THE FUSION — HOW REAL AND DIGITAL ARE MERGING
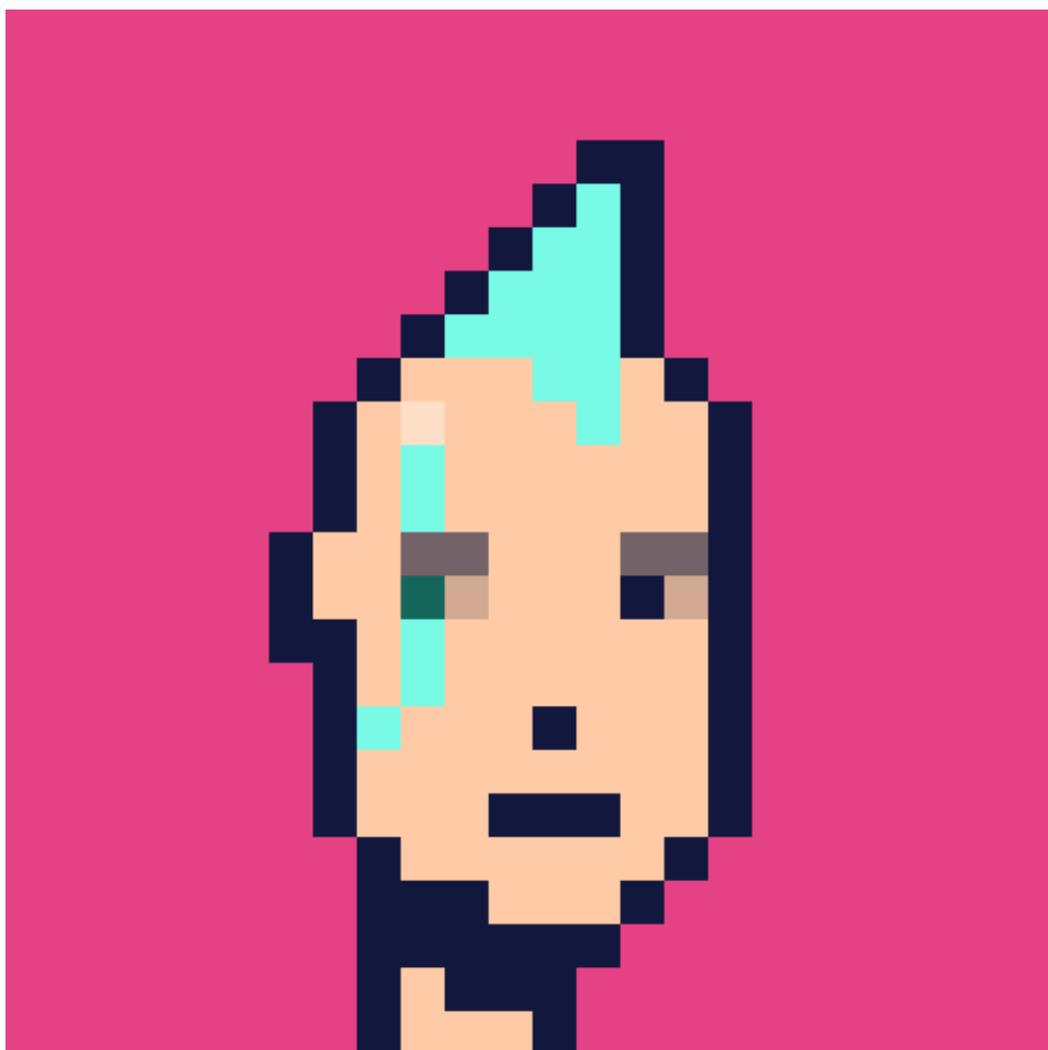
DYSTOPUNK · *IT TOOK THE UNIVERSE ALMOST 14 BILLION YEARS TO COME UP WITH NFT TECHNOLOGY*

INTRO

Most people like computers. They get real benefit from them.

