

What is programming?

Khambar Dussaliyev

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Abstract

This essay is intended to answer (very briefly) to a question: *What is a programming?* Although computer programs nowadays are pretty ubiquitous in nature, they remain being *black boxes of magic* for most people, even tech-savvy ones.

However, being a *black box of magic* to some extent is a requirement for some commercial software (especially when there are trade secrets involved) natural. But this essay is not intended to answer how every software works in details, but *how every software works, in general*.

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1 Introduction

Basically, *everything* you do on a computer is running some program. Everything, no matter what you do is a result of executing and working with some program. Your OS¹ *is a program*. Your internet browser is a program. Your media player, file explorer, video game, media editing software, office software *are programs*. *Everything that allows you to interact² with computer (and not just bare metal) is a program*.

So, essentially, *what is a program?* According to Merriam-Webster³ definition⁴ (applicable for us), we can use following as a definition:

program is a sequence of coded instructions that can be inserted into a mechanism (such as a computer)

The gist of it being – *sequence of instructions*. So every interaction we can possibly have with a computer is somehow just a set of instructions. But *how computers do understand out instructions?* If I just shout into the microphone some command, computer will not just do as I say⁵. The same effect will have some instruction that I carefully write them in some text document, using Microsoft Word, for example.

How do I make computer to understand what I want from it? To understand this, *we must first understand what is a computer*.

¹Operation System - Windows, Linux-based, MacOS, Android, iOS etc.

²Interaction with a computer here and on will not take physical interaction with a bare metal in account

³Here and on Merriam-Webster dictionary is referred to as a ‘general-scope’ dictionary to avoid technical details redundant for this essay

⁴<https://www.merriam-webster.com/dictionary/program>

⁵Provided, there is no running program, responsible for such behavior

2 What is Computer?

2.1 Data and Information

Let's once again refer to Marriam-Webster dictionary for a *computer* definition⁶:

computer is a programmable usually electronic device that can store, retrieve, and process data.

So, a computer directly tied to all sorts of *data manipulation*. But what is data, and how can it be manipulated? Data is pretty much any factual information. Weather outside a window? Data. T-Shirt you're wearing? Data. Dusty books in my shelves? Data. But there are a certain layers present. The fact that I'm wearing a T-Shirt is data (even if I'm not – also data). What color it is is also, most certainly data. Is there any text or image present? Both the existence and *information* in it – also data. Let's also not forget about colors, sizes, fonts. We are living and have always lived in an enormous ocean of data. Nowadays, with our technology even more so.

But do we have use for this data? Well, the answer is – it depends. To assess data without well-defined goal will almost always result in you drowning in said data without much progress, since world offers us practically indefinite source of it. We must put our data into some perspective, some context. Once we put our data in some context and it becomes *useful* for us, *it becomes information*.

To somehow navigate in this world, we must put our data in context. Data with given context becomes somewhat useful. Such data called *information*.

Information is much more well defined than data. *We can measure information, actually*. We even have a science discipline, called *Information theory*, that researches all about information, from mathematical and engineering standpoint. Not only that, but we have an entire industry, called *Information Technologies* built entirely on a foundation provided by Information theory and adjacent disciplines.

But until we dwell into technical stuff, we must also remember, that *we used to operate with information*. Our brain is a natural computer, dissecting data into information that we use in our everyday life. How come I am so sure to call that information and not just raw data? Well, that greatly depends on a scale, but *our brain have very defined goals*. One of the main said goals being to *keep us alive*. Therefore there is a context, and brain will always tend to categorize things (organize data) based on this goal⁷, making it somewhat useful, therefore making it an *information*. Even the simple fact, that we don't notice our noses, although our eyes do see it constantly, tells us how natural brain is in working with information.

⁶<https://www.merriam-webster.com/dictionary/computer>

⁷If your goal at the moment being something more specific, than just stay alive, many of the information brain gives you still raw data

So, being a natural organic computer, we must first understand what we do with information, to have insight on what computers do with information. All processing of information, our minds in work is mostly an internal process. *Sooner or later there is a point, when we must exchange said information.* So, how do we exchange it? We have an enormous number of ways, actually. We can say something to another person, write it down, pass via somebody a note, we can just hint at something. We can send message in a messenger, send an email, send a radio-signal, we can knock a Morse code. *We are practically limitless with one major nuance – the other side must be able to understand us.* There is no point in sending email to a person, who can't use it⁸.

We now can conclude one fundamental distinction: information itself is mostly independent from it's carrier. To demonstrate it more clearly, let us consider following example: I want to send information to my friend at the table, with the main message being '*pass me salt*'. There is definitely a context: we are at the table, eating food, there are at least two parties involved (me and my friend), and I expect salt to exist somewhere at the table. I can pass this information with a various number of ways, provided my friend understands me. Just to mention a few:

- Say to him 'pass me salt'
- Ask him to pass me salt in other language, he is familiar with
- Write a note to him 'pass me salt'
- Write a note in foreign language, he is familiar with
- Get his attention and non-verbally point at salt
- Write him a message in messenger, expecting phone to be near them
- Get his attention and use ASL or alternative, provided he is familiar with it
- Exclaim obviously 'Oh! This food will be so much better with salt! I wish somebody passed it to me now', provided he understood our hint
- Rhythmically knock with Morse code, provided he understands it

In all aforementioned examples we can clearly see, that the gist of our 'message' stayed the same. *We did pass a more or less the same information* in each and every case. Despite the medium being completely different, if our friend can understand us, nothing really changed for him or us. In such cases the 'main message' containing an actual useful information we are willing to exchange usually colloquially called a '*payload*'. However, despite our 'payload' being virtually the same, we did pass some additional information (or data – depending on context) along the way, didn't we?

⁸In general. Sometimes we are interested only in sending information, not concerned by an actual delivery. Some legal procedures can be of an example