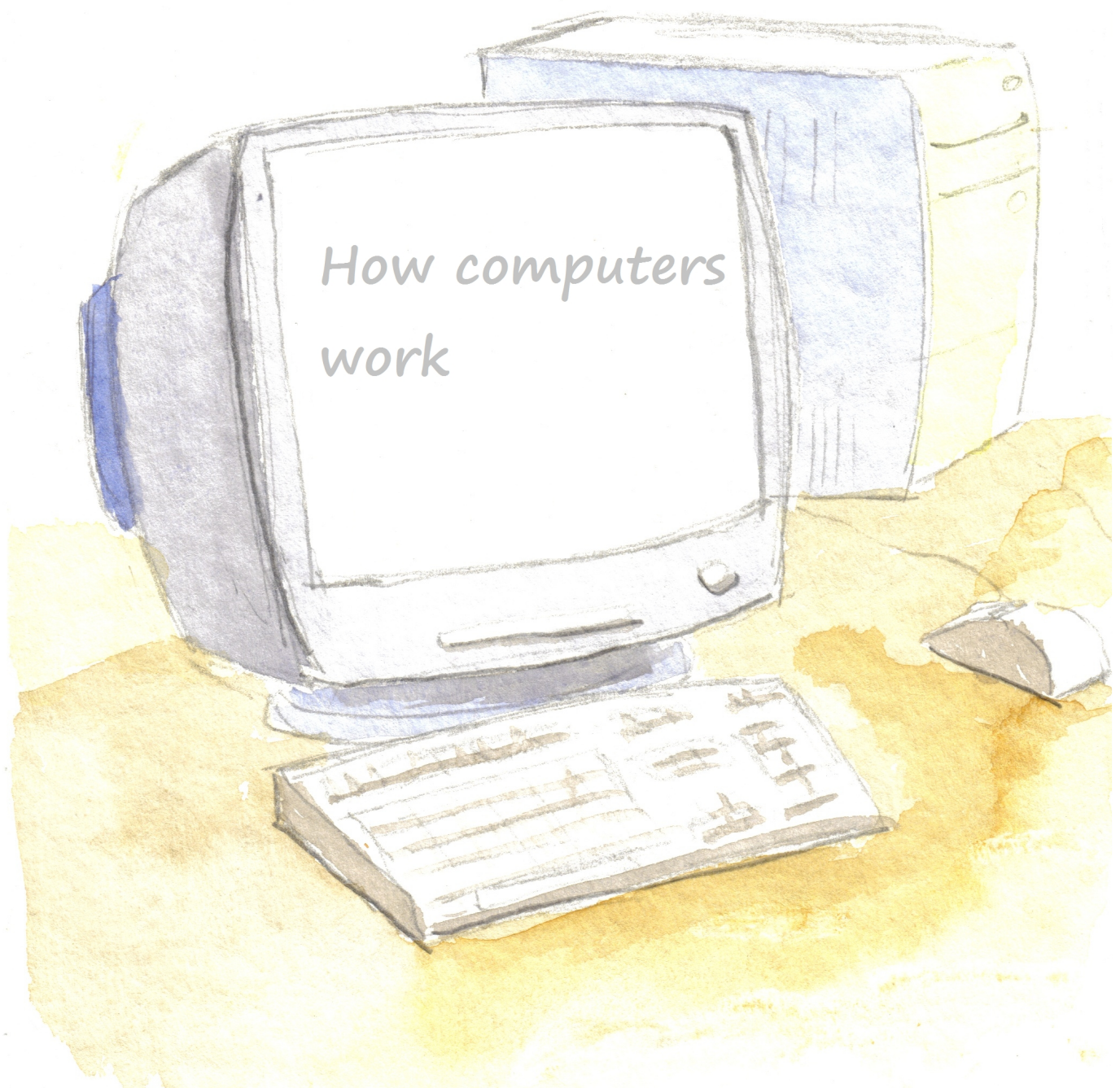


How computers work



Cecilia Ingard

Boksidan

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Translated from Swedish to English, by Google translator and Gunnar Björing.

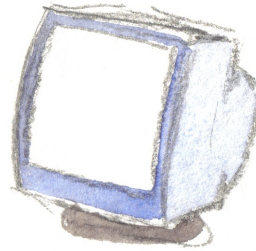
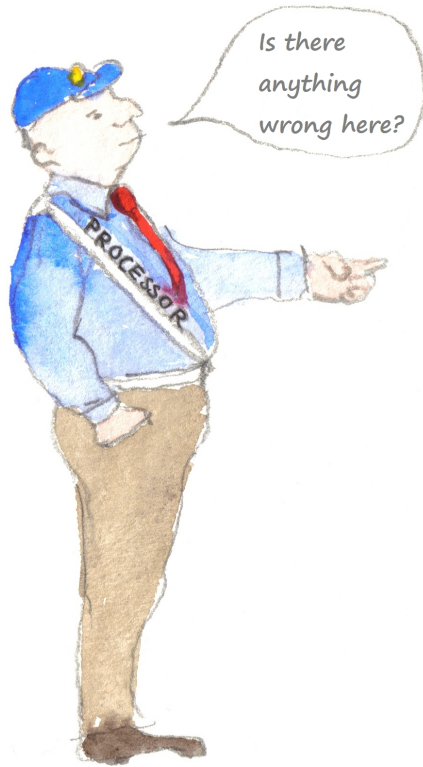
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How computers work, ISBN: 978-91-88109-17-0

