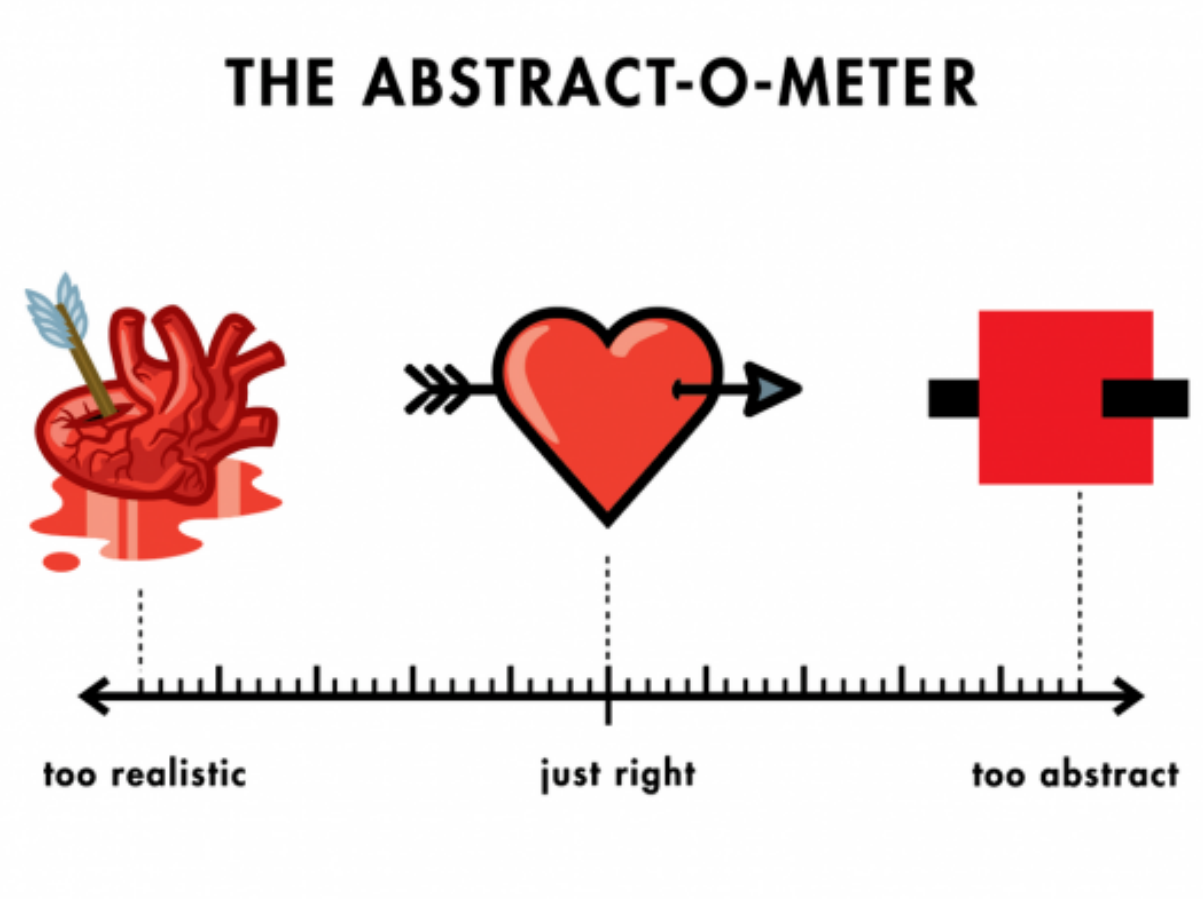
# ABSTRACTION

HIDING COMPLEXITY




As a kid you would often ask questions that sound something like “How does this work?” In IT we often don’t ask that question because we don't care how it works, only that it does. But sometimes it helps us to do our job better if we understand computers on user level, as well as on the bits and bytes level. In this chapter, we explain why it is important to understand abstraction and how abstract are computers really.

