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Frooxius' Blog

Here I share everything, from my thoughts, news about my projects and so on. It needs some work so bear with me as I work on this ^^'

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SATURDAY, APRIL 2, 2016

How VR became my job because I didn't give up

Check out the discussion thread on Reddit for this post.

Hello Rifters!

My name is Tomas Mariancik, although you might know me better as Frooxius, creator of SightLine, World of Comenius, Neos: The Universe, Unity VR light fields and bunch of other smaller things (you can check them out at my website on www.frooxius.com).

I'm 24 years old and for past year I have been doing VR for living. You could say (and some actually say that to me) that I'm living the dream, but what few realize are the years of nightmares that have preceded.

I am exaggerating a bit for dramatic effect of course, but the truth is that the path to this dream was lined with a lot of stress, depression, pain and other generally unfavorable feelings that have left quite a mess.

That was the most significant impulse to write this article, both for myself to tidy my own thoughts and for you, so you can better understand what's going on in the background and in case you are in similar situation, know that you're not alone and that there is a soft puffy cloud on which you can live your dream if you'll be persistent to find it through all the storms.

What I want you to realize is that path to success isn't easy as many imagine (unless you get really lucky) and patience and persistence are probably the most important virtues required to achieve your goals.

People usually only see you once you succeed, so it might seem that the success came so easily that you must be doing something wrong because you can't replicate it so simply yourself, but I want to show you how difficult the path is and give you a brief overview of my journey on it.

How Intel ISEF gave me the courage to pursue my dreams

My path to VR started perhaps surprisingly with experimental processor architectures. During the last years of high school, I developed a deep interest in the inner function of CPU's and programming in assembly languages (and the layers of abstraction built on top of those – I always loved imagining how things fit together and how they relate and influence each other, creating hierarchies and layers of abstractions) and began to think if they could work in a significantly different manner, considering that the basic principle dates at least all the way back to Babbage's analytical engine in the first half of the 19th century.

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Long story short, I developed a series of esoteric CPU architectures (with associated softcore implementations on FPGA boards, programming languages for them, compilers for those languages and set of examples and measurements of their properties) and with those, based on the initial impulse of my high school teacher, I competed in the national science fair, which got me to Intel ISEF 2012 in the US.

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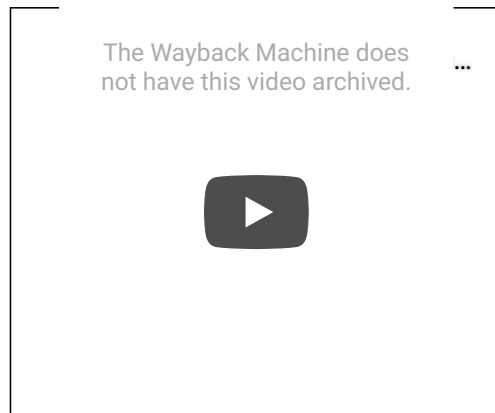
Before all that, I was a very shy, socially anxious kid (and still am, but not nearly to the same extent as before) with low self-esteem. My idea of my future was that I would somehow get through university, get a job somewhere and maybe, in some free time, I'll work on things I'm really passionate about.

This thought was very depressing, because since young age I loved to create. I have been writing stories, drawing machines, inventing some working ones (like one time I disassembled my electric car toy and made a functional blender from its components and a yoghurt cup, using a duct tape and pieces of cardboard to hold it all together, including the wires and electrical components (didn't have a soldering iron yet)), later I started making my own amateur films, animations, games and software. I just love creating stuff of many kinds across the whole spectrum, from highly technical to artistic.

At any moment my mind is full of ideas for things I would love to do, whether they are stories for games, details of alien worlds or perhaps a unique sound synthesizer algorithm or some new way to create 3D geometry. Now imagine you have all those ideas and your expectation is that nobody will ever support you in working on any them, so you'll spend the rest of your life ignoring the constant stream of ideas and just focus on doing things others tell you to do.

With that mindset and against all my expectations (I was too afraid to even show the architectures I made to anyone, which is why it took impulse of my former teacher to participate in the science fair) I suddenly found myself in the United States of America, at age of 19 (well not so suddenly, there was a year delay between the national science fair and Intel ISEF) at the biggest pre-college science fair in the world.

The whole experience was grandiose, fascinating and impactful. I was surrounded by thousands of other young people from all over the world, with similar passion for learning and creativity, although I didn't talk with almost any of them because of my shyness. But that didn't matter, because the biggest impact was made by the opening speech by David Brian Johnson, Intel's Futurist.

His talk about pursuing our dreams and how technology progressed to the point where we are constrained only by our imagination (more or less) and most importantly that it is us who are building the future, instead of future being something that just happens to us, awoke something in me. I felt as if figurative chains that were tightly wrapped around my whole body suddenly ruptured and I was free. I was no longer afraid (at least not nearly as much as before).

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After I returned home, I soon quit university after the first semester (which frustrated me to no end) and decided to start pursuing my own dreams. I returned to game design with work on some mobile phone games based on ideas I had since the first year of high school (and some even before that) that I wanted to implement for years.

Muddling with mobile games

Those didn't do particularly well, but I was learning a lot of new things during the early period, both about the Unity engine (which I started using) and promoting my content. I found it was hard, especially on the mobile market, which was already oversaturated at that point. I spent more time posting about my game than working on it to get barely any people to play it, let alone pay for it.

Later I found the OUYA Android console. Excited about new technology and possibly new market, I joined the CREATE 10-day game jam, with a game idea I was cultivating for a while (most of my ideas that you see were fermenting in my head for years already – it's just that I've only now gotten around to implementing them) and managed to secure a nomination for the "Most Original" award, but didn't win.

My entry wasn't nearly as polished as the others since I worked alone, but it was at least fun and valuable experience for me. The participation generated more interest in my prototype than the months of posting about my previous games combined. But it still wasn't anywhere near enough to support the development.

Because of that, I had to take up contract software development work to earn some income. For the most part the work wasn't particularly enjoyable. Sometimes it was quite challenging, as I got to use variety of my skills, from software analysis, engineering, application development, automation, database design, support (I never imagined how annoying some people might be) and even reverse engineering and disassembly, all for one client. This produced roughly 600 USD on average per month, which doesn't seem much, but since I still lived with my mum, I managed to save up most of the money.

This however presented new a dilemma – I got much less time (and energy) to work on my own projects, which resulted in dwindling interest from already small pool of fans. Selling your work to earn for living on a challenging market requires immense dedication (and even that isn't guaranteed to give you results), which requires a lot of time and as everyone knows, time is money.

Essentially to earn money with your projects, you need to already have that money – a catch 22, which ultimately forms an entry barrier. One that I hit very hard.

I have tried to gain advantage by creating novel games in combination with simple, but polished aesthetics to capture interest of people, but as I've found, novel ideas aren't very useful if people don't actually know about them in the first place – many games look more or less similar if you give them just a few glances at screenshots or videos.

This simply wasn't the way to get through, but then the Oculus KickStarter came.

First success in VR

Seeing the KickStarter campaign for DK1 made me immensely excited. The promise of a technology that transports you into the virtual world was like a dream come true. As I mentioned before, I am constantly thinking of many diverse worlds in my head (most of which nobody has even heard described yet) and there's nothing I want more than to share them with others (it's almost bordering on an obsession).

Writing stories, drawing pictures, creating classic games are all great ways to share those worlds, but virtual reality is simply the ultimate one (although I'd say the current one isn't the ultimate one yet, since there are some stories it can't tell, but that's for another article).