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What happens when the computer starts

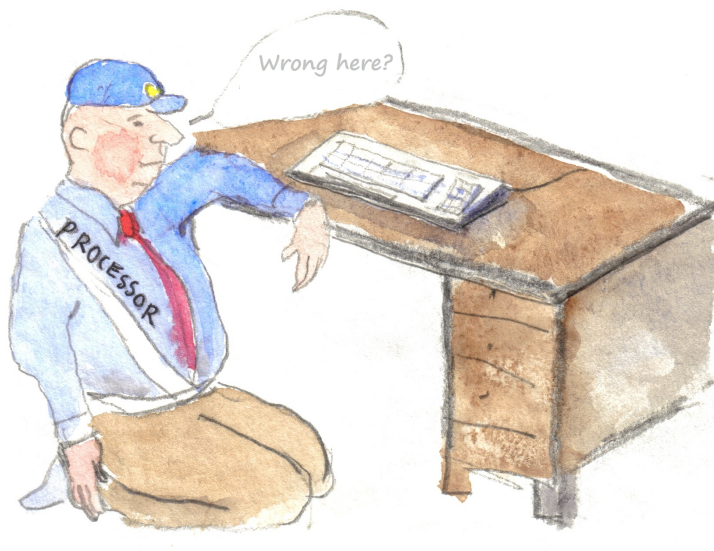
When you start the computer, it appears at first as if nothing happens. But in fact it is the processor checks that everything works.



It checks the screen,

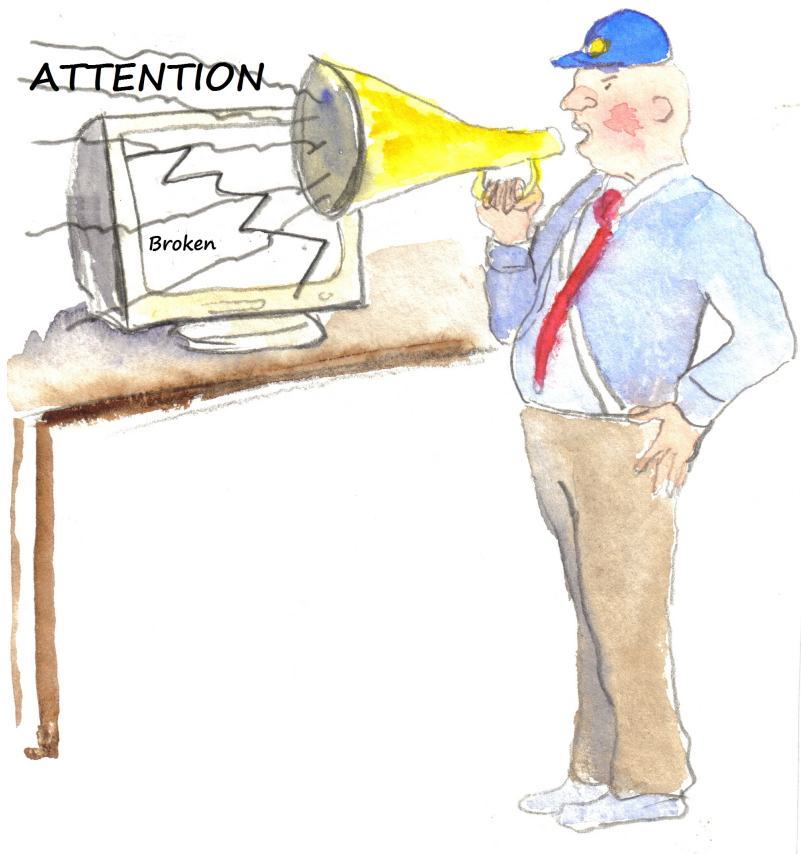
the hard disk,





The key board and other things.

Would it find anything wrong, you will see a message on the screen.



Would it be something wrong with the screen, the processor sends out a beep instead.

The check is always done according to the same schedule.



The schedule is stored in a location where it can't disappear and where the processor can always find it, when it starts. The location is in a thing called the BIOS.

The processor then checks if the things that it found the same things as usual. It does this by looking at a place called CMOS.

Billboard CMOS



CMOS is a memory circuit that keeps track of what parts are in your computer.

If the processor finds something that do not match whit what it usually finds, it sends a text to the screen.



The text then often says that the parts do not match, and a special program called "setup" must be run to correct the error.

When the check is finished, it says in the BIOS that the processor shall search for a file with instructions about how to start the operating system.



First the processor check if there is a floppy disk with such a file in the disk drive. Afterwards it checks the hard drive.

Most often the processor will find the operating system start-up file on the hard disk.



When the processor located the file, it moves the file to a place where it can read the instructions.

That place is called RAM.



Then, the processor reads the file and follows the instructions.

The file describes for the processor where it can find the rest of the files belonging to the operating system.

The operating system is required for the processor to find the files and programs you want.