They feel like they understand them well enough and manage to utilize them for personal progress as well as family or community advancement. Computing is empowering individuals all over the world, helping them become smarter, more resilient and overall better parts of their societies.

If computers are such amazing tools and if they are here to stay forever and always evolve further then it follows that everyone will have to learn to keep up with their progress at least to some extent. Learning just a little bit every day is much better than standing still. We can no longer afford to stop learning once our formal education is over.

Lately it feels like we have to run just to stay in place. This is true and is not true only in computing. The world is learning and advancing at the fastest pace it ever has. Everyone is in awe but at the same time very fatigued, such fast-paced progress can be extremely nauseating. Partial solution is to try and make learning enjoyable. This is achieved through small incremental steps that give real results and over time this becomes very motivating. Best time to start is right after birth which means that parents need to pass the desire for learning to their offsprings almost from day one.

What also helps a lot is *learning with others* because exchange of opinions and ideas is very rewarding and it brings useful results faster. First step is *finding others* with whom we can learn effectively. There is more choice in this regard today than there was in the past.

Another important part of surviving and thriving in *vast information overload environment* is realizing that we will never be able to know *everything* and most pieces of information will pass us by. Sometimes alltogether because it is just not relevant for us and other times we can still benefit from it even if entirely ignorant about inner workings of a particular thing. One example is some recently discovered medication or medical procedure that helps us but we have no idea how it works.

The risk here is that we don't find it (are not aware of its existence) in the first place or that we refuse to use it because of *misunderstanding(s)*. This happens for lack of education and if we never question any other type of medication that has or has not previously worked for us for any type of condition. When we realize that it is not that hard to understand the basics of medicine or any other field, then we can really prosper and even see connections and similar approaches in many seemingly unrelated fields. We may even ask our personal doctor that has stopped learning a long time ago if they are aware that something new may be happening in the field that may help us or even save us. Today, more than ever an individual can really shape their fate just by keeping informed and never stopping to learn.

Ultimately we learn from each other, including from people no longer with us. Computers are intermediaries and best tools for analyzing, storing and disseminating information.

ABOUT THIS BOOK

The world is big and complex.

Countless layers of abstraction provided by The Nature itself and then something happens:

The Nature invents The Brain.

And a few million years later another thing happens:

The Brain invents The Computer.

And so it starts... a positive feedback loop between The Brain and The Computer is established. First we get one useful machine for each individual, The Personal Computer. Soon we connect our PCs together, add some always-on computers in *The Cloud* and call them Servers. Some capable mobile devices (i.e. Pocket Computers) are added to the mix and it all happens so smoothly that most don't question it deeply, we just use it.

Internet could possibly be compared to gravitation. We almost never think about how it works and what it even is. Gravitation is such a crucial part of reality that it just *disappears*.

Same is happening with computing and computers. They are ever present and when they work correctly, they also become invisible. People born into the networked world just take all of this for granted, just like gravitation. Computing revolution is far from done though.

It is evolving further and every few years a new computing trend emerges that takes everything to the next level. Computers are not *everything* but the for sure are special. They can mirror and then augment every aspect of reality.

The focus of this book is subtle and not so subtle impact of computers and the change they have been bringing over past the few decades.

I'm just a guy from a small town in the middle of Europe. Being fourty years old this year I have been fortunate to surf more or less peacefully on a few computing revolutions. I catched wave after wave until finally putting myself in the position of neutral observer. I currently have no real obligations imposed from the outside (of my family) and so I'm trying to find some good challenges. I have no aspirations or desires of putting big stress on myself or developing any software solutions that would take more of my time and energy than I actually want. What I know is that I want to keep on learning until I'm dead and I want to meet a few more people with similar motivations. I want to *learn better together* with people all over the globe, using the best tools possible.

This book is about observing trends, catching some waves, finding luck and learning from the digital and material environment. Next book — the *DMT SYSTEM BOOK* will be about code, tinkering with hardware and practical solutions for digital independence.