## WHY IS ABSTRACTION IMPORTANT

Abstraction is the process of simplifying concepts by removing details and hiding complexity to focus on what is important.

If a child asks you how a car works, you wouldn’t start explaining how fuel is burned and laws of thermodynamics. You would probably say that a car is a device that gets you from point A to point B, using some source of energy. Later you would explain how to drive a car, and after

that you might explain what is under the hood, but you definitely wouldn't start with laws of thermodynamics.

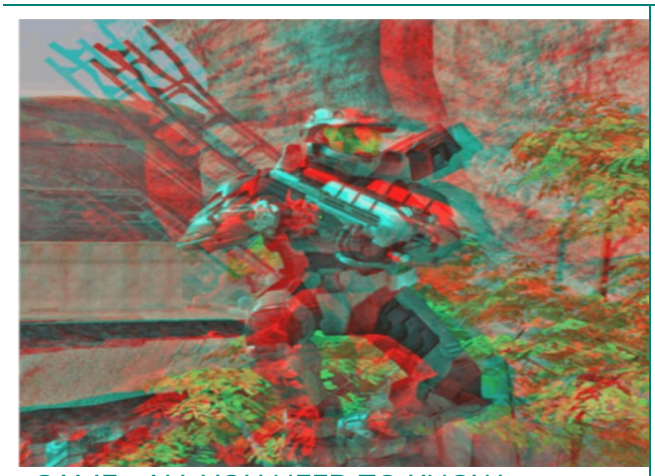
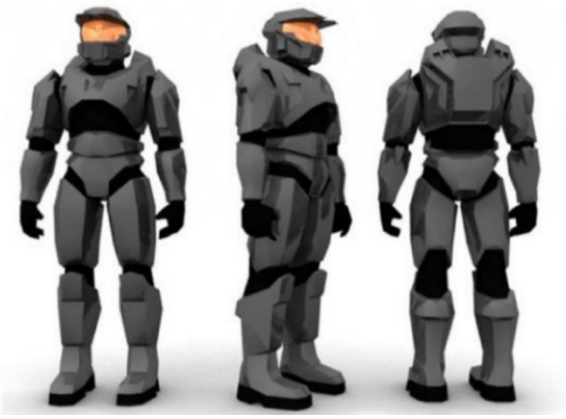
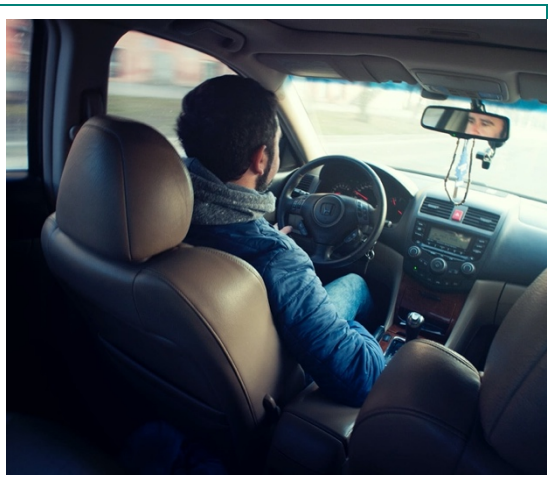


https://memegenerator.net/instance/80849458/grandma-finds-the-internet-wait-how-does-this-work-again

Example of how the same thing can have different numbers of abstraction layers would be the network models, ISO-OSI and TCP/IP. Even though they describe the same thing we use different models with different numbers of layers depending on our needs and work we do.

# ABSTRACTION IN REAL LIFE

Now let's take a look at how complex things get if we look beyond the abstraction, and if we start wondering how things work? We can use the car analogy to see how far abstraction can go, and we will compare it to the abstraction of a computer. It's important to understand that the number of layers in abstraction is not defined. In this example we will compare playing computer games and using a car. Examples in the table below describe abstraction from the highest level, where we only use the product, to the lowest level where we get an in depth explanation of how something works.