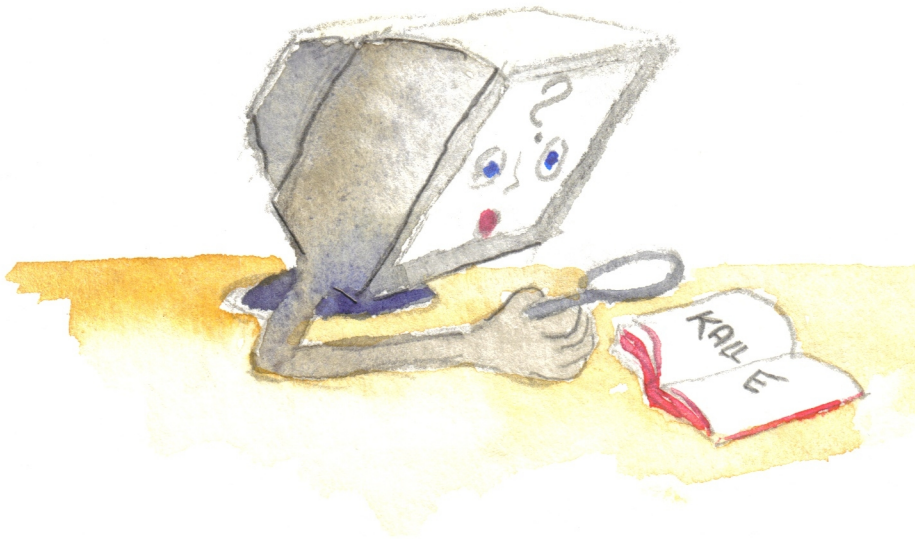
The operating system also creates the image that you see when the start procedure is over.



The image is called the desktop.

How does a computer see our letters?

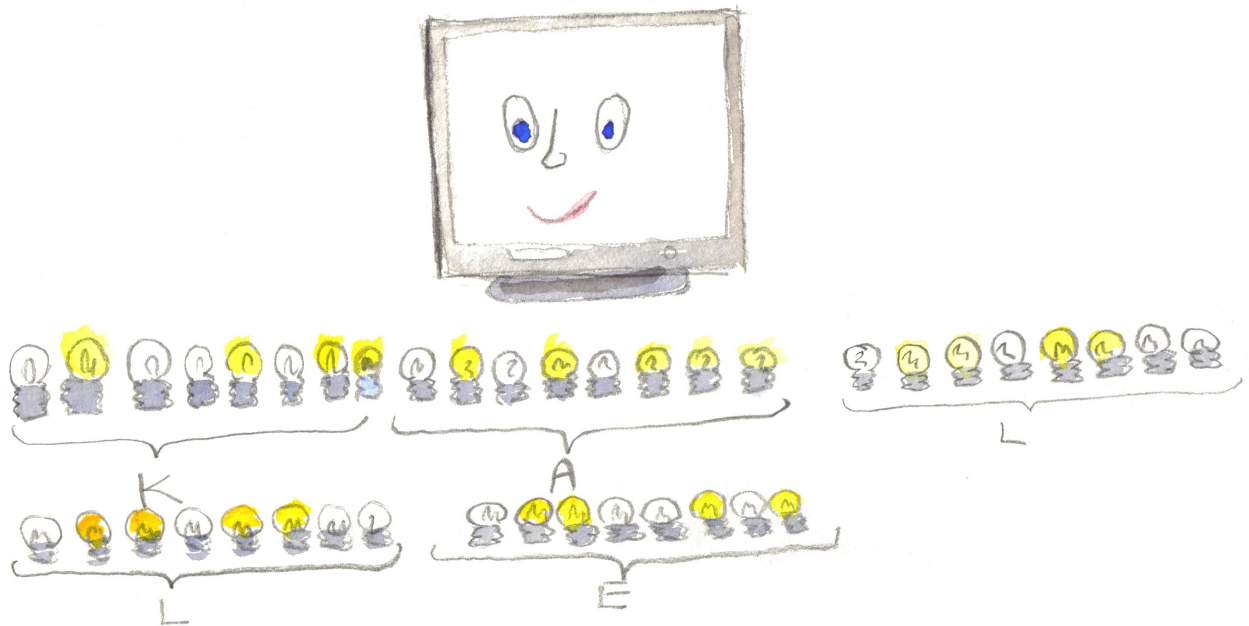
A



computer can not see. It can just feel the difference of two things: if there is voltage (usually 5 Volt) or no voltage (0 Volt). One can compare it with that the computer can only see if a lamp is off or on.

But that will not get us very far.

But if you put eight lights in a row and decide that all every letter has its own combination of lit and unlit lamps.



These combinations are called bytes and the eight "lights" are called bits.

The part of the computer that does the "thinking" is called the processor or the CPU. You can read more about that later in this chapter.

What happens when you write a letter

Many people write important letters using their computer.