DMT SYSTEM is a community of learners and a set of tools and approaches for developing useful socio-technological applications using modern computing discoveries. We emphasize hands-on learning and managing our own hardware and software. DMT nodes operate as a reliable constellation around any individual user.

This book describes the emerging global digital environment from the perspective of a casual observer with no special access to any secret information. Most of us are in this position and any further more focused picture will emerge with more information sharing.

Why computing is special

For many people computers are very hard to understand. Most did not study the theoretical background of the field and merely using standard applications does not make one understand *the essence of computing* (or possibly multiple essences).

On the other hand for many people that understand computers very well the rest of the world is a bit hard to grasp. Some may *seem* maladjusted to the "real world" and many actually are. This is very interesting but not so surprising. Working with computers professionally is often relatively cosy but also time-consuming and all-encompassing. Workers in this industry often feel like every moment invested somewhere else is at the expense of missing out on new developments in this fast paced industry. For this reason many programmers don't often pick up power tools or in general avoid dealing with things outside of the screen, even neglecting their bodies. I was one of these people as well, not all my life but long periods for sure. I did it consciously and on purpose but one has to be aware that at some point starting to look outwards (once again) is smart.

Before getting my first computer at age 13 I was interested in almost everything. After that I was only interested in computers and some electronics. Thinking about this again I see that I was more interested in computers as a window to broader education and easy access to information more than I was actually interested in programming. To make the most use of this amazing new tool (Personal Computer) I did need to program quite a lot but the goal was to make computers do what I want with least effort possible and not so much the act of programming. Along the way I started wondering more and more what computers are really made of, what they mean or could mean to us and how things in general work. Details are the most interesting aspect of anything. Without first understanding the parts (details), you have a slim chance of understanding the whole.

I read a lot over the screen: books in digital format, articles all over the Internet (which started slowly taking off around that time — 1994), things not available in my local library, anything interesting, weird or potentially useful. Influx of information never ended. I reduced my time invested elsewhere because there was so much to see and do over the keyboard. This was great but also a trap, of course. I enjoy practical things as well but I neglected them at the expense of reading (and programming when I had to).

This personal story was included to depict something special about computers: they are indeed almost invisible and just *a medium* through which *real stuff* flows. Real stuff is in the form of information which first has to get translated into suitable form and then translated back into form suitable for humans.

Imagine a reflection in the mirror. It looks real but it is very far from it. It is a simple physical process that fools our perceptions to make it look exactly as the real thing. Computer programs or anything in digital format are also an illusion. The kind of illusion that manages to have real effect on reality.

Computing universe is not the real universe. Real universe is much broader and computing is only a partial reflection of the real state of affairs inside complex human universe. What universe actually is and means outside of our own perspective - this we can only wonder but perhaps computers are (asymptotically) bringing us one step closer to the truth as well.

Computers are special because they are almost not real but they touch everything.

COMPUTERS AS PROBLEM-SOLVING TOOLS

The world in general and each individual will never run out of problems. Even animals could be very well described as problem-solving living entities.

We are all solving problems of different kinds and sizes from the moment we wake up.

Computers were utilized as problem-solving tools to help the good side win World War II (see Colossus computer). Computers have saved the world at least once and it was the first thing they did when they sprung up into existence. Is there actually a bigger story than this anywhere? Just think about it: humans screw up, almost blow up the earth and/or let the evil side win, but the smartest people instead of operating tanks and planes invent a tool that tips the balance and saves the world. Such is the power of thought and computation.

If a problem is being solved with the help of computers then this means that the existing actual problem *outside of computing* exists and is then translated into form suitable for computers, solved there and then translated back into the real world again. This was not an usual approach to problem solving even a few short decades ago. We have now probably built an entire parallel universe inside digital realm. It is a reflection of the usual reality but it is not a simple reflection anymore, it is something more.