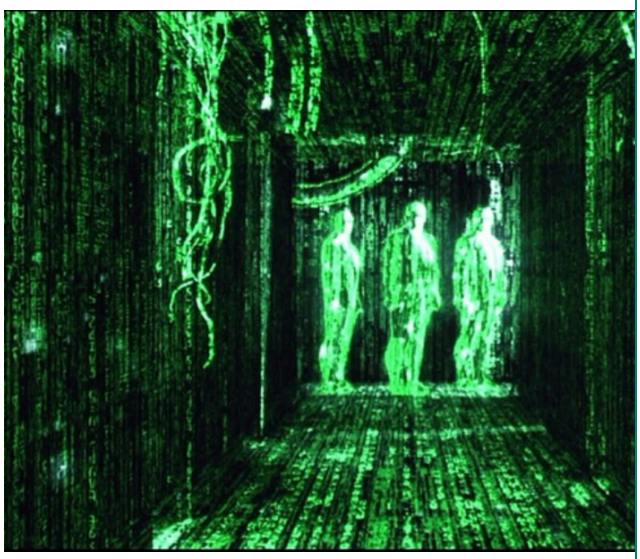
| COMPUTER GAME | CAR |
| --- | --- |
| HIGHEST LEVEL | |
| <br>GAME - ALL YOU NEED TO KNOW IS HOW TO KILL THE ENEMIES | <br>PASSENGER - ALL YOU NEED TO KNOW, IS THAT THE CAR WILL GET YOU PLACES |
| <br>GAME ENGINE - ALLOWS YOU TO CONTROL WHAT WILL BE IN THE GAME | <br>DRIVER - ALLOWS YOU TO CONTROL, WHERE YOU WANT TO GO |

```
181    public void actionPerformed(ActionEvent e)
182    {
183        if (e.getSource() == forwardJButton)
184        {
185            Transform3D temp = new Transform3D();
186            viewObjectFromGroup.getTransform(temp);
187            Transform3D tempDelta = new Transform3D();
188            tempDelta.setTranslation(new Vector3f(0.0f, 0.0f, -1.0f));
189            temp.mul(tempDelta);
190            System.out.println(temp);
191            float matrix[] = new float[16]; //declare array of 16 floats for ma
192            temp.get(matrix);
193            if (matrix[11] <= 1.0)//object front face z = 1
194            {
195                System.out.println("Don't multiply Transform3D at: "+matrix[11]
196            }
197            else    //setTransform
198            {
199                viewObjectFromGroup.setTransform(temp);
200            }
201        }
```