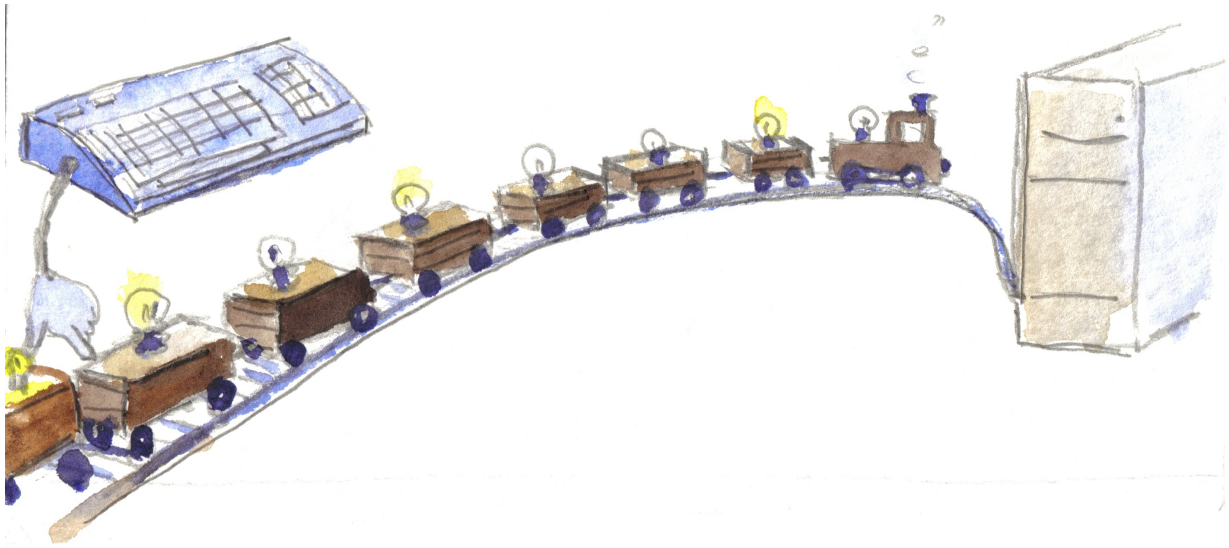
But even in a computer words can be spelled wrong.

Luckily, Kalle saw that the letter was misspelled. He then took away the e and changed it to an a

Then happened all of this inside his computer.

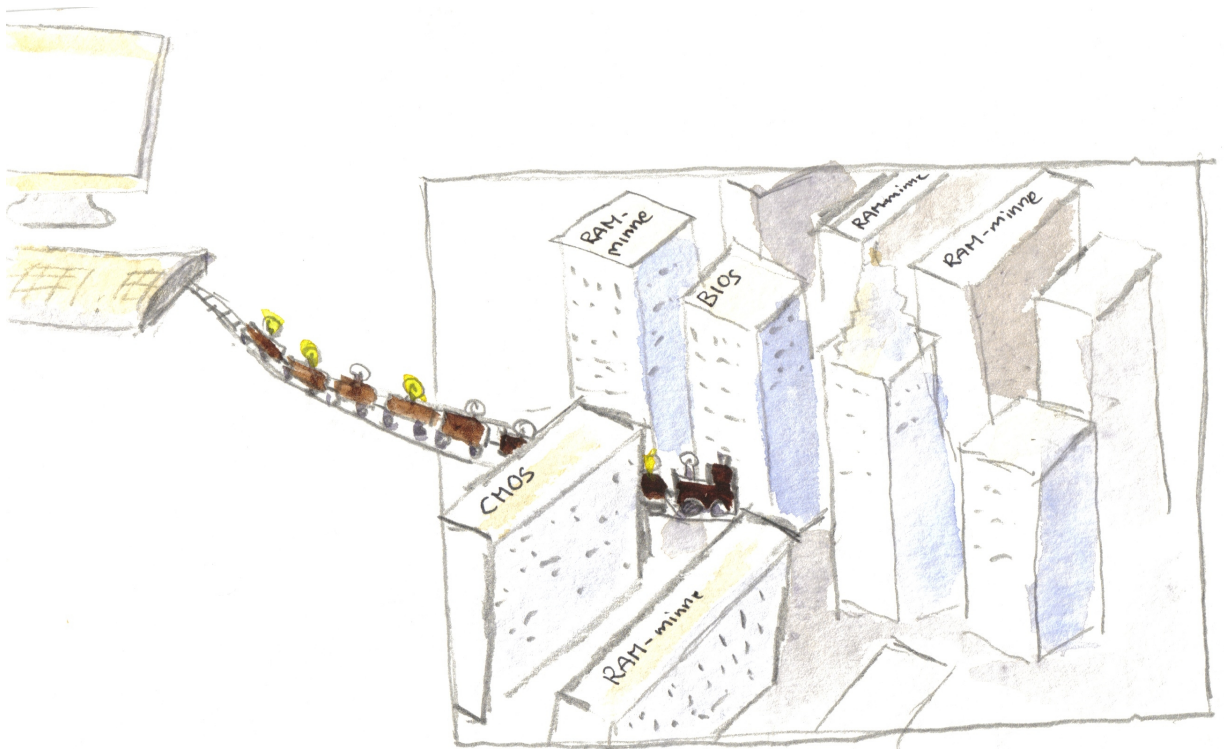


When the a-key was pressed voltage could pass through the power switch located under the key.



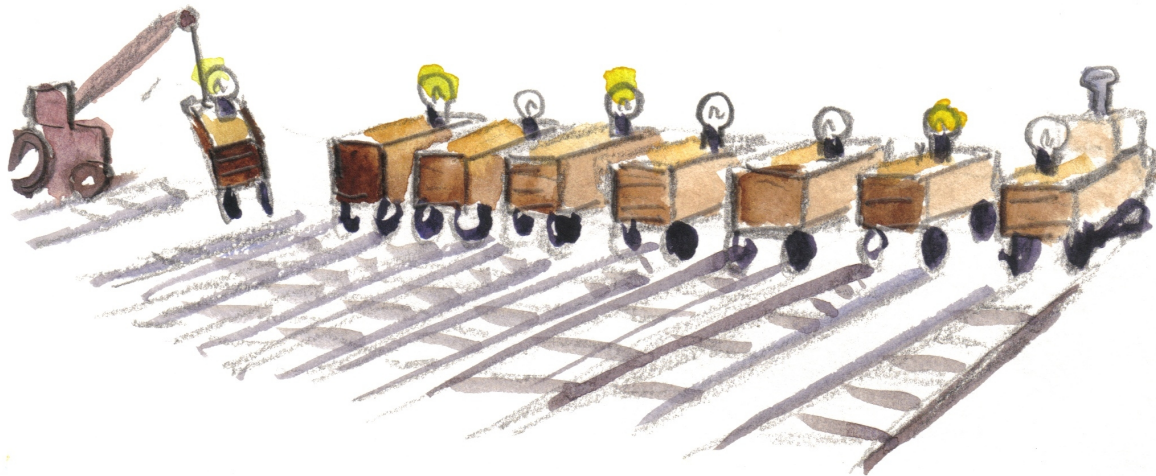
And it created a signal, a particular byte, that means the letter a.