No longer do you have to imperfectly imagine the world from the words (on the other hand it gives you certain freedom for your own imagination). No longer do you have to imagine what's going on in the paintings and what the world would look like if you started exploring around. No longer do you have to look at flat rectangular projection of the world. You *are* in the world.

Even before hitting the pledge button (for two rifts actually) my head filled with many ideas of more or less bizarre worlds (including what became the SightLine) that I would like to create for the technology. And the impatient wait began.

Meanwhile I continued making classical games in my free time while doing contract software development for money. After some delays and impatient refreshing of the community-made delivery log, my dev-kits finally arrived. Despite the low resolution and other issues, I was completely amazed by the technology and played through the whole Half Life 2 in almost one sitting in the first few days, partly because there was little community content at the time.

Of course it didn't take me long to start producing my own. I've dabbled with several concepts as I explored the technology, none of them receiving particular attention (though I haven't thought they would in the first place), but I started slowly working on a bigger game based on the painting game concept from the OUYA game jam.

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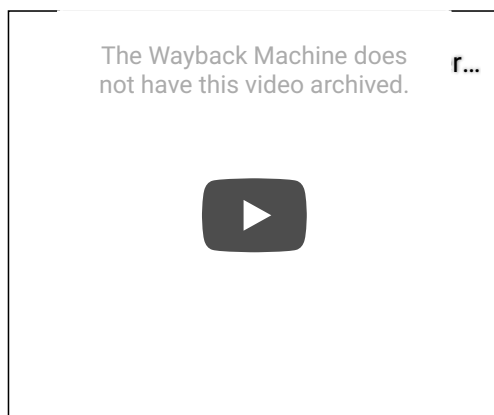
When the VR Jam was announced, I considered participating with the painting game for a while, but eventually decided to use an idea I was personally most excited about and which I thought would stand a better chance – a game based on lacking the object permanence and building a surreal dream-like reality.

The decision proved to be a good one, earning SightLine a third place. The prize money helped things a bit, but wasn't nearly enough to fund a team to develop the concept into a full game.

However, I got something much better from the VR Jam. Attention from both the Oculus and community. Or so I thought.

Struggling for help

I was already happy to be among the twenty finalists, but when the winners were announced and I received personal congratulations from the Oculus team, I thought "This is it, this is the turning point."

Oculus contacted me directly and claimed that they were impressed by my project and wanted to help me. The community loved it too. I thought that this was the chance to drop the senseless contract projects and devote my time fully to VR. I was excited that I would finally have opportunity to transform the ideas I had into a fully blown project.

But that was a naive viewpoint. I had no idea how wrong I was at the time. I began talking with Oculus, showing them more concepts, development progress (still slow, made in my spare time). When I heard that they funded some other VR Jam projects, I asked about funding also.

The replies I've got were always semi-positive, but never quite giving me anything solid, just raising my hopes that they were interested (and that they indeed provided funding to some projects) and answering my questions only partially. Sometimes responses didn't arrive at all. It was okay I thought, they are just very busy, I just have to keep again later.

So I kept trying and trying. I launched an IndieGogo campaign to attempt to get funding from the community, but unfortunately that has failed for multitude of reasons. Firstly, I had no experience running such campaign. I tried my best, but I don't really think it was enough.

Secondly, the community was still quite small as this was all the way back in the DK1 days when everyone pretty much knew each other (a bit of an exaggeration, but you get the point). And third, it was IndieGogo.

I was warned about that many times, I got told it's a graveyard for projects, but I didn't have a choice. I lived in the wrong country. I desperately searched for ways to launch my campaign on KickStarter, but didn't succeed in doing so. There were way too many barriers. So I had to do with IndieGogo.

Interestingly, during the IndieGogo campaign, Markiplier made a playthrough video of the demo, getting huge amount of views. I thought this would help the campaign tremendously, but sadly the number of visits to the campaign didn't even increase noticeably.

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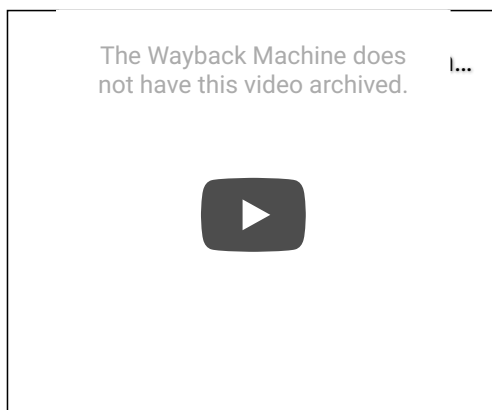
Failing the campaign was unpleasant and it certainly didn't help with motivation, but I kept working on the project, bit by bit and kept talking with Oculus, trying to get some kind of help from them.

And then the big event came out of nowhere. Oculus got acquired by Facebook. I was one of the few people (at least it felt that way) who weren't overly negative about it, even somewhat positive after I heard Palmer Luckey talk about how this is going to help them with a lot of things, especially being able to afford to fund a lot more developers.

"Maybe now I have a chance to get funding from them!" I thought. I waited after everything calmed down and contacted Oculus again. No definitive answers again.

"It's been a while since the VR Jam, maybe it would help to have something new to impress them with." I continued thinking. The arrival of DK2 shipping was also coming up soon, so it seemed a ripe opportunity for a new proper demo.

So I devoted two weeks of my free time and chunk of my saved up funds (including the VR Jam prize, which helped a lot) and worked day and night on an idea I have been toying with a while – SightLine with absolutely no user input except the head tracking, because continuing with locomotion didn't seem like the right path.

So SightLine: The Chair was made. I did my best (under the circumstances) to produce the most mind-blowing and beautiful demo I could with my limited resources, to show off what VR can do and also what I can do myself as a small taste of the ideas and concepts I have in store, hoping it would lead to the funding for the full project.

After anxiously releasing the demo to the public, fearing how it would be perceived, I encountered a problem. But it was one of the nicer problems to have– the demand for the demo overburdened the server, leading to about 2 TB of traffic in just a few hours. Luckily eVRydayVR offered his server to host the demo and everything was good.

SightLine: The Chair became a hit. I was overwhelmed with the positive feedback I got from people. I got tons of replies each time I released an update (and I tried to reply to them all, although some slipped through (sorry!)). Playthrough videos started popping up everywhere, even from quite big YouTubers (including very hilarious one by Markiplier again) and I watched them all, happy that people liked my work so much. I kept releasing updates based on feedback and I was immensely happy and empowered by the community.

Encouraged by all this, I talked with Oculus again, thinking that having such hugely popular demo would be a strong point to finally get some kind of solid support. But nope. To this day, I often feel that almost nobody at Oculus even knows that SightLine: The Chair exists.

I don't think that's actually the case of course, since they later gave me a Crescent Bay prototype and free ticket to Oculus Connect 2 (I wasn't able to be at the first one), both

of which made me really happy and excited (despite a certain person from the community telling me the CB is an outdated trash anyway and they actually give out better betas of CV1 to devs), but it still didn't help with the actual problem – getting resources to develop VR fulltime.

All I got were just another series of unanswered emails, half-baked answers and unfulfilled promises. My hopes were being constantly raised up and slowly shattered by the uncertainty, over and over again.

Being a young developer just starting his career made me almost entirely dependent on the help from others. I had many ideas and passion, but I lacked the time and resources to develop them. I hoped that would be enough for the Oculus, but the help simply wasn't coming. Sometimes they reached out to me out of the blue first, but either stopped responding half-way through, or nothing useful actually came out of the exchange.

