

Part XXVIII

Future of Informatics - Chapter 8

Chapter 9: SINGULARITY

**life after a merge
of biological and non-biological intelligence**

- Food for thoughts.
- Singularity and singulatarians - basic views.
- Roads to Singularity and its visions.
- Principles of Singularity.
- Basic Impacts of Singularity.
- Some key elements of singularity: nanobots and virtual reality.
- Long term impacts of Singularity - saturation of universe with intelligence.
- A word of caution - what can be really expected.

WISDOMS - I. Samuel Butter, 1863

There are few things of which the present generation is more justly proud than the wonderful improvements which are daily taking place in all sorts of mechanical appliances.....

But what would happen if technology will continue to evolve so much more rapidly than the vegetable and animal kingdom? Would it displace us with supremacy of earth?

Just as the vegetable kingdom was slowly developed from the mineral one and, similarly, the animal kingdom from the vegetable, so in these last few ages an entirely new kingdom has sprung up, of which as yet we have only seen what will one day be considered as a prototype of the race....

We are daily giving [machines] greater power and supplying them by all sorts of ingenious contrivances, such as self-regulating and self-acting power, which will be to them what intellect has been to human race.

Samuel Butter - 1863, 4 years after publication of Darwin's *The origin of species*

- Who will be man's successor? To which the answer is; we are ourselves creating our own successors. Man will become to the machine what the horse and dog are nowadays to man; the conclusion being that machines are, or are becoming, animate.

Samuel Butter, 1863

- When first transhuman intelligence is created and lunches itself into recursive self-improvement, a fundamental discontinuity is likely to occur, the likes of which I cannot even predict.

Michael Anisimov, 19??

- The ever-accelerating progress of technology gives the appearance of approaching some essential singularity in the history of the [human] race beyond which human affairs, as we know them [today] could not continue...

John von Neumann.

- It seems probable that once the machine thinking method had started, it will not take long to outstrip our feeble power. They would be able to converse with each other to sharpen their wits. At some stage therefore, we should have to expect machine to take control.

Alan M. Turing

- Philosophers have long noted that their children were born into a more complex world than that of their ancestors. This early and perhaps even unconscious recognition of accelerating change may have been the catalyst for much of the utopian, apocalyptic, and millennialistic thinking in our Western tradition. But the modern difference is that now everyone notices the pace of progress on some level, not only the visionaries.

John Smart.

- Yes, we have a souls. But it is made of lots of tiny robots.

Giulio Gioreli

- If men cease to believe that they will one day become gods, then they will surely become worms.

Henry Miller's (1891-1980)

- We are what we choose.

Jeff Bezos, Amazon.com founder, 2010

- This is the first self-replicating species we have had on the planet whose parent is a computer.

J. C. Venter, 2010, after announcing creation of a synthetic cell.

- The question whether a **computer** can think is no more interesting than question of whether can swim **a submarine**.

Edsgar Dijkstra

- The problem is not simply that Singularity represents the passing of humankind from the center stage, but that it contradicts our most deeply held notions of being.

Verner Vinge

- It's change, continuing change, inevitable change, that is a dominant factor in society today. No sensible decision can be made any longer without taking into account not only the world as it is, but also as it will be. This, in turn means that our statesmen, our businessmen, our everymen must take on a science fictional way of thinking.

Isaac Asimov

- Let an ultraintelligent machine be defined as a machine that can far surpass all intellectual activities of any man, however clever. Since the design of machines is one of intellectual activities, an ultraintelligent machine could design even better machines; there would then unquestionably be and "intelligent explosion" and the intelligence of man would be left far behind. Thus the first ultraintelligent machine is the last invention that man needs ever make.

I. J. Good, 1965, a British mathematician

- If the technological Singularity can happen, it will.

Verner Vinge

- Man is something that should be overcome.. Man is a rope, tied between between beast and overmen - a rope over an abyss... What is great in man is that he is a bridge and not an end.

Friedrich Nietzsche

- The human mind likes a strange idea as little as the body likes a strange protein and resists it with the same energy.

W. I. Beveridge

- The only way of discovering the limits of the possible is to venture a little past them, into the impossible.

Second law of prediction of Arthur Ch. Clarke

(1917-2008)

SINGULARITY - WHAT IS SINGULARITY ABOUT? I.

- The term *singularity* was borrowed from mathematics and astrophysics.
- In mathematics, a singularity is a value that is beyond any limit - in essence in infinity. Formally, at a singularity point the value of a function is not defined and it can be shown that it exceeds any finite value.
- In astrophysics singularity refers to a point in a space-time - for example, inside a black hole - at which the rules of ordinary physics do not apply.

SINGULARITY - WHAT IS SINGULARITY ABOUT? II.