HIGH LEVEL SOURCE CODE - THE MEAN OF CREATING THE GAME



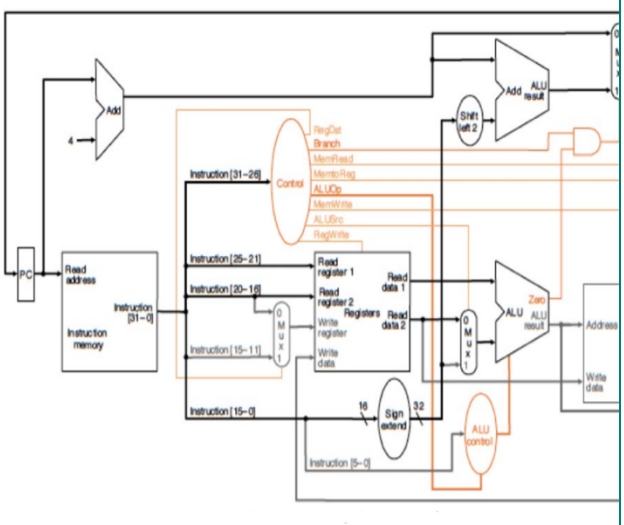
CONTROL PANEL AND GEAR - MEAN OF CONTROLLING THE CAR

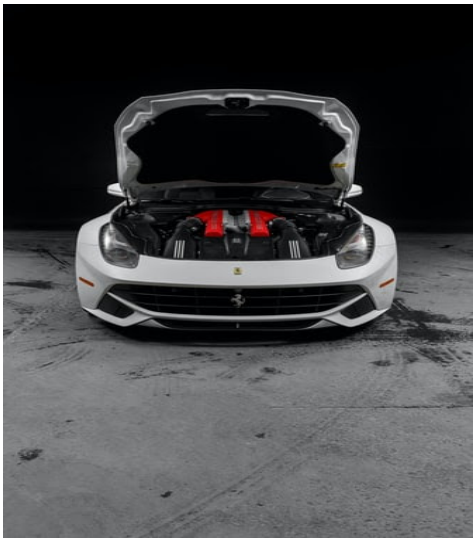


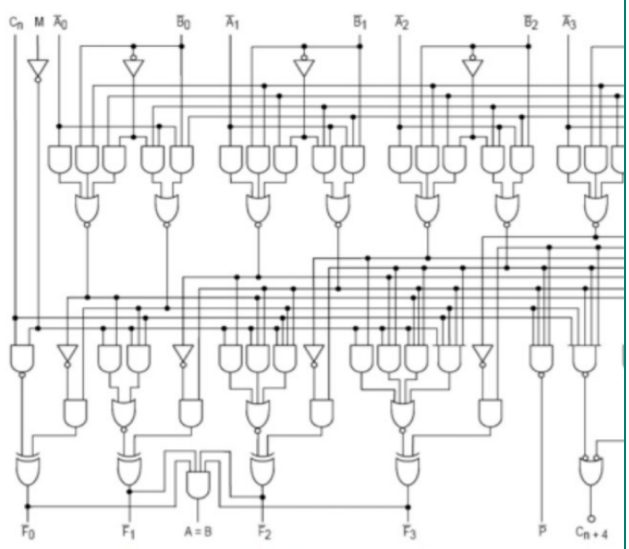
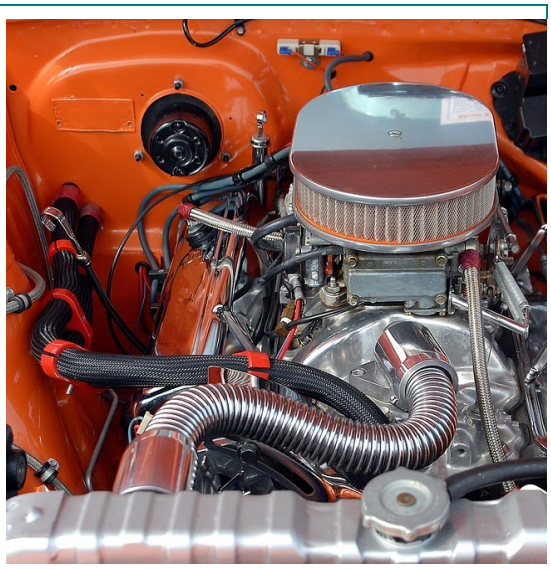
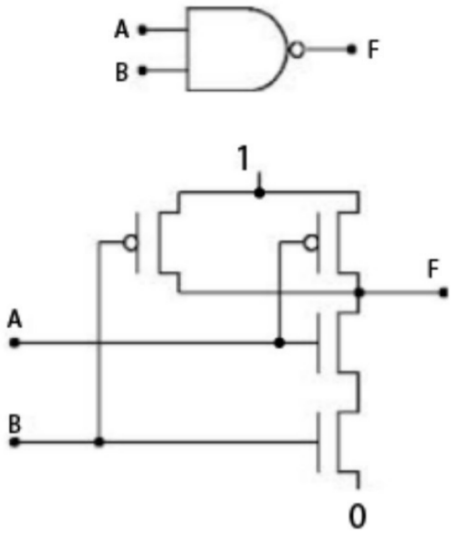
MACHINE CODE - HOW DOES THE COMPUTER “UNDERSTAND” WHAT YOU MEANT