I didn't know what more to do to get them to somehow recognize me and get some reliable communication channel. Not just for financial support, but for other kinds of help – help with promotion, or even submitting a build to their store, getting access to the latest unreleased SDK so I can prepare my builds (I had to wait for the release of CV1 for example to update my builds from 0.8 and still no progress on getting on Oculus Home, not to mention that I cannot even order CV1, since Oculus doesn't ship to my country) or getting access to the hardware so I can develop and test.

Making successful VR experiences didn't work, winning multiple VR awards (including their own 2013 and 2015 VR Jam) didn't help either, if I tried to complain a bit about the issues some community members lashed out on me for being whiny and bad-mouthing Oculus and sent me into spiral of self-doubt and depression, as I kept wondering if my complaining contributed to the Oculus avoiding helping me in any way.
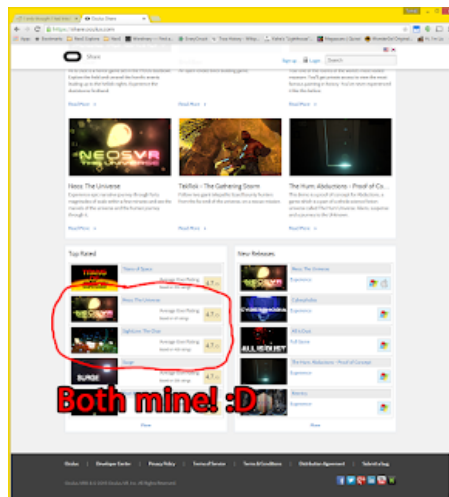
Two of my demos in the Top 5 category on Oculus Share at the same time. Still counts for almost nothing.

Oculus slowly changed from a company for whose hardware I was really excited to develop for, to a company whose hardware I only support because of their position on the market.

It's something that I'm unhappy about, because I feel that they have betrayed their principles and from what I've seen and heard, I feel as they let the community of developers and enthusiasts down. People who devoted big chunks of their time and money to make great VR content when few trusted the new medium would deserve a lot more support than they're getting.

But I still remain hopeful that this is just unfortunate side effect of their rapid growth and some degree of internal chaos and not deliberate work of some people in the background and that they will make me (and others) excited about them again.

Anyway, enough of the chronologically inconsistent ranting and back to the proper timeline.

It was clear that the help from them was unlikely, so I asked elsewhere for advice. A few people suggested to me that SightLine: The Chair isn't simply enough. It's just a demo after all, I need to develop a proper game to get support from them. Somehow they didn't realize that the reason I needed help in the first place was the lack of resources to develop a proper game in the first place.

Others have told me to "just get your ass on a plane and visit them in person, nobody trusts dealing over emails", also not realizing that the plane ticket alone costs easily $2000 (there and back) from where I live. And since I earned about $600 per month, I could hardly afford a plane ticket it on a promise of them maybe helping me. Once again, I lived in the wrong country.

They weren't particularly insightful comments for my situation, but they were infuriating nonetheless. People kept suggesting things that I was simply unable to do because of my situation (which fueled the feelings of hopelessness and despair, that no matter how hard I try, I just won't succeed) or they were way outside of my skillset (running a business/studio, finding investors and so on).

And so I continued my day to day contract development job and doing VR for living remained just a dream.

Finding a partner in crime

Working with VR in all of my free time wasn't entirely without its merit in the end (and I didn't make just SightLine of course, I did a bunch of other VR demos and experiments as well and made a few VR events/lectures in my country, but I don't want to bug you with those). Because someone from my own country noticed my work and got in touch with me.

Karel Hulec started his own VR project – the RiftUP upgrade kit and had run a few successful businesses before that as well. He had great interest in VR as well and has been following me for a while.

We eventually met and discussed great deal of things, not just VR, but science, technology and fiction and we ticked off immediately. I finally found someone who understands the same concepts as I do and who has similar motivations and goals.

While he didn't have the same deep level of understanding of more technical or creative topics as I did, he had a great knack for communication with people and running a business – something which I almost completely lack.

Great thing was that he actually understood the ideas and concepts I presented to him as well and we could have a proper discussion about them. We complemented each other greatly.

It was no surprise that we started cooperating on a VR projects. One of the most common and personal topics for both of us was education, so we decided to start a project together and we called it World of Comenius. A VR system designed to change the way we learn.

I started development of various demos, while Karel organized visits to festivals, competitions and other events. We demoed VR and our stuff like crazy, but kept hitting one problem over and over again: we spent most of the time pitching VR itself rather than our work, because most people were unfamiliar with the technology.

That also lead to another problem – money. The project had no customers at the moment, so we leapt from one contract project to another, developing demos and pitching VR to various companies around who have taken interest in the technology and exploring ways to incorporate it with their existing business.

This lead to another problem on itself. We didn't have time to focus on World of Comenius. It was the same issue all over again, but at least now most of the work was VR related. Despite the distractions, we managed to run the first class in Czech Republic using VR and win a prize (third place again) in the Leap Motion 3D Jam.

But the situation wasn't good for us. Almost nobody around knew VR and of those who did, not much came out from our talks and demos in the end. Companies, investors and accelerators were very distrustful of the new technology, let alone our ambitious ideas. We simply lived in the wrong country.

One call that changed it all

One night, after we've returned home after an extra busy day, we've received a very peculiar Skype call. It was from Tipatat Chennavasin representing Rothenberg Ventures. He invited us to River VR, the first accelerator for VR startups.

It was a bit of a last minute invitation, since the program was announced for a while and the submissions were closing in just a few days, and he had to reach us through Leap Motion developer relation. Naturally we were a bit distrustful, we had no idea what this program was and what would it entail.

But on the other hand, suddenly there was someone who didn't care where we lived, only about what we could do. They have seen SightLine and World of Comenius and decided they wanted us on the program.

We had only few days to decide and coupled with very erratic and busy schedule, the deciding wasn't easy at all, not knowing what we were getting into, but in the end we have decided to go for it.

For me, the decision was very difficult. The prospect of spending a few months in foreign country, doing who knows what was very scary. For several days in a row, I couldn't even sleep. So many unknowns only gave my imagination greater freedom, so I spend the sleepless nights anxiously imagining one terrible scenario after another. I'm simply a natural worrier.

But all that has disappeared when we first arrived. We were greeted by Tipatat who showed us around, introduced us to others and generally made us feel more at ease and welcomed.

Later that day he drove us to our hotel an in the car, he said something that I'll probably never forget. He told us that the reason they invested in the VR companies is because they *really* believe that virtual reality is the future and that's why they put the money into it, while everyone else just talks about it, but doesn't actually invest and instead waits.

The reason I won't forget that is because of how empowering it felt and how illustrative it was of a completely different mindset, one that we weren't used to at all. After struggling to get some kind of investment back home, or some kind of substantial help from Oculus, suddenly there was someone willing to support us based on the merits of our work alone.

I often kept wondering why it's so difficult to get help even from Oculus, since they seemed excited about my work. Were they just feigning excitement, hoping I'll keep making VR demos, without actually having to spend any resources to help me? Or was it because I'm too young and inexperienced for them? Or it is because where I live? Or maybe because I don't already have enough money to run my own studio, but instead I'm cobbling things together from my bedroom.

It was frustrating, because I didn't know which (if any) of those reasons it was and they were often reasons I had no control over. Many nights I have worried about those and wondered if I could do anything about them. The uncertainty simply gives too much room for the imagination.

People at Rothenberg Ventures didn't mind any of that (in fact, I think that they actually liked some of these aspects). They trusted us enough to give us some of their resources and that alone felt very motivating.

