14

i can was supported by

51:20

government and ibm to [Music]

51:28

build mark computer one mark one harvard mark one and it has

51:34

again mechanical switches really flops back and forth to represent mathematical data so there are relays

51:42

mechanical relays again inspired by telephone exchanges telephone exchange

51:49

is a big computer but it's not programmable it is fixed programmable so

51:54

people are interacting with it to select destination the original

51:59

crossbar exchange it's electromechanical device but computer

52:06

inspirations came through those electro-mechanical devices

52:12

this mark 1 weighed 25 tons with 500 miles of wiring

52:20

it's like big telephone exchange and intelligent telephonic telephone exchange center

52:28

hardwood mark 1.

52:34

another piece of

52:40

information here grace hopper

52:48

this picture is uh

52:55

this picture is in our laboratory in the kuwait laboratory

53:00

we prepared it there so she has the image

53:07

as one of the pioneers of

53:12

computer science and engineering she was in the navy she was one of the first programmers and

53:19

developed the first compiler before

53:25

all programs were written in the machine code

53:31

but she developed a language so that language can be translated into

53:40

uh a machine code so

53:46

we can say that she is the mother of the compilers [Music]

53:52

the language she concept she invented later

53:57

turned into the computer language named as kabul

54:04

here she with the president ronald reagan during that time

54:10

she died recently a few years ago

54:17

president obama gave a president

54:22

to present to her a medal freedom medal to her

54:27

but i think she was unable to come and somebody else

54:33

came to pick up the medal

54:38

so mother of thee not father but mother of the compilers

54:50

okay also

54:57

she is the one who found the bug in the program

55:02

actually this is the report original report and the bug itself

55:08

that they extracted from the machine relate to panel f

55:14

the bug is in the relay so the relay is not working and the program is therefore not working

55:22

started the cosine tape scientific started the other test and then

55:28

there is a bug in the relay this one is considered as a first bug

55:34

found in a computer program so by

55:40

by again by grace hopper

55:48

this was mark one uh it was 25 tons also so it's a big

55:56

telephone exchange electromechanical computer very expensive room a lot of electricity

56:04

and heat but it was working so it's a bigger version of electrical version of

56:11

the relay version of the charles babbage machine charles babbage machine was completely

56:17

mechanical but these were electromechanical meaning that there are relays small relays and

56:23

rotating rotating motors positioning motors so that you

56:29

can select different target target values

56:37

for binary operation relay is sufficient

56:43

but for decimal computers you need to be able to represent zero one two three four five six seven

56:49

eight nine then next digit zero five zero to nine next digit zero to nine

56:56

next digit therefore you see a lot of rotating [Music]

57:02

wheels and numbers in the charles babbage's machine because that was

57:07

decimal that wasn't binary

57:12

the in the binary the code may be binary but operation numbers in the registers were

57:20

stored as numbers also in mechanical calculators they are not binary they are decimals so

57:27

each disk each disk contains 10 numbers

57:32

rather than two numbers but with the with these ones with when you use relays it is on and off

57:44

through the vacuum tubes this was your exam question it replaced

57:50

electromechanical relays but they were unreliable

57:57

and they were costly and unreliable but very fast much much faster than

58:03

relays

58:12

with the anyak 1946 17 tubes

58:18

and every two days one tube was failing which was not significant actually

58:25

uh it took 15 minutes to locate and replace so

58:31

that kind of reliability was achieved in 1946

58:39

so let's come back to touring died in 54

58:45

early in early age english mathematician during the war time he was influential in the

58:51

development of computer science by formalizing the concept of the algorithm and

58:57

computation and the famous tooling machine and tooling test

59:02

and with the role of the creation of the modern computer is

59:08

widely considered as a father of the computer science uh not the father of the computer father

59:14

of the computer is the charles babbage father of the computer science is alan turing

59:20

and also the artificial intelligence he was

59:32

during the second world war the germans on the right writing the code

59:37

uh made he made a major contribution to the development of sophisticated computed machine called colossus

59:44

and by british who was used to help crack the codes of the german enigma machine enigma machine

59:51

is on the right the enigma machine was an electromechanical machine used for encryption of decryption of secret

59:57

messages it is basically the

1:00:03

private key private key symmetric

1:00:09

cryptography today since it is since it is based on private

1:00:15

key and private algorithm in both sides encryption and decryption is relatively

1:00:21

straightforward but decryption without private key is very difficult so that's how

1:00:28

alan turing was done was doing with the colossus

1:00:35

touring's world touring's work helped allied code breakers to decrypt the vast number of messages that had been encoded

1:00:42

using enigma the intelligence that's gathered from this resource was

1:00:48

very important in the winning the war second world war

1:00:55

against germans

1:01:01

this was the machine colossus [Music]