Everything is going digital: our classical reality is getting a new semi-visible thin overlay of dynamic information superimposed on top of it. The important point to note is *thin overlay on top* and not the replacement of our base reality made of atoms. We are most definitely not uploading ourselves to some digital metaverse anytime soon. We might come close to *feeling like we did* that but only until some climate catastrophe hits near our home, we get some nasty disease or we run out of food or water. Sometimes a clogged pipe in our building is enough to wake us up from our digital utopia.

Conclusion is that we are going to have to live in two worlds at once. One world is the digital mirror of the classical world (base reality) with cars, streets, food, parties, viruses and the rest of it. Which world likely has more influence on the other? So far atoms were "in charge" but this is getting at least somewhat reversed. Now many things happen in digital realm first and then they are reflected in the world of atoms. This is fascinating.

We saw how powerful the digital invisible realm can be and now this has become the guiding force of our collective destiny and individual destinies as well.

Digital and "actual" are merging but nobody alive today will see the final result, we are just intermmediaries. Our known universe and specifially our planet are also a process which is evolving and humans are not the final result of this evolution. On the way to whatever we are to become we are going to have to solve many of the hard problems through the use of computers.

Computer science is a special field at the intersection of all other fields. It can offer the best possible resource of them all: it can help solve many problems in many fields. Medicine is again a great example. We keep getting better at medicine and all kinds of electronic instruments including computers play a crucial role. Global economy, global climate, global civilization: all potentially improved through smart use of computers. There is probably no other way to sustain and improve ourseves than to augment the real with the digital. Maybe it only looks hard but is actually quite doable. Small steps over long time...

Distributed computing as a force for good is coming. Solving one small problem at a time.

Polymathic thinking

People previously not interested in computing are getting very interested in this field and on the other hand some people focusing exclusively on digital side of things are now learning other disciplines like biology, physics, philosophy, knowledge management, economic theories, history, space, cooking, construction, climate sciences, you name it!

This is *The Fusion*. Computer science at the center because in this context it is special as it is a reflection of everything else. Computer science in this sense is like a meta-discipline.

The best applied computer scientists and IT entrepreneurs know this and they strive for knowledge of computing plus a particular domain or intersection of domains to which computing techniques are applied. Many researchers, developers and programmers are indeed polymaths or in the process of becoming one.

Polymath is someone who has good knowledge of many different (intersecting) fields. In team environment this knowledge can be further spread out but there are still common touch points where many people have to understand at least the foundations of different fields. They usually collaborate through software and this software has real influence on the collaboration outcome. Sometimes the planned outcome of some collaboration is actually software but more generally it is something else and software is only the means to an end.

When the product of collaboration is actually sofware, then we are in the *meta-realm*, developers are switching between the reality (particular domain of knowledge) and its digital reflection (software). Every few years a radically new set of digital capabilities (long in the making) emerge and new types of software become possible. This has real effect on not just digital realm but on physical reality to which it is ultimately applied.

Distributed crypto technologies are a great example of this. What started somewhere deep in digital space with no apparent connection to anything real is now rearranging the world. Such type of fusion has even more radically interesting emergent properties. Digital and real merge to bring unpredictable outcomes with profoundly destabilizing effects. Ultimate goal of such destabilisation should be to settle in a new, more effective stable state on a higher organisational (energy?) level.

Distributed networks of computers that produces all kinds of value almost in traditional (monetary) sense become even more interesting to different people from other branches of human knowledge. Everyone wants to participate in the new computing revolution except the true anti-polymaths and anti-learners. These types have a tendency to oppose radical but subtle change because it doesn't make sense to them initially and they don't bother to look close. Out of precaution or sometimes out of spite they don't want to participate in any kind of "funny business" (to them). All the other people either young enough or with open enough minds are having the time of their lives. Through all the noise and occasional disagreements something new is springing up: a set of new collectively owned digital platoforms to run our real world on.

Everyone is welcome and everyone not natively a developer (computer scientist) instantly becomes a polymath once they learn the basics of crypto / web3 inner workins. Now they know web3 *and* something else plus they can meet many other interesting people that also decided to take a bit more of their fate into their own hands.