During the following weeks, we spend almost every waking hour of every day at the Rothenberg offices working and connecting with other VR startups and other relevant companies that they have brought in. We went to various events to showcase our work and got to meet influential people from the area.
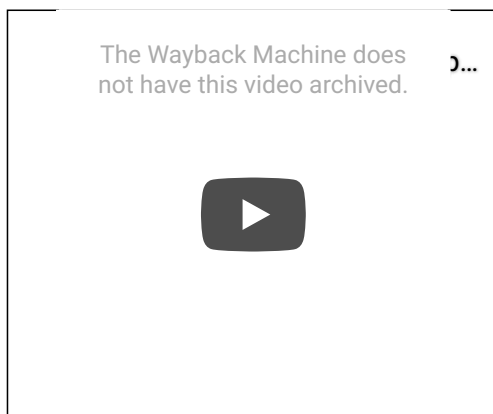
The entire experience was exhilarating. We no longer had to pitch VR to everyone we met. We were surrounded by VR enthusiasts (including the Rothenberg Ventures staff), people who understood the technology and its potential, we could focus on our work.

It was a very refreshing environment to be in, one that gave us great strength and a room for our vision to breathe. We met with a lot of smart people from the industry (not just VR, but related to VR) and exchanged our ideas, which was very rare before, as people we met back home were either mostly too ignorant (not in the pejorative sense) of our field to hold a sensible conversation about it, or simply unwilling to accept it because of their conservative values.

Letting the train run away to build a rocket

In the meanwhile, we continued our work. I've continued researching and developing light fields in which I have initially taken interest at December of 2014 as a side project, while World of Comenius slowly transformed into Neos: a much bigger and more grandiose project.

We released Neos: The Universe for the second Oculus VR Jam and soon won a third place (what is it with me and third places?). When demoing it to other people, we tried to convey how it is just part of our main vision for Neos itself, but that was mostly left with misunderstanding, because it wasn't clear from the experience itself.

That sort of became a new problem and source of worries, at least for me. Because of the big plans and visions I have for Neos, there's a lot of underlying work that isn't immediately visible.

I spent a lot of time designing and building architectural foundations and other parts of Neos that could support the big visions and offer something that nobody else does. Building such system requires a lot of patience and focus.

Meanwhile others have been churning out quickly made demos and showing off their work, while it seemed that we did very little. I wanted to avoid doing the same, because such quickly made demos usually lack depth to them – they're great showcases of concepts and ideas, but we wanted to focus on something a lot more substantial, something that will last for years, if not decades.

I also vehemently avoided another approach to development, where you start with quickly made demo and then keep piling on features. While this would allow to release eye candy updates at rapid rate from the beginning, the development speed would start dwindling as the project would go on, because it would become bigger and bigger hairball of messy design and code.

Instead, I have opted for the opposite approach, which has slow (visible) development speed at the beginning, but starts ramping up and accelerating as the project goes on, as everything benefits from a strong and stable framework. However, such versatile and well-designed software architecture requires a lot of effort and attention right in the first phase of the development, during which there's seemingly little progress, because there's nothing that's actually built on the system, since it lacks the critical mass so function independently.

The most difficult part about building system as complex and intricate as Neos isn't actually the technical part though. I've always found the technical part rather easy. It's very rare that I would get an idea and have absolutely no clue how to implement it. I always know where to start and eventually work my way to a full implementation.

Light Fields? Easy. Volumetric rendering of MRI scans? Done in two days. In the spare time when charging the battery of a quadcopter when visiting my dad actually. I'm not even kidding.

The trouble is that Neos is a very complex and expansive idea and requires a lot of time to work through all the aspects of it and thorough consideration to make sure everything fits neatly together, because I needed to find a set of basic elements which are both very simple and elegant, but interact in so many ways that they provide extremely flexible, but also consistent system.

I always know what to do from moment to moment, but there's just a lot of things to do. So I keep working for months, piecing the system and working through it all. But before the system comes together, there isn't much to show for it.

What I found most difficult is watching as everyone else is showing off their VR projects with quickly made solutions, but with a fraction of functionality, gaining attention, winning awards, participating at events, demoing in public, getting invited to VR shows and podcasts, while I'm piecing together my big vision in the shadows.

Coping with that wasn't easy though. I often feel guilty and anxious both towards people at Rothenberg, worrying that taking so long might worry them and make them question their support. I worry about not showing progress to the community as well and that I'll be simply forgotten and lose their support whenever I release something new – something that I value highly.

Funnily these worries sometimes actually help. Whenever I feel like I've lost motivation to continue working on the project, I keep going because of my fear of disappointing others, by not delivering what I have promised. It's not the ideal motivator, but it keeps me going through those times.

Distractions along the way

A few times I have actually pushed Neos into the background and worked on a smaller project, just to show something off, partially to mitigate those worries, for example with Neos: The Origin or even Neos: The Universe. I've tried incorporating as much code into them from the big Neos as possible, but having a lot of throwaway code in them was simply unavoidable.

Having those demos has proven useful in some regards (though the amount of time I have wasted on trying to (unsuccessfully) publish Neos: The Universe to the Oculus Store is infuriating) even to the development of the big Neos, since they provided a nice ground to prototype some concepts and have something solid to show others, but spending time on them kept pushing the big Neos further and further away.

I kept worrying about every hour I spent working on throwaway parts of the demo, just to make a deadline or make the best impression possible, because I could spend the time designing and building parts of the big Neos that were supposed to be built to last.

The matters were complicated by the fact that it wasn't simple question of partitioning time either. To work on the full Neos, I need to get into the right mindset where I have the project architecture in my head and I can immediately think through a lot of options and consequences of each design choice.

Switching focus to another project and then coming back produces certain overhead – a period of time where I need to get back into the right mindset, after being "distracted".

Sometimes the distractions come from other sources too – travelling, running errands or even publishing new update of SightLine (sorry guys!), trying to deal with Oculus or some big event that I missed (and usually getting infuriated or depressed as a result).

Sometimes they even come so often that I lose my focus on Neos just after I have gained it back again, further contributing to my worries about not progressing fast enough.

Devoting my life to VR development

For those reasons my colleague and I have decided to get rid of all (or most) of those distractions, so I can focus fully on Neos for several months straight and push it from the mild part of the (apparent) development speed curve towards the steep exponential bit.

We stay at our rented house most of the time, rarely go anywhere (except getting food and other necessary errands) or meet with anyone. Even online, I don't follow most of the news and community developments, because whenever I spend time not working on Neos, I get anxious about its progress.

So this is my life now. I wake up, move a few meters to my computer, continue working until I'm sleepy again. There's some food and hygiene between, but mostly just focused work. Day after day, night after night, month after month.

When I dream, I dream of my project. Sometimes I dream of solving technical problems, data structures, consistency checks. Other times I dream of architectural solutions and ideas and then I wake up already in the middle of conscious thought about Neos. This isn't a metaphor or euphemism, this has actually happened to me and it's been one of the strangest feelings I've ever had.

During the day, I daydream about Neos in its full blown state and all the awesome things I would be able to build with it, I think how many cool things I can add into it and how will I finally be able to share it with everyone else, hoping that they'll find it as brilliant and elegant as I want it to be.

And then, some days, I fear that they will not. I fear that it'll fail and go unnoticed, I fear that I'll disappoint everyone who trusted me and has given me this opportunity.

I fear that someone else will suddenly release something much better and all my work will go to waste. I watch as others rapidly release their VR projects, some of them fully focused on what will be just a small subset of what Neos could do (or something you could fully implement in a few hours with it), worrying that each such release will make Neos seem less awesome and interesting to others when it's ready.