1:01:07

mark 1 and 10 mark 2 was

1:01:13

built first one started running in february 1944 so it is very end

1:01:20

at the very end of the uh at the very end of the

1:01:30

war mark one the first version contained 105

1:01:36

1500 electronic valves mark ii had

1:01:41

2412 and it was five times faster than the first one so

1:01:47

version two was much better than version one

1:01:53

alan turing had personal problems uh due to his gender preference

1:02:02

he was an athlete a world class marathon runner

1:02:12

he got prosecuted due to

1:02:19

gender preferences and got

1:02:25

treated medically and he died in 54 several weeks before

1:02:31

his 42nd birthday from

1:02:37

poisoning

1:02:46

either either by suicide or by killing probably it was

1:02:51

suicide then later in the 2009

1:02:58

british government made an official apology from the alan turing

1:03:05

about how they treated him by conviction conviction

1:03:14

due to homosexuality

1:03:23

let's go back to united states and this is from the anyak

1:03:30

from university of pennsylvania in again in the

1:03:35

war time anyaqua is designed to calculate filing tables for the us army

1:03:42

so what is the angle of the projectile what should be the angle of

1:03:48

the projectile to hit a certain target under certain conditions etc that kind of calculation

1:03:56

when any aqua's announced in 1946

1:04:01

it was uh very uh

1:04:06

famous in the in the world giant brain

1:04:13

so brain machine etc giant brains

1:04:18

it was a thousand times faster than electromechanical calculators which was

1:04:25

which was like mark one mark one harvard mark one was electromechanical

1:04:31

but anyak was so fast thousand times faster because there were no electromechanical parts no relays etc

1:04:40

so inventors of the enact promoted and spread the new technologies through series of lectures and construction of

1:04:46

uh electronic digital computers in the university of pennsylvania in 1946

1:04:53

the

1:04:58

and yak was very big 17 000 wipes

1:05:04

5 million hand shoulder joints 30 tons and took up 167 meters square so it's

1:05:13

very big input was possible from an ibm card reader

1:05:18

an ibm card punch was used for the output so card input and card output

1:05:24

these cards could be used to produce printed output offline using an ibm accounting machine so cards

1:05:32

were put into card printing machine and then human

1:05:37

readable form can also be taken by a printing machine

1:05:46

reprogramming a task of programming after anyak was very difficult because it required cable

1:05:52

connections after the program was figured out on the paper the process of getting program into anyak was

1:05:58

manipulating the switches and cables it took the several days

1:06:05

that was after period of verification and debugging and controlling

1:06:12

then using the using the aniak one newman uh

1:06:18

came up during the manhattan project here we see

1:06:25

richard feynman ulan

1:06:30

and ulav and von neumann this guy is von neumann

1:06:38

in a manhattan project a toy

1:06:46

he came up an idea of using part of the internal memory to

1:06:53

store the program inside the computer so before one newman

1:06:58

program was something like hardwired and something predefined and must be configured

1:07:06

but what newman said we have the memory why don't we use the memory to store the

1:07:13

program so that was the memory concept of the one

1:07:18

new one and then he got very successful and the architecture today we use

1:07:24

is called as one newman architecture where we store program and data in the

1:07:31

same memory

1:07:37

between aniak and in the iowa state university

1:07:43

there was a scandal atanosov and bailly

1:07:50

professors atonosov and berry from iowa state university made a different computer actually

1:07:58

any aquas actually designed based on the information that

1:08:04

is taken by taken from the atlas of computer so uh

1:08:14

until 1972 there was an injustice uh when honeywell

1:08:21

the company honeywell for atanosov and

1:08:28

sperry rand which was holding the accurate and mostly patent

1:08:35

and after the anyak so eniac turned into sperry computers

1:08:42

atonosov turned into honeywell competing

1:08:47

they got to court and then the injustice was rectified

1:08:55

and atonosphembery were credited credited as the first inventor of the electronic digital

1:09:01

computer not a therefore first digital computer is not enyak

1:09:11

atanosov and berry

1:09:18

which is then

1:09:25

turned into honeywell

1:09:32

honeywell was still producing computing devices computers

1:09:38

when i was in university uh i think

1:09:44

coach holding was selling honeywell computers for some time

1:09:50

then honeywell closed the mainframe division

1:09:56

today honeywell is a technology company and working for

1:10:01

aviation military and

1:10:08

a controlled automation technologies it's very

1:10:13

and runs very is no more

1:10:18

selling machines

1:10:25

this was a tunnel softberry computer

1:10:31

it's the famous one so it's an electronic computer and

1:10:38

etc so there are mechanical parts but data data processing is electronic

1:10:45

with the with the tubes

1:10:52

these are the tubes small tubes you'll see

1:10:58

on screen input and output is done by cards and

1:11:03

yeah cards

1:11:12

later i'm going to be quick uh later uh

1:11:20

edsak as made by uk people er it is it was inspired by one newman's

1:11:28

ideas and the first practical stored program

1:11:34

stored program electronic computer so you store your program in the memory and

1:11:40

press the start button then it is executed so program is not

1:11:46

hardwire hardwired edsak first program was run on 1949.