One computer is a powerful device but many *people* connected together in specific way by means of their computers are way more powerful.

Distributed systems

We can look at distributed systems from many perspectives, it depends on the level of detail we want and on type and purpose of a distributed system.

On fundamental level a distributed system is a set of spatially distributed processes — running on some hardware — that communicate by exchanging messages. Messages travel from one place to another through physical carriers. Digital messages are encoded and decoded at each end of transmission medium. No message can arrive in zero time and any message can get lost. This immediately complicates the situation because usually we cannot be entirely sure for how long we should wait for message confirmation. Will the message surely arrive if we wait for one more millisecond or did it actually get lost? If we make wrong assumptions then distributed processing slows down radically.

As per famous paper *Time, Clocks and the Ordering of Events in a Distributed System* events in a distributed system are defined to be of three types: 1) sending a message 2) receiving a message 3) internal event. All processes must agree on the same ordering of these events if they are to reach the same conceptually shared (replicated) state.

Reality comes in and complicates this task once again in the sense that in most cases there does not exist one unique globally ordered sequence of events. For some pairs of events that are not causally connected we cannot say which one happened first. It is a nonsensical question. This is much easier to understand if we consult the special relativity analogy where there is also no global time and events seem to happen when the information reaches us and we register them. If we have no information (direct effect) of an event then from our perspective the event didn't happen yet. There is always some time between event happening *at some place* and us becoming aware of it. It is easy to show that (at high speeds OR long distances) we can trivially construct situations where two observers disagree on whether an event happened before or after some other.

It turns out that time, just like gravitation is something everybody understands and at the same time nobody actually understands. For most people time is something "outside of the system" that is just ticking in the same way for everyone and we can order any set of events by "happened before" relation just by consulting this magical global time. There is a few million people in the world that went one small step further, starting with Albert Einstein. They have a different notion of time, namely that it is a product of "happened before" relation instead of actually existing on its own. It is fun, not very hard but quite rewarding to understand this. Besides being interesting it is very useful or rather required for proper understanding of the facts of distributed processing.

We saw that distributed systems even on the base level are a multidisciplinary area using insights from three fields: mathematics, physics and computer science. By further adjusting to (human) reality and allowing potentially dishonest processes, some game theory, some basic economics and "double spending" prevention tactics we get to modern distributed singleton computers consisting of many regular computer nodes. We arrive at a type of distributed system that we simply call "blockchain". Blockchains keep global state on which the entire humanity is agreeing and this is now changing our society profoundly.

Most people think cryptocurrencies are spculation with no firm basis when they are actually a product of many decades of hard scientific research. NFTs are just like regular cryptocurrencies except that each token from a set has some unique qualities. This is now the unexpected frontier of innovation that probably has many years to fully play out.

SOCIETY AS A DISTRIBUTED SYSTEM

Society is ultimately made of humans. Humans "hide behind" companies, corporations or other institutions. More and more inviduals act outside of these somewhat rigid structures and they connect with each other through various distributed computing networks. This mode of work is not suitable for everything but it is very suitable for more things than previously thought.

This essay is more poetic than scientific or factual but surely there are some possible parallels between distributed computing systems and "distributed systems" made of individual humans?

Whatever mode of communication some group or entire country uses (Internet or other media), they strive for some form of consensus - for example for common understanding of problems at hand. In this view indiviual nodes (human brains) exchange messages which over time are expected to build up a shared consensus / understanding of some problematics. Currently society is trying hard to reach some global understanding of COVID problematics. It looks like many more messages will have to get exchanged to reach a stable state.

Messages between humans and between computers are similar in regard to reliability of delivery. With computers we are talking about actual delivery of objective bitstream and message either arrives or it does not. With humans we could look at the same thing a bit differently: "Did the intended message arrive conceptually? Did it convey our insight/emotion/desire/request/comment/question and cause a shared understanding between our brain and the other brain in that moment?" If the message was heard but not understood or it was not clear enough (or sensical enough) in the first place, then we have the opposite of shared state / consensus, we have a *misunderstanding*.