But I keep pushing hard and working nonstop, happy or sad, depressed or full of enthusiasm, slowly building towards the big milestone, when everything will come together. Most of the time, only my own motivation to make this project work and excitement about its possibilities is enough to get me through the day. Other times it's the fear of disappointing others.

I often even wonder if I'm doing the right thing and making the right decisions. I question if I should be doing this at all, if I'm not overdoing it, if I'm not trying to get more than I can chew, if it's the right way to do things or if I'm the right person to do it.

The important thing is, I keep pushing on and it's paying off, because I can already feel the moment approaching. Just as I kept pushing and devoting my time and energy to VR when there was nobody to help me and support me, I keep pushing now.

I often feel very lucky that I've met my colleague, who could handle all the business and social things that I never could, while also having great passion about our project and great grasp of VR so we can discuss it in depth.

I feel lucky that people at Rothenberg Ventures decided to help us and thanks to their resources and efforts not only that we don't have to constantly worry about getting money for the next meal, rent or even new hardware and travelling, but we encounter so many new opportunities and people that we wouldn't otherwise.

Even just meeting with people from Rothenberg is extremely invigorating, often times with Dylan Flinn who took us under his wing there. It always refills our energy and motivation and makes me feel happy that they trust in our abilities to make great VR and our potential (to be honest, I sometimes wonder what did we actually do to deserve such great trust, but I'm set on proving it worth).

Sometimes I find motivation in work of other people or even entire teams and finding analogies and parallels. For example, building the foundation for Neos is a bit like team of rocket scientists working for months and years on so many separate parts, doings tests, simulations, assembling the rocket bit by bit.

For a long time, there's not actually entire functional rocket and the individual parts might seem to do "nothing" to laymen.

But then they get to the part when the rocket is standing on the launch pad, ready for start. Just a few last things remaining to put together until you hit the button and it flies.

I'm at that kind of stage right now. Everything is coming together so quickly, but still not fast enough. Every day seems to last forever. Every day counts more than the last. I work harder and harder, ignoring everything else, focusing just on the project, because I can't wait until it launches.

I can't wait until it gets into hands of people and it'll be clear to everyone not only what the big vision is, but how exactly is it being achieved. I keep hoping that Neos will end up powering so many VR experiences, anywhere from social communication to science and education, because people will see it as a useful tool.

I keep looking forward to the point when its apparent development will hit the exponential part of the curve, so I can keep releasing one new update after another, providing plethora of new abilities and functions and demonstrating all the ideas of how things could be done in VR that I have been piling in my head (and notes) for years, from enhanced communication, sharing experiences with family, working with mathematical formulas or collaborative VR way of editing audio and video.

If I ever gave up during the process, I wouldn't have the opportunity to devote this much time and though to these concepts. Even though majority of people can't or don't want

to help me, there are always some that do and it's thanks to persistence that you keep slowly accumulating those.

The cofounder of Solirax found me out of the blue, because he stumbled on my work online and without him I wouldn't be able to create and run a startup (and technically I still don't, he does, I just keep creating).

The writers from Road to VR (especially Paul James) have frequently offered to publish articles on my endeavors from the early days, bringing more attention to them.

On the other front, it was thanks to the ever growing VR community full of people who supported and spread my work among others, that the awareness of my projects has spread exponentially. When I was stuck in my country without funds, dozens of people have demoed my work in many different places in the world, for which I'm very grateful.

Thanks to this awareness, people at Rothenberg Ventures knew of my work when they were picking the startups for the first River VR accelerator and decided to invite us in, after the official registrations ended. They provided us with funding and support, that pushed our startup in ways we couldn't imagine.

Thanks to all of this, I can keep pushing on, despite all the difficulties and worries, towards the launch day of my metaphorical rocket. And when it finally flies, I hope it'll reach the stars.

Posted by Tomáš Mariančík at 10:55 PM   14 comments: Links to this post

Labels: accelerator, dream job, founder, motivation, Neos, not giving up, Oculus, Oculus Rift, Rothenberg Ventures, startup, struggle, success, virtual reality, VR

SUNDAY, DECEMBER 14, 2014

Why is fingertracking a must for the future of VR

Virtual Reality allows us to see new worlds as if we were inside of them, but without ability to touch and interact with them, it'll never be complete. I wrote down some of my thoughts on finger tracking for virtual reality.

I love making content for virtual reality and showing them to other people, observing their reactions as they suddenly find themselves in the worlds that I have imagined, designed and programmed to respond and react in the ways the real world wouldn't.

One of the most common reactions to first putting the Oculus Rift on is putting the hands in front of one's eyes and asking why they can't see them. Right now, you're invisible in many of the VR experiences. Sure, you can look down and see a body, but it doesn't do anything that your body does, it's not really yours. The easy way around this is to position yourself in the same way as your VR counterpart to increase immersion.

But doing VR right isn't going to be easy. The head mounted display takes care only of the visual part, but there's a lot more to the world than just seeing. We have a very long road ahead to cover all the other senses, but even now some technologies are exciting and quite useful for VR, namely finger tracking.

Technologies like Leap Motion, ControlVR or Nimble Sense resolve the common question "Where are my hands?!". Sure you could've used a Hydra/STEM, but I don't grab some object and move it in front of my face to see my hand... that's what I do when I want to see an object I've grabbed, which is what devices like STEM are good for – holding things in VR, like mech control handles or guns.

Don't get me wrong, they have amazing applications as well and I have great plans for such controllers in VR, involving some over-the-top fast-paced action with unique hi-

tech virtual "guns" that make you feel like you're holding a portable nuclear bomb. Using them for various precise tool tracking applications, such as 3D drawing or modelling, makes perfect sense as well, since you're actually holding some tool, instead of using your bare hands.

However what I want is to see my hands as I would see them in real reality (can we call it RR? :3). But what's more, I want to use my fingers – and this is where devices like STEM are coming short. They can track overall position of my hand, but not my fingers – it's effectively like having stubs in place of your hand.

Very early version of World of Comenius using the Hydra controllers.

When Leap Motion introduced the VR tracking, I quickly glued my Leap Motion to the Oculus and started playing around and integrating it with my own applications, namely World of Comenius. At the time, it was sadly glitching to the point of being unusable. Luckily people from the Leap were very helpful and listened to the feedback and criticism and over the time improved the tracking software significantly and it's likely to continue on that road.

Early version of the Leap Motion integration, with quite painful glitches that made it mostly unusable.

Fingers are extremely versatile appendages. Just think about how many things we do with them. We write, we paint, we type, play games, interact with variety of devices or even gesticulate. The article you're just reading is result of series of fine movements of my own fingers and so was the virtual reality software I have created.

That software is built on top of work of a lot of other people, from Leap Motion, Oculus or Unity, running on hardware designed by thousands of engineers, inputted into computers with their own fingers. Much of the technology, software, art and entertainment in our society was expressed and built by a long series of fine finger motions.

Interacting with virtual reality using your fingers is therefore crucial, as it opens a plethora of options. If you want to grab an object in front of you... well you go and grab

it. Sounds better than moving a controller thingy near it and pressing and holding a button to express such action. No, not that one! Move your finger higher. No not that high, ugh let me just position it for you since you can't see through the Oculus...

Of course things are still far from perfect now. Not only the finger tracking solutions glitchy, high latency or expensive, but we are completely missing tactile sensation. We can interact with the world, but we can't feel it yet. It's like interacting with intangible holograms – which is the narrative I've actually chosen for World of Comenius, including a hologram-intersection effect when you put your virtual hand through the virtual object.