1:11:55

okay then

1:12:01

transistor came up with the transistor these are the guys

1:12:07

who invented transistors bardin bretton and shockley and in bell

1:12:14

laboratories [Music] instead of tubes people started using

1:12:20

transistors and that that

1:12:26

increased the speed reduced the current and the power consumption

1:12:32

miniaturized everything significantly and also increase the reliability

1:12:39

some magazine these electronics magazines

1:12:45

called the device as crystal triode because tryout was tube

1:12:52

tube with three the same function same functional tube is called as triode and

1:12:58

crystal triad means there are no tubes but only silicon

1:13:03

then it's crystals tryout

1:13:09

so what was it what was the first thing done with transistor

1:13:15

a hearing aid hearing aid was the first thing that was done with transistor low power low

1:13:22

power and small then the pocket radio

1:13:31

then a computer obviously who is paying more money army army is paying more money

1:13:38

and airplane computer was done because it was not heavy

1:13:43

uh so b52 plane this is still big plane bombarding plane

1:13:49

uh this tradic transistorized airborne digital

1:13:54

computer was made using made and completed in 1954

1:14:01

within the plane this is the

1:14:07

picture of the plane and this is the opened gate with the

1:14:15

with the same device on it on the on the board

1:14:24

in 5th 1950s there were univac ibm and borrows there were three

1:14:30

companies who were making electronic computers they were making a lot of money and the

1:14:36

computers were very expensive hard drive hard drive was not possible and

1:14:44

random access memory was not available random access memory was

1:14:49

[Music]

1:14:54

these are the memory drums they were random access memories so it

1:15:00

was rotating very fast you can read and write from disk

1:15:05

so that was used as temporary memory not hard drive

1:15:12

magnetic drive but magnetic disk but used for

1:15:17

ram run the max's memory

1:15:26

then in the fifth 1951 uh again counting census bro uh accepted delivery

1:15:33

of the first newer computer remington rat became the first american manufacturer to

1:15:42

manufacture a commercial computer for companies so in the

1:15:48

business use not government or not only government or army

1:15:54

so remington rent was first company to deliver a competing machine

1:16:00

for companies

1:16:06

first non-governmental contract was general electric's appliance park in

1:16:13

kentucky

1:16:19

one year after univac was used to predict

1:16:24

elections regular polls

1:16:31

predicted stevenson will win univac

1:16:37

univac predicted eisenhower will win

1:16:42

and at the end eisenhower won and i universe was right that was very

1:16:50

important in the history because computer was right regular method was

1:16:55

wrong and the comp tvs and all the public opinion changed

1:17:01

and this new technology and new tools

1:17:06

and computer importance of the computer is accepted by the public

1:17:13

after this election issue

1:17:22

in the popular culture in those years 1950s univac named univac was

1:17:30

used significantly for for a computer

1:17:36

it says our newer computer has screened applications

1:17:42

so in

1:17:55

in newspapers comic books included started to include

1:18:02

the word computer and univac together

1:18:12

since uh 1955

1:18:18

programming languages fortran kobold uh

1:18:29

became widespread throughout the world and the producers were very big machines were

1:18:35

expensive they were getting smaller and with the

1:18:40

transistors they will be becoming more reliable after 1955

1:18:46

second generation so these are among those

1:18:52

ibm 1401 ibm 1401 is binary coded decimal

1:18:58

not exactly binary so binary coded decimal there is no

1:19:04

a to f hexadecimal letters you have binary zero

1:19:09

zero zero zero zero zero zero one zero zero zero zero

1:19:15

one zero one no zero

1:19:23

zero one so this is nine right this is zero after then

1:19:28

it goes back to zero so no more numbers so some digits are

1:19:34

wasted but that is what binary coded decimal is

1:19:41

borrows was also producing similar machines

1:19:48

in 1956 ibm 305 was a first commercial computer that used hard drive which was

1:19:55

five megabytes of hard drive this is the hard drive is

1:20:00

putting in the airplane for shipment and the ramak actually

1:20:07

is was the acronym for random access methods for accounting and control

1:20:13

so ceramic random access the word the random access was used and

1:20:20

this is the control room for ibm 305

1:20:30

then space race began and nasa was

1:20:36

in the play nasa spent billions of dollars to miniaturize the computers

1:20:43

first integrated circuits were manufactured so integrated circuit

1:20:50

idea came up then third generation of computers came up

1:20:58

this is 3 370 ibm

1:21:07

so that's the third generation competing with the magnetic tapes etc

1:21:14

and when we are doing programming in 1960s and 70s people were

1:21:21

there you see there are no computers

1:21:27

you have flowchart ruler and flowchart symbols so you generate

1:21:33

flowchart so it is so important even today it is so important to analyze the problem