A byte is like a train with eight cars.



The train runs into the computer case to a circuit board with a lot of electronics. The board looks something like a city in a small scale.

The board is called the motherboard.



The train stops at the BIOS. In the BIOS the train switches so that all cars instead can travel side by side. This means that every train will arrive faster.

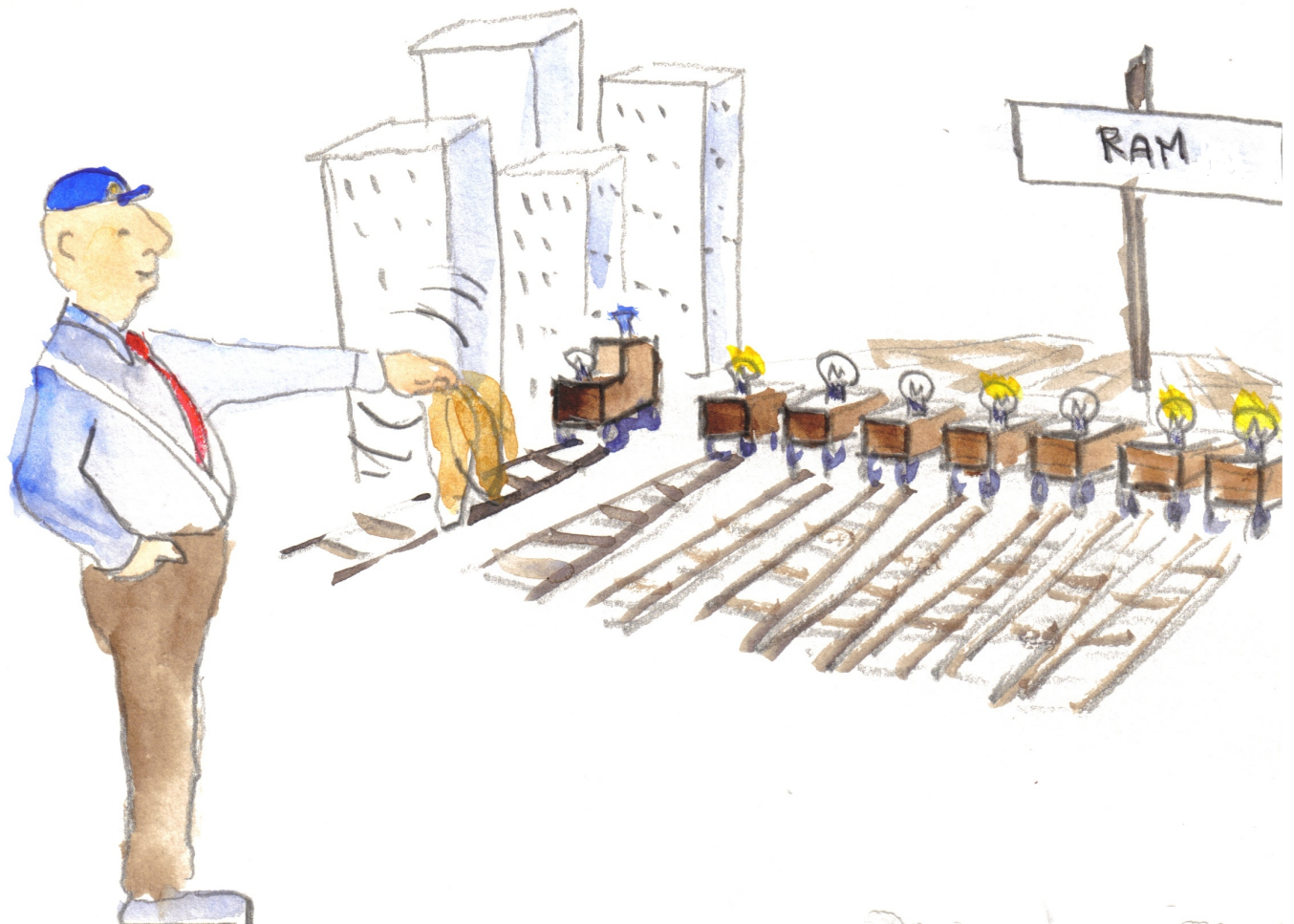
The places where cars are next to each other are called the bus.

While the train is switched in the BIOS, it also sends a signal in a cable that goes to a particular input to the processor.