World of Comenius in its current stage, Leap Motion tracking improvements made it quite usable in most cases.

Fortunately there are already solutions appearing, such as using ultrasound array to give a tingly feeling to our fingers in the midair. Now we've got some semi-tangible holograms that we can interact with, which is a lot better.

But even with mid-air haptics there's an important element missing: Our sense of proprioception. When the fingers get near an object, sure it starts tingling, but we can still put our hand through it. We can't press the fingers against its surface, or grab it with your fingers and have the sense of not being able to push through and our fingers staying in the same position, despite the pressure we're exerting.

We're not interacting with tangible holograms, but still holograms. I'm not sure what the solution to proprioception is going to be. Maybe some simple one could involve some pads on fast robotic arms with the finger tracking, quickly moving near anything that the fingers can touch and exerting a force against?

I don't know, but I certainly hope it will get resolved before we go full VR and just directly stimulate our brains and read their outputs – because that's probably going to take a while.

Meanwhile, we'll have to make do with what we have. It may be glitchy and far from perfect, but it's still fun to play with. No technology was ever perfect from the beginning and ambitious goals are going to take a lot of work to achieve, so we can at least enjoy the increasingly more convincing glimpses of the perfect VR as we progress forward.

Coming next: Behind the scenes of SightLine.

Posted by Tomáš Mariančík at 6:29 PM   7 comments: Links to this post

Labels: finger tracking, fingers, future, hands, interface, Leap Motion, natural interfaces, NUI, Oculus Rift, sensors, virtual reality, World Of Comenius

SUNDAY, NOVEMBER 17, 2013

How science makes world more fascinating and wonderful

Have you ever heard from religious people that we should look at the trees, rocks, birds and the whole nature and tell them that there's no creator for all this beauty? Have you encountered opinion that science, reason and careful empirical examination of the world around us strips away this beauty?

Have you ever heard from religious people that we should look at the trees, rocks, birds and the whole nature and tell them that there's no creator for all this beauty? Have you encountered opinion that science, reason and careful empirical examination of the world around us strips away this beauty?

I can't count the times I have heard this "argument" against science and god and I think it couldn't be farther from the truth. If someone looks at the trees with absolute ignorance in regards to how they work and finds them beautiful, why person who knows a lot about them cannot do the same?

In fact knowing all the intricate processes going on in every leaf, every branch, every single cell of the large tree, understanding how the chaotic chemical orchestra results in life, growth and all the other properties of the tree we can observe, comprehending how the tree got there and how it evolved via long process of small changes and how its characteristics that the ignorant person finds beautiful developed only adds more beauty and fascination.

An educated person can admire not only the parts of the nature we can perceive by naked eye, but also all its beautiful details that are revealed only by careful investigation and scientific experimentation and evidence gathering.

When an ignorant person looks at a tree, he sees just the "shell" visible to our senses. When an educated person looks at a tree he sees the "shell" as well, but also thinks of the huge amounts of cells, working together to make up a living tree. He also thinks of the hundreds of millions of years of biological development that led to the beautiful object of admiration in front of him: an image hundreds of millions times more beautiful and fascinating than just the outer shell.

Educated persons will know how every cell of every leaf of a tree will break molecules of water to extract an electron so it can be used in the photosynthesis process and the oxygen molecule that breaks away from the hydrogen is then released in the air and later inhaled by us, transported around the body and into our cells, where it accepts a different electron, links with a different hydrogen ion, producing a molecule of water, as the end stage of cellular respiration which provides our cells with energy products it uses for many of biological functions, some of which result in the neural processes of thinking and admiration of this beautiful cycle.

Person admiring with ignorance has no chance of seeing and understanding this immense beauty if they choose to remain blind to many aspects and details of the world they live in. And this shouldn't be insult to these people. No, I encourage them: find a book, find a documentary, read an encyclopedia, even go to some university courses to educate yourself.

If the blurry shallow picture of nature and world around you is enough to fill you with wonder and amazement, learning about all the intricate details will blow your mind. Science and understanding doesn't make the world around more boring, that's just a stupid stereotype repeated again and again by people who don't understand science and what kind of people many scientists are or were.

Science makes the world a billion times more beautiful because it gives you billion of details interconnected with each other in variety of ways to admire and fill you with wonder. There's no need to make up things about the world to make it more wondrous.

The world is full of wonderful and amazing things by itself, you just need to open your eyes to it. Science is just a reliable method to examine it in detail with highest accuracy and certainty as possible. And you can go even further, becoming a scientist and searching for new things about the world for others to admire.

There's no reason why seeing much more of the world you live in would take away its wonder. Admiring from ignorance is like seeing extremely blurry photo of a masterpiece

painting with washed out colors. Sure you can find some beauty in the mystery of wondering what the fuzzy shapes might be and trying to interpret them in some way, but you can never appreciate all the details and vibrant colors and seeing how all the bits of painting are interconnected, forming a complex coherent picture that you can admire in all its beauty and complexity for the way it really is, instead of fuzzy blurry guessing of what it might be and what it might mean.

If you really want to admire the world around you and for what it really is, try opening your eyes fully to it, instead of looking through thick distorting glass of ignorance and claims without proper evidence.

Posted by Tomáš Mariančík at 1:21 AM   No comments: Links to this post

Labels: Atheism, atheist, beauty, beliefs, biology, evolution, ignorance, nature, rational, reason, religion, science, thinking, universe, wonder, world

SUNDAY, OCTOBER 27, 2013

My take on the free will

Free will. Popular topic discussed by philosophers and scientists. Do we have it? Or do we have just an illusion of it? Can we be held responsible for our actions? I would like to share my position on this subject with you. Because I have no choice but to do that :-)

People feel that they have free will that is a free control over their decisions and actions. We punish people when they decide to do bad things to others, because they are the ones who freely choose that harmful behavior and thus are held responsible for their actions.

There's an idea of free will that you can do absolutely anything, going around the laws of the universe is obviously not true, otherwise I wouldn't be in this kind of universe, writing this article, since I would be too busy playing around in a world of my own choice. So let's focus on a free will that means we have any choice over what we do within the possibilities of our bodies and the universe we inhabit.

Are we just decision making algorithms?

We are made out of matter and energy, including our brains, which are very intricate "machines" that process information and control our behavior. We *are* our brains, at least everything we know at this moment points to that. If our brains are complex machines that work according to a determined set of rules that essentially boil down to very convoluted and complex interactions of basic elementary particles, does that mean that we have no free will and are subject to the laws of physics?

If we write a program that takes certain data as input and produces certain decision as output, did it achieve that decision by its own free will? It simply followed its predetermined behavior, a set of rules that given the same input variables produce the exactly same result. Even if we made the algorithm very large and convoluted, with many input variables influencing its output in various ways, its decision making process would be very difficult to follow as well as the influencing variables, but it still wouldn't make a free choice, but simply follow a deterministic set of rules.

Does randomness help?

And what makes us think that our brains are different? Perhaps quantum physics can help us here, with the uncertainty principle. It would be analogous to including a random number generator as an input variable (consider source of true random values, not a pseudo-random generator for the sake of argument). Then, given the same input variables (sans the random one) it would produce different result each time.

But does that make its decision making process actually free? It still follows a predetermined series of steps in order to achieve a conclusion. It's just that one of the

input variables is randomized and unknown in advance, which also means that the algorithm has no choice over it. There's no conscious element choosing a particular outcome, only undetermined event influencing deterministic algorithm. Furthermore, given same determined input variables and same randomized variable, the algorithm would still produce same result.

So even if nondeterministic phenomena had any significant effect on the decision making process of our brains and neural networks, it would hardly be a free will.