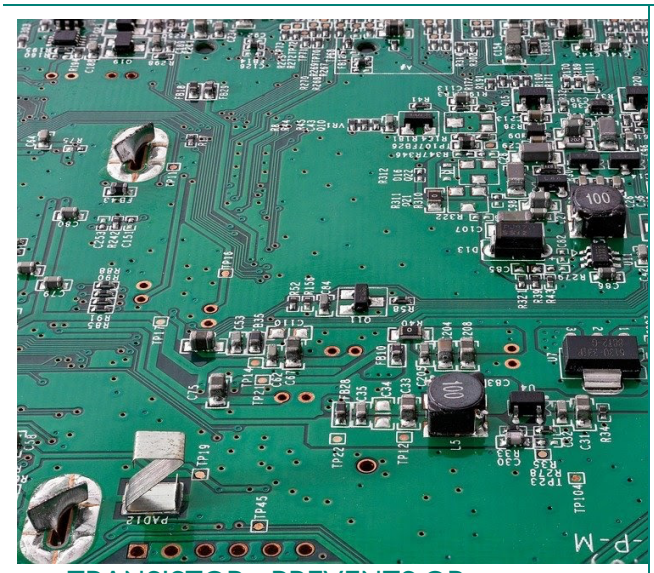


SHAFTS, GEARS, PIPES - TRANSLATING YOUR ACTIONS INTO CAR’S LANGUAGE



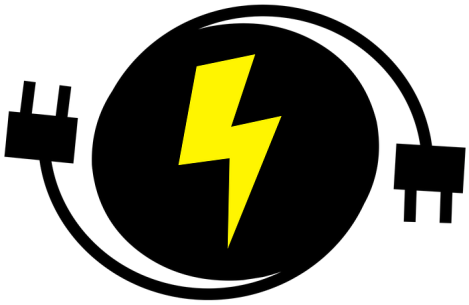
| CPU - THE BODY OF THE COMPUTER | UNDER THE HOOD - THE BODY OF THE CAR |
| --- | --- |
|  |  |
| ALU - THE BRAIN OF THE COMPUTER | ENGINE - THE HEART OF THE CAR |
|  |  |
| LOGICAL GATE - ALLOWS COMPUTER TO PERFORM OPERATION ON BITS | PISTON - ALLOWS ENGINE TO GENERATE MOVEMENT/ENERGY |



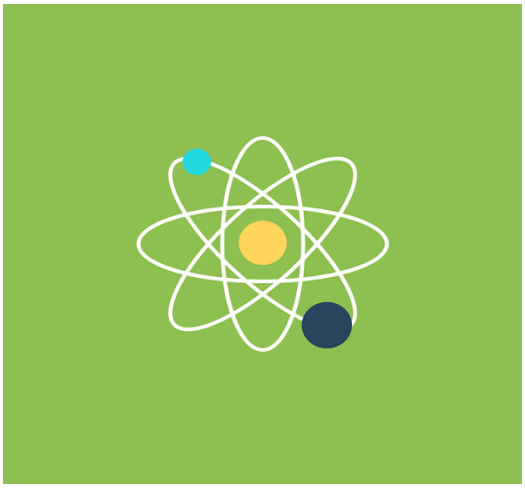
TRANSISTOR - PREVENTS OR ALLOWS CURRENT TO FLOW THROUGH



FUEL - RESOURCE THAT ALLOWS PISTONS TO MOVE



ELECTRICAL CURRENT - FLOW OF ELECTRONS WITHIN CONDUCTOR



HYDROCARBON AND OXYGEN REACTION TO IGNITION - SET OF CONTROLLED EXPLOSION

LOWEST LEVEL

When you start to understand the concept of abstraction levels and you just can't stop getting more into it