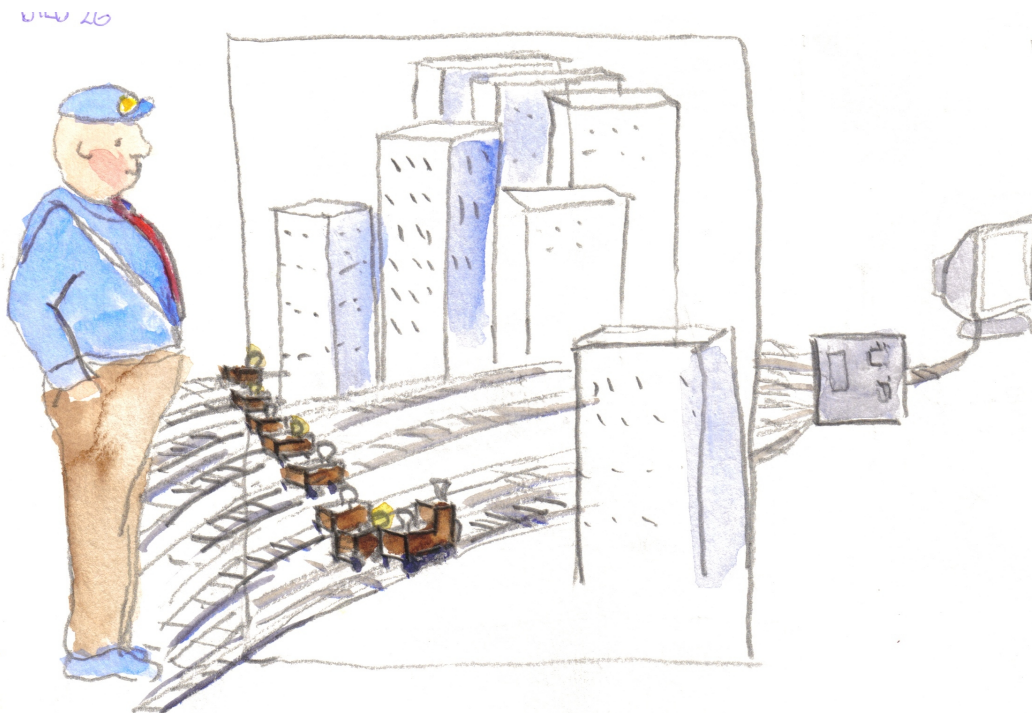


When the signal arrives to input of the processor, it knows that there will soon be a train on the bus from the BIOS.

The processor prepares to receive the train.



The processor then sends the letter to the RAM, and the screen card.



The screen card sends the train on to the screen.



The "a" pops up on the screen and Kalle is happy. Therefore, he gives the processor orders to print the letter on his printer.

So the processor moves one letter at a time from the RAM to the printer.