No… for a true free will, our minds would have to exist outside of the causality and laws of physics, controlling our brains and bodies like puppets, but nothing in all the knowledge and understanding of how our brains work seems to indicate anything even remotely similar to that. So there's little reason to believe there's actual free will.

What kind of "free will" do we have?

But why do we feel that we have free will? Free choice over what we do and how we behave? Is free will just an illusion?

Indeed it is. Our behavior and decision making process is at the principle no different from the simple computer algorithm, but much more complicated and convoluted, with millions or even billions of various influences – "input variables". Our behavior and choices are influenced by our genetics and environment.

As have many experiments shown, genetics has large say on our personality and nature, which interplays with the environment from the earliest stages of development in the womb. Differences in nurture can alter the way our brains develop and are structured to some extent as does education and interaction with the world after we're born.

Each day we are bombarded with tons of new information that our brains process and we are consciously aware only of small portion of it. Our conscious mind can't keep track of all the influences, of the countless numbers of "input" variables that are continuously processed by our brains and in various ways influence the "output" – our behavior and choices we make.

Our decision can be influenced both by immediate experiences, like reacting to something that just happened and distant experiences, like a traumatic event in our childhood (but also much more subtler ones). We can't control all these variables that produce our decisions and we can't even be aware of all of them, therefore we aren't aware of how we actually reached to our decisions. Our behavior is even heavily influenced by our endocrine system as various hormones bathe the brain and influence its function.

However we consciously experience some of the mental processes that process the input stimuli and output a decision, which is why we have illusion of free will. The decision making process isn't a black box from our perspective. We *are* the decision making process.

Unlike a simple computer algorithm, we contain many more "algorithms" that process the world around us and take care of rationalizing, conscious thought, emotions. Our mind is interplay of these interconnected "algorithms" which are involved in various ways in the decision making process. Even if our rationalization and thinking follows some predetermined rules, it's complicated and convoluted enough that it creates illusion of free choice.

So if I were to define a free will that definitely exists, I would define it as some self-aware "entity" (which can be manifestation of interactions of various parts of the brain, not a single physical thing) experiencing at least some of the decision making process, even if that process is completely deterministic and follows some physical laws that the entity has no control over.

Under that definition, we *do* have free will, but simple computer algorithm doesn't. If we were to create a complex computer algorithm, which was capable of reasoning the way we do and internally experiencing its own decision making process, it would also have this free will, even if it's just an illusion.

What responsibility really means

If we have no true free control over our actions and our behavior is just very convoluted and complex set of interactions which all boil down to the laws of physics, how can we attribute responsibility for someone's actions? How can we say that someone is responsible for certain action when what they did is simply a result of the physical laws?

The whole world is full of specific interactions that follow the laws of physics. And we call some bunches of particles arranged and interacting in certain way X and another arrangement interacting in different way Y or even different interaction of the same arrangement Z. Considering this, free will is nothing more than another group of particles interacting in certain way.

Of course, no arrangement or interaction is the same. For example each apple is completely unique and I think you would have problems finding two apples that would be exactly the same, down to every single molecule. So it's not about naming very specific arrangements something, but rather arrangements that have certain common and similar features. The whole word is fuzzy and only things that have enough apple-like features will be called apples, even if it's just our concept and there's no intrinsic concept of "apple" or any other isolated entity in the laws of physics.

And some other sets of arrangements of particles we call humans and we also label their interactions and actions in various ways. We can say that given person is responsible for certain action, because it originated from it. Free will is not necessary to assign responsibility and blame to some entity, if we say that responsibility means that given event was a result of actions of given entity.

Falling rocks and murderers

This of course means that if a large rock falls and kills a person, we can say that this rock is responsible for killing that person as well as the events that led to it falling down, whether there was any decision making process involved or not. It's simply a non-factor. The rock could have fallen down perhaps simply due to unfortunate conditions and timing or perhaps a person made a decision and pushed it over with intention to kill someone else – in this case we can trace the responsibility to this person.

Some would ask a question then: Why don't we lock up the rock in prison then? And the answer is quite simple: Because it doesn't make any sense. But why do we then lock up murderers and serial killers in prison, when their behavior is simply result of physical laws of the universe?

Because we have evolved in a way that we try to ensure our further survival, we have to deal with these things in order to prevent any more harm to our society and to individuals. And while both rock falling by unfortunate timing and a person consciously deciding to shoot someone were simply following physical laws and are same in this regard, their properties and the way the series of interactions led to death of someone else are very different.

And that difference is what we base our response on. We should always try to find the best possible way to eliminate harm. Locking up rock in a prison is nonsensical, because the rock isn't capable of intentionally rolling around and falling on people again. A person on the other hand can keep shooting and killing more people if left free.

Free will or even conscious thought are irrelevant when dealing with potential harm: we have to consider the specific situation and circumstances and approach each case differently based on its nature and the way it could result in more harm.

In case of rock, we might place any loose rocks in the area somewhere else, where they have no risk of falling down. Or we can build barriers to stop them. Or also put up warning signs or even find alternate, safer route.

In the case of a person killing others, we can put this person in prison, to prevent any further murders. We can assign responsibility for the deaths to given person, when the person executed actions that led to these deaths. Therefore putting this specific person which kills other persons in prison will ensure safety of others.

Unfair world and the insane

Is it fair to the person that the physical laws ultimately led to them behaving in that way and ending up locked down? It's definitely not. But it's not fair either for people who are being killed or harmed in other way if the person is left free. And after all, we all follow the laws of nature and if the killer has no actual free will and choice to do things he did, neither do other people who capture this person and put it in prison to protect others.

Ideally we should try to influence these people in a way that they can be reintegrated back to society and have better life themselves. More importantly we should look for ways to help other people in less fortunate circumstances to prevent harmful behavior happening in the first place.

There's also difference between someone who hurts others for personal gain and a mentally ill person. While both people had no actual choice in their behavior and their actions were determined by many factors following the physical laws, there's a difference in the actual cause of their harmful behavior and the way we deal with them.

People in the first group usually understand that their actions will hurt other people and when dealt with appropriately, there's a possibility they realize what they've done and won't do it again and can be reintegrated in the society.

The other group however has their reasoning skills impaired in some way. The legal system can classify them as "Not guilty for the reason of insanity", but they are still the ones responsible for the things they did, even if their action stem from different mental processes. And we deal with these people different as well.

We take care of them in mental asylums, which are better suited for their situation. The point is, even though both groups are following the same basic physical laws, each one is structured somewhat differently. Their circumstances are different and just as we don't treat rock falling on people and a murderer the same way, we don't treat people who murder for personal benefit and are reasonably and people who don't realize they are actually killing others the same way.

Different response for different circumstances

Different circumstances need to be dealt with differently, even if they all boil down to the same physical laws.

Our own bodies deal with harmful elements, like bacterial or viral infections or cancerous cells and try to remove or eliminate them. Some cells can go rogue by a set of biochemical reactions that are simply unfortunate coincidences, but following the very same laws of nature as all the other healthy cells and they are sacrificed and destroyed to save the whole organism.

Same could be applied to society – certain kinds of behavior are simply harmful to the society as whole and we need to deal with them. Ideally not by destroying them, but by containing and helping them to change, so they can function better with others.

The world isn't a fair place. Lives of some are very lucky and full of joy, lives of some are extremely unfortunate and filled with pain and suffering and there are a lot of people somewhere in between these two extremes. But we should try to find ways to create

influences and environment that push as many people as possible closer to the lucky side and generally make everyone's lives better.