Misunderstandings happen when inter-personal realities clash because of clumsy or lazy communication. This is very easy to do because we can rarely be totally aware of what other person is actually hearing and also if we really did our best to convey our intentions as clearly as possible. Sometimes we cannot even do that when we are still in the process of learning something new. Biggest danger for misunderstandings is when one or both parties are new to the knowledge area or they just don't know each other well enough yet.

I believe at least 70% of misunderstandings don't ever get identified. In some cases this number is smaller but it can also be higher. In any continued interaction even with close friends the number is not zero. This should make us all think.

Humans as part of a distributed system can be greatly helped with distributed systems made of computers. Globally spread fair systems of this kind were historically not realistic because business models didn't support them.

People wanting to work in this field professionaly had to first invent their own, natively digital money to boot the entire process. Cryptocurrencies served this purpose and now this process in unleashed and cannot be stopped by any imagined means.

Pendulum is currently in the "decentralized camp" and will take some power from clearly centralized architectures. We will explore many more reasons for this swing but what was needed at first is funding. Nobody had any motivation to provide this funding and so funding was made "out of nothing", through pure digital consensus. Society decided that this funding is legitimate and here we are!

Misunderstandings

Humans tend to trust each other in some circumstances, even live peacefully along each other for many decades. However these societal systems are always in dynamic equillibrium. This means that they only appear stable even if they can remain stable for generations. When external or internal conditions start to shift many such systems experience perturbations and sometimes even don't return to equillibrium. They can spiral out into the state of chaos before either ceasing to exist or settling in some other temporarily stable state.

There exists a broad consensus about basic aspects of reality: that our planet is round, that gravitational force is responsible for mutual attraction of things with mass, that it rains from the clouds, that sea is salty, big and that it contains fish, that ice is actually frozen water and so on.

A special case of nasty problems can arise if people do not agree on basic reality. We are not talking about different (often valid) beliefs but cases where only one side can be right. Peoples' beliefs that are disconnected from wide and most likely true consensus are actually dangerous on top of appearing silly. Examples are people thinking that earth is not actually round or that vaccines are preparing us for A.I. robot rule. We cannot blame these individuals for believing that because not everyone is born with brain suitable for modern high-tech challenges / complex environment and even totally capable brains can be ruined with enough negligence, with illness, advanced age or with purposeful manipulation.

Let's talk about the other case of people holding different beliefs. Imagine someone thinking that someone else is cheating on them (financially or in some other way). Because they believe this is happening they will possibly start cheating too before the other person can take (supposed) full advantage of them. When the other person who was not actually cheating notices it then they also start misbehaving. Now both parties think that the other party is trying to take advantage even if they initially didn't plan to behave in this way. There was either a small disturbance (or minimal initial mistrust) that set the cascade into action or perhaps it was destined to happen in any case because of environmental conditioning or personal traits / history. In any case this turns out to be a negative sum collaboration that usually ends badly and it all came from a misunderstanding.

These two cases are different because in the first case some belief is totally wrong to start with and in the second case strange beliefs evolve through some interaction that can be traced back with enough capable investigations. First example was a case where people clearly believed something that is not real and the second case ends up with reality being defined in realtime where each person is indeed trying to cheat the other one even if that was not the initial goal.

The third case are temporary, desireable misunderstandings that help us reach the shared state that is the most beneficial to both (or many) parties involved and also for the environment. These misunderstandings help us on the way to the best approximation of reality that we are currently able to reach.

Distributed systems for societal organization have big potential to eliminate at least the second case of misunderstandings and make the entire society more stable. This should then help with first case as well since more people will feel more connected to happenings in "fused hyperreality" than they are otherwise. There will be less people inventing crazy theories which are entirely disconnected to base reality.

New essay is added once per week

.....