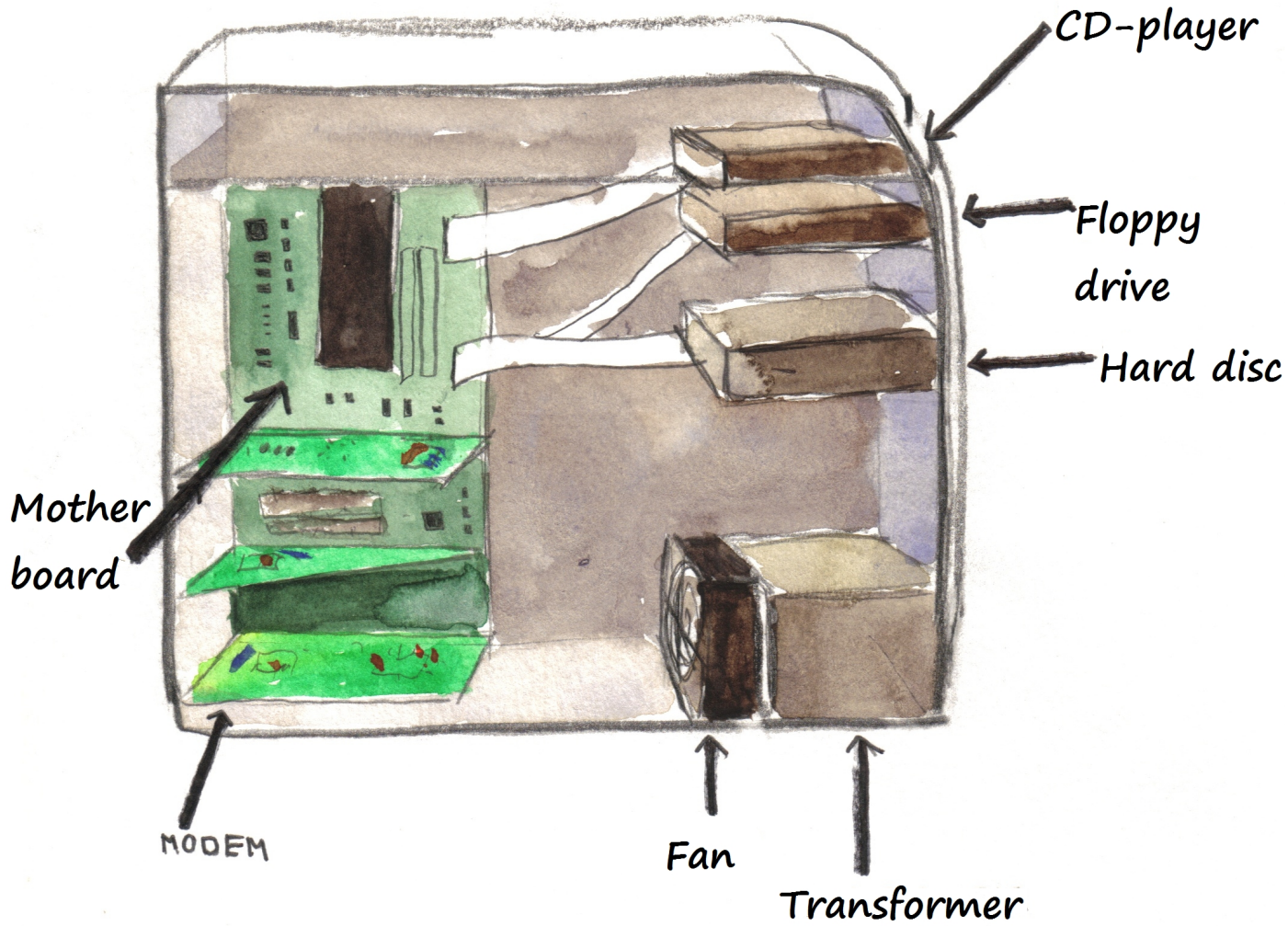


Finally gives Kalle the processor orders to save the letter on the hard drive, it may well be needed again.

This the processor does through by moving one letter at a time from the RAM to the hard drive.

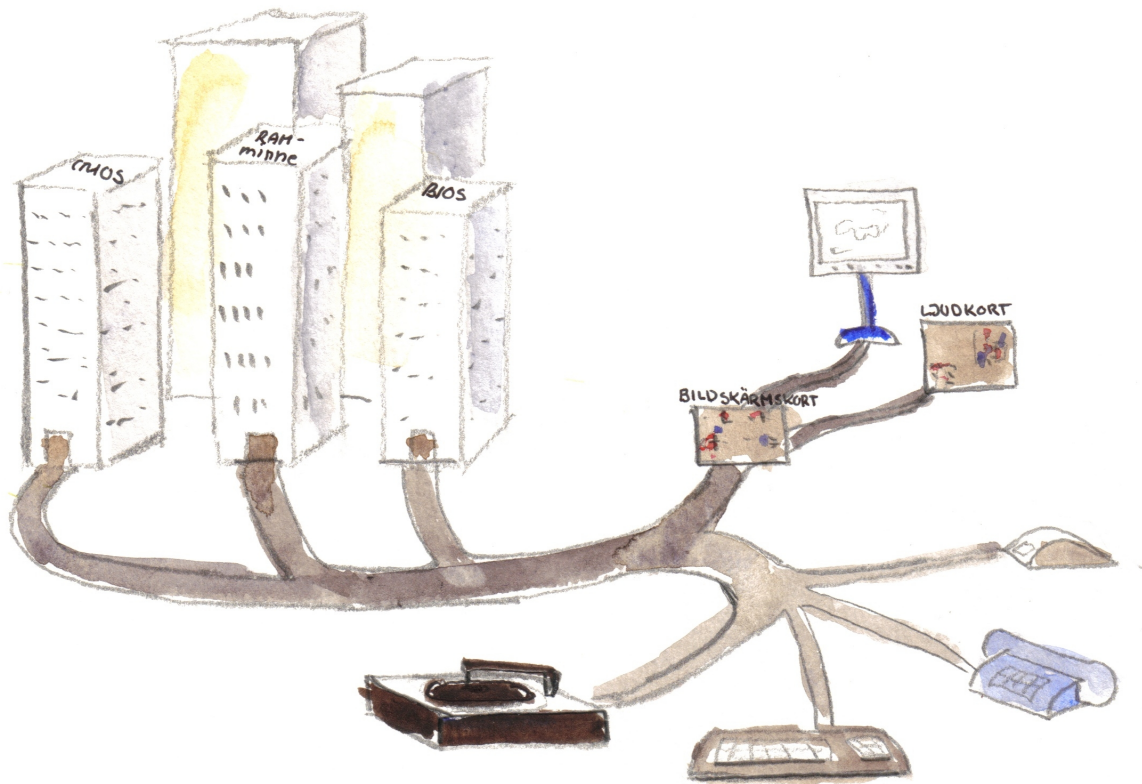
Inside the computer case

Inside the computer case, there is a fan, a transformer, a motherboard, a video card, a floppy drive, one or more hard discs and usually a CD player. Between these things, there are cables.



The motherboard

The motherboard is the processor, BIOS, CMOS and RAM. There are also a lot of terminals.



In some of the terminals there are flat cables called buses. Buses are coming from the hard drive, CD drive and floppy disk drive.

In other there are cables from the keyboard and the printer.

In still other terminals are cables to different extra cards, sound cards, video cards and modem cards.

Processor

The processor can only do very simple things. It can also only do one thing at a time. What makes it all go so fast, is that it makes every thing tremendously fast.

The processor contains foremost: bus connections, clock, instruction decoder, caches and registers, and the ALU and real numbers processor.



Bus terminals are gates opening when the processor wants to drop off a train to any other device in the computer.

The clock keeps time on what is done in the processor. At any rate makes the processor a thing. Instruction reading programs that are currently running.

Cache memory and **registers** are different types of memories that keep track of important things, such as what will happen next.

ALU and **real numbers processor** are calculators that are so simple that they can only add. All other mathematics, the computer must use programs to manage.

RAM

If the RAM is 128 MB, it means that the data train can stay on 128 000 000 stations to pick up or drop a byte.