1:21:40

and convert that into a computer program so that was the ibm programmer

1:21:50

data entry was done through not only by cards but only by

1:21:57

papers papers were also uh like jacquard long

1:22:03

papers paper tapes were also used these paper tapes later turned into

1:22:10

magnetic tapes data storage was

1:22:17

implemented with the disk uh 30 megabyte disk 1966

1:22:24

it was so heavy but that was it

1:22:30

more expensive hard drives in 1980 one gigabyte hard drive 250 kilograms and

1:22:36

eight thousand dollars this was the this was the hard drive uh manufacturing

1:22:41

place of the ibm so it had to be clean no dust

1:22:47

during the manufacturing

1:22:53

why do we have mainframes mainframes evolved even today we use

1:22:58

mainframes because central computation power is required

1:23:06

sometimes when we have client server computations today

1:23:11

since network is sufficient enough uh [Music]

1:23:16

it might be wise to use centralized very high power computational device because

1:23:22

data is stored there so banks

1:23:28

research research companies research centers

1:23:34

government and make big hospitals and accounting

1:23:39

things require mainframe computing so personal computing is only for some certain

1:23:46

things but if the data is big and if there is intelligence prediction is required

1:23:53

big intelligence is required artificial intelligence is required significant powers when significant

1:24:00

power is required still we need very powerful machines more much more powerful powerful machines is required

1:24:08

in future with the deep learning algorithms

1:24:14

becoming popular we need more powerful machines and one example is

1:24:20

ibm mainframe series these are

1:24:26

modern versions of the old mainframes ibm z15

1:24:31

and ibm tillium these are the new ones

1:24:37

so these are the new looking mainframes so when you go to the banks

1:24:42

big data centers when you talk about mainframes these are the mainframes they are basically cabinets

1:24:52

they are basically cabinets

1:24:58

and the power is

1:25:04

what happened

1:25:17

what happened next slide

1:25:26

[Music]

1:25:38

okay it the new the new

1:25:59

this

1:26:04

these tell you mainframes have 256 cores

1:26:10

on 32 cpus and they work at five gigahertz so it is combined it combines

1:26:16

multiple cores into into single chip and has

1:26:21

many of those chips in the same enclosure

1:26:27

we have a short one-minute video on this [Music]

>> IBM Telum Mainframes videosu var izle (22 şubattaki dersin videosunda)

1:26:35

the teleprocessor's ai capabilities have been specifically designed for low-latency real-time ai so that it can

1:26:41

be embedded in transaction workloads to you as a consumer that might for example mean that a model to predict

1:26:49

credit card fraud can be applied in a way that the fraud gets detected in time

1:26:54

before the transaction even completes the chip contains eight processor cores running at more than five gigahertz the

1:27:01

processor cores are what's executing the actual program and then each processor core is connected to a 32 megabyte

1:27:08

private level 2 cache which contains the data so that the programs can get to the

1:27:13

data they need to operate on very quickly all the caches are connected with the ring think of this as a data highway

1:27:20

along which we can send the data between the different caches when different programs need to communicate with each

1:27:25

other and that way we build up a 256 megabyte cache for the entire chip holding a lot of data for all these

1:27:32

programs executing on these cores the ai accelerator has its own

1:27:37

entry and exit to the data highway so that it can get to the data in the caches perform the ai operation that's

1:27:44

necessary and then put the result back onto that entry to the highway put it back into the cache so that when the

1:27:50

program continues using the ai result that result is right there in the cache and readily accessible by the core

1:27:58

up till now there are chips that are dedicated to ai and there are server processors that run enterprise workloads

1:28:04

like databases and transactions the talent chip brings those capabilities together to enable our clients to embed

1:28:11

ai directly into their transaction workload

1:28:17

[Music]

1:28:23

[Applause] [Music]

1:28:29

obviously a mainframe

1:28:36

has multiples

1:28:42

of these chips and

1:28:48

vast amount of

1:28:54

storage uh the price of price of z15

1:29:02

mainframe it starts from 200 000 dollars

1:29:11

and goes up depending on the configuration depending on the configuration it goes

1:29:17

up so if you have any questions let me know

1:29:30

do you have any questions

1:29:37

okay let me stop recording maybe you have questions without recording