Even though all our actions and interactions might follow the physical laws and our free will is an illusion, we don't know what the future will bring because of the sheer amount of influences. My hope is for a world that better and happier place for everyone.

My hope is that the laws of nature will give people no choice but to create such world.

Posted by Tomáš Mariančík at 11:10 PM   No comments: Links to this post

Labels: blame, determinism, environment, free will, freewill, influences, interactions, law, mind, murder, philosophy, quantum physics, responsibility, thinking, universe

FRIDAY, OCTOBER 11, 2013

A year of freelance self-education (+ rambling about biology)

It's been a while since I have decided to drop out of the college/university and keep learning on my own, as I've been doing for a while. Recently I was asked how it feels and if I regret that decision by someone and I think I could share more elaborate answer with you.

I'll start with a quick answer: No, I don't regret my decision. On the contrary, I am very happy about it and educating myself further without the combined variety of pressures of the college life feels much more relaxed and enlightening.

I've learned a lot over the time. I bought myself a bunch of books on various topics outside of my current area of expertise (computer science): most importantly a big biology textbook that covers everything from basic biochemistry to whole ecosystem (and is appropriately lengthy), since the realm of functions of biological "machines" was one of the most unknown ones to me that was also bugging my mind the most.

And when I don't know almost anything about something, it burns. Not knowing is like extra flammable oil poured into the fire of curiosity. And that's what really pushes me to learn about things: just my natural curiosity and desire the understand things and how the world works. I don't want to learn things because I *have to* according to the school curriculum, but because I *want to* know more about them.

Natural curiosity is good enough motivator to spend hours buried in textbooks and researching materials.

One thing I found during my time at the school is that it can have quite opposite effect and rather suffocate the flames of natural curiosity. The pressures can distort normally captivating study materials into repulsive shapes, making me actually annoyed to go through them, simply because I am forced to.

It's well known that people have more trouble acting under a pressure and might not find many activities as entertaining. While a lot of the pressure is natural and unavoidable in daily life, some of it might be unnecessary and artificial and these could be eliminated and more importantly *should be* eliminated.

Even though I found certain topic interesting (although as I often like to say, I find **everything** interesting) I found myself often annoyed with having to go through it according to some premade schedule. I didn't have much freedom to adapt the learning process to my interests and style. I got annoyed by spending too much time on things I understood well and going too quickly or superficially over things I didn't understand well enough.

Natural curiosity *can* be suffocated by the school environment conflicting with personal needs of a student and actually have negative effect.

But dropping out of college and using the free time to structure the learning to my own needs did wonders. I found many books and resources on topics that caught my interest or that I needed for some project of mine and I am still finding more and more. I feel literally like a kid in a candy store, with sweets made from knowledge and understanding, not knowing what to learn first.

Nothing is pushing me or forcing me to learn something in specific way or order so instead I chew through the knowledge (and I mean actual understanding of it as well, not just memorizing stuff) candy naturally, how it bests suits me at the moment. If I get tired with particular area, I go do something else for a while, or if I would like to get more details or alternate explanations, I just go and find them.

Learning new things became very natural, relaxing and enlightening experience for me.

One thought that went through my mind, but more importantly through minds of others I encountered is that without school, without the external pressure, I'll get lazy and stop learning.

Learning has also become entertainment for me.

Yet I find myself trying to read more and more every chance I get, sometimes even having to sadly put the book down (or rather close it, since I mostly read electronic variants), because I have to do some work on a project.

I was always very curious, ever since I was a little kid I was always asking questions and always spent hours buried in books and encyclopedias and I'm very glad that I retained this curiosity and hunger for knowing more.

The very act of learning more about how various aspects of this world work is very enlightening, adding data and details to my internal model of it or even correcting some parts is very fulfilling. The better grasp of reality I get, the better I understand why things happen and how can I affect them or use them for my work.

Just a few months ago, I knew almost nothing about how organisms work and now, even though I'm only about a quarter into the Biology textbook (but it's a pretty thick book) my understanding is much higher.

Whenever I look at animals, plants or even some phenomena involving microorganisms, I think of various biological processes happening inside of them, I think of how they developed, how they got here. And even though I understand only a fraction of all there is to know about these I still feel fascinated by the beauty of it wanting to learn more.

Understanding the world in all its complexity involves finding relations and connecting things, seeing what I actually learned in the world around me and realizing how various areas and fields relate. But the amount of information and details is so overwhelming that thinking I understand things around me fully would be pretentious and arrogant.

I love connecting my new knowledge and understanding to the real world around me.

Biology is fascinating subject and coming from computer science and engineering background makes it even more peculiar. Organisms are essentially complex molecular "machines", but they're machines without a designer. At least an intelligent one.

When I look at function and processes in a cell, I see chaos. The biological processes result from (semi)-random interactions of molecules, floating around, bumping into each

other, forming groups or dissolving and interacting in various ways.

Yet there is an order within the cell, because only the interactions and molecules that are good at keeping the whole system going and propagating themselves remain. The randomness is filtered by the conditions of reality and environment. The natural laws of physics are "designing" and "guiding" the development.

There's no intelligence involved however, there's no foresight or sense of elegance and clean design. Organisms are overly convoluted bunch of chemical reactions interacting with each other and often tend to compensate for this chaos by robustness and quantity, so on the outside they seem to function very well with a sense of direction, function and purpose.

But apparent sense of purpose of organisms is just an illusion.

Biology has also some interesting relations to computer science (or vice versa). Ribosomes translating RNA to polypeptides, using a sequence of specific molecules as "instructions" are very like a Turing machine. The cells have various ways of communicating with other cells or environment, a protocol involving various other molecules that trigger whole series of reactions.

Some of the processes even inspire engineers when creating solutions for problems, for example using the principles of evolution in evolutionary programming to sift through a large set of possible solutions with fitness criteria over thousands simulated generations to get the very good ones.

Biology and Computer Science seem to have more in common than one would imagine.

And not just that, we can take the inspiration a step further, because engineers can do what nature generally can't: Design with a foresight with some intended function and redesign certain parts when they become overly convoluted.

Nature can change the "design" of organisms only by small steps to changing conditions. Much like when you're developing software and your client keeps changing his mind all the time, the constant changes and modifications result in chaotic disorganized code. And we can see that in biology.

But programmer or engineer can do a great thing when this occurs: Erase the whole design and start anew, designing the system from the scratch to handle all the complexities it's supposed to handle in the most elegant way possible. Unlike nature, he doesn't need to change the system in a series of small steps from something very simple to something more complex.

If life had a designer, it was a brain dead one. "Retarded design" seems to be more fitting than "Intelligent design".

But we can get inspired by biology and take it a step further using our intelligence, which we, funnily enough, obtained by this long process of random variations in biological processes over many generations of organisms. This reminds me of bootstrapping in computer science, where a simple program can initiate a much more complicated one.

I wonder about the day when we will be capable of creating a "super-organism", a being much more efficient, intelligent and generally well-designed by an actual intelligent designer(s) compared to ourselves.

And to do that we have to understand the world we live in as best as we can. And that's why I love learning about everything I can. It satisfies my curiosity about the past, how things developed, from galaxies, to intelligent life, about the present and inspires me about the possible future.

At the moment I am captivated by biology (hence the musing about it above), but I already found interesting books on geology, psychology, cosmology or quantum computing and I can't wait to get into these topics as well.

All this fuels me to get more books on various sciences, not just one and hopefully use that to contribute to building a fascinating future as much as I can during my life.

Well… enough rambling, back to learning and working on cool stuff :3

Posted by Tomáš Mariančík at 3:17 AM   No comments: Links to this post

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