The processor controls that the train arrives at the right station through shifting gears. The gears are controlled through the address line. At each station there is a place for each coach to pick up or drop a bit.



Each slot at each station consists of one transistor and one capacitor. Transistors are switches that switch in train carriages so that they can pick up or drop cargo to the capacitors. The capacitors are like boxes that you can put tension in, much like a rechargeable battery. But capacitors discharge much faster than a battery. Therefore, the computer is constantly feeding them with 5 volts, otherwise the voltage drop and the RAM is empty.

Hard drive, floppy drive and CD player



The hard drive and the disk drive stores all bits on magnetic disks. The magnetic disks are full of posts where the processor can put bits. Each station has eight slots. Each slot can be either magnetic or not magnetic. The processor can change from one to the other by means of electric magnets.

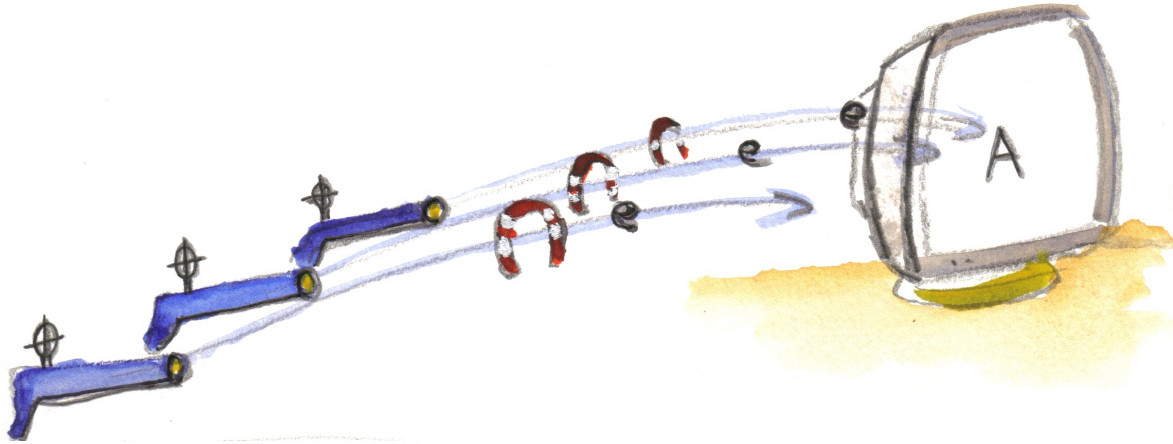
CDs also have a lot of stations. But the slots in the stations are either pits or no pits. After you have decided that a place to be pit or no pit, you can not change. The Cd-player sees if there is no pit or pit by means of a laser light that illuminates the plate.



Outside the computer case

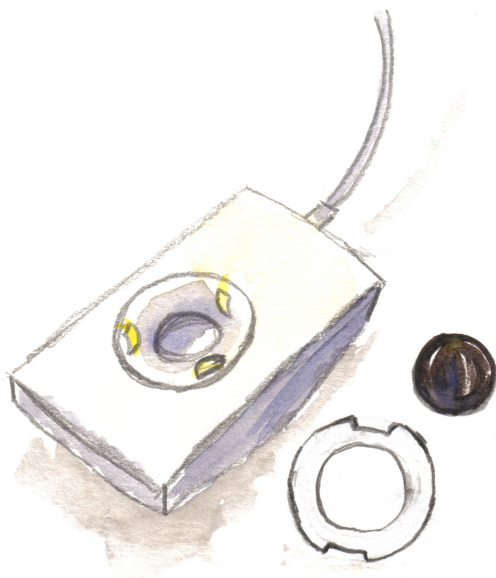
Screen

Almost at the back of the monitor there are three electrode guns. These guns send electrons toward the inside of the screen surface. Where there is phosphorus. When an electron hits the phosphor, it becomes a bright spot that shines for a little while. It shines as long as it is needed for the electron beams to shoot at every spot on the inside of the Monitor and then come back.



One gun sends electrons forming red, the second green, and the third yellow colour. These three colours are then mixed inside the screen surface to a spot that has the right colour. The direction of the electron beams is controlled with electro magnets which are mounted between the guns and the screen. By just start some of the electric magnets the electron beams turns in the right direction for the moment..

Mouse



If you look under the mouse you will see that there is a ball in it. The ball rolls when you move the mouse. If you open the cover mounted above the ball, you'll see that there are three wheels in there.

These wheels spin when the ball rolls. The wheels have sensors that detect in which direction and how fast they are spinning. The processor translates the information from the wheels and transfers it to the screen.

Computer words

BIOS is an acronym for expression: Basic Input/Output System. It is the part of the motherboard that contains information about what the processor should do right after the computer restarts. In addition, it receives information from the keyboard and mouse.

Mb is an abbreviation for Megabytes. One byte is one symbol and the symbols are those you see on your keyboard. If it says 100 Mb on a memory disk, it means that it can store one hundred million symbols.

MHz is an abbreviation for Megahertz. A processor has to work at a certain pace. Megahertz is a measurement of how many beats the processor clock strikes during one second. If it says 900 MHz on the computer, it means that as the clock strikes 900 million times per second.

RAM is an abbreviation for the expression: Random Access Memory, which stands for that that the processor reaches all stations as fast. Unlike, for example, the hard disc where it takes longer time to access data that is far from the reading head. RAM is the place where the processor place programs and files that it is working with.