- In our use, the Singularity is the future period during which the speed of technological progress will be so rapid, and its impacts so deep, that humanity - our bodies, our minds, and our civilization, will be completely and irreversibly transformed.
- The first reference to "singularity" as an event capable to change human history is von Neumann's statement quoted above and refers to the state of society after non-biological intelligence overcomes biological one.
- Singularity, as we will deal with, does not represent infinity concerning computation, memory or other measure of information oriented technology, but refers to their nowadays hardly imaginable levels.

- Singularity will represent a culmination of the merge of our biological thinking and existence with our technology, resulting in a world that is still human but that transcends our biological roots.
- Singularity epoch will transform concepts that we rely on giving the meaning to our lives - from our business models to the cycle of human life, including death.
- To truly understand singularity inherently changes one's view of life in general and one's own in particular.
- The key observation leading to the vision of singularity is that the pace of change of human-created technology is accelerating and its powers are expanding at exponential pace.

- The principal assumption behind our expectations of singularity is that non-bio mediums will be able to emulate richness, subtlety and depth of human thinking.
- The key problem behind believing in singularity is that exponential growth is very deceptive and extremely hard to envision its impacts.
- Though the vision of singularity may look as a science fiction, it is much better to take it as a serious hypothesis about the future of life on Earth.
- One should pay large attention to the ideas of singularity because if it turns out to be real, it would be the most important thing to happen to human beings since the invention of a language.

- Singularity is an expansion of human intelligence by a factor of trillions through a merge with its non-biolog. forms.
- The Singularity will represent culmination of the merger of our biological thinking and existence with our technology, resulting in a world that is still human but that transcends our biological roots. There will be no distinction, at post-Singularity, between humans and machines, or between physical and virtual reality.
- Singularity will bring a change in the nature of our ability to understand. We will become vastly smarter as we merge with our technology.

- In Singularity there will be not a distinction between humans and technology. This is not because humans will have become what we think of as machines today, but rather machines will have progressed to be like humans and beyond.

SINGULARITARAINS - I. WHO THEY ARE?

- Singularity is someone who understands the Singularity and has reflected on its meaning for his or her own life.
- Singularity currently form a movement or a community.
- Though there is quite diversity of opinions among singularity what the Singularity means and when and how it will or won't happen, they share a worldview.
- Singularity think in terms of deep time, they believe in the power of technology to shape history.
- Singularity have problems to believe that so many people live their life as if the artificial intelligence revolution was not about to erupt and change absolutely everything.

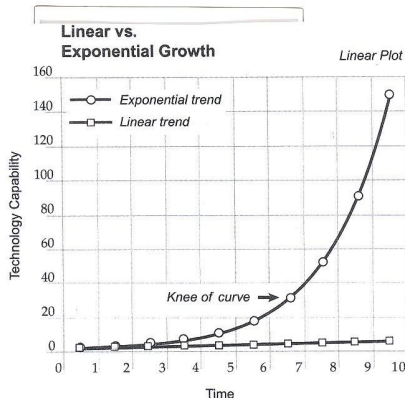
- Singulatarianism is fundamentally an understanding of basic technology trends.
- Singulatarianism is simultaneously an insight that causes one to rethink everything, from the nature of health and wealth to the nature of death and self.

SINGULARITARIANISM - WHAT IS IT (NOT)?

- Being a singulatarian is not a matter of faith but one of understanding of the science and technology trends and their impacts.
- Singulatarianism is not a system of beliefs or unified viewpoints.

- The common wisdom is that the human life is short, that our physical and intellectual reach is limited and that nothing fundamental will change in our lifetimes.

DECEPTIVENESS of EXPONENTIAL GROWTH



Linear versus exponential: Linear growth is steady; exponential growth becomes explosive.

We are now in the stage where growth of the potential of information based technologies is beginning to reach the "knee of the curve".

PERSONAL VISIONS of RAY KURZWEIL - I.

- We have the means right now to live long enough to live forever. Existing knowledge can be aggressively applied to dramatically slow down aging process so we can still be in vital health when the more radical life extending therapies biotechnology and nanotechnology will be available. In this spirit we can reprogram our biochemistry and we should do so.
- Our bodies are temporary. Its particles turn over almost completely every month - only the patterns of body and brain have some continuity. We should try to improve these patterns by optimizing the health of our bodies and extending the reach of our minds.
- We need a body, but once we incorporate molecular nanotechnology fabrication into ourselves, we will be able to change our bodies at will.
- Knowledge is precious in all its forms: music, art, science, technology. As well as embedded knowledge in our bodies and brains, any loss of this knowledge is bad.
- Information is not knowledge. The world is awash with information. It is the role of intelligence to selectively destroy information in order to create knowledge.
- Death is a tragedy. It is not missing the point to regard a person as a profound pattern (a form of knowledge) which is lost when she or he dies.

PERSONAL VISIONS of RAY KURZWEIL - II.

- A primary role of traditional religious is deathist rationalization - that is rationalizing death as a good thing. This was nicely expressed by Malcolm Muggeridge as **if it weren't death, life would be unbearable**. However, the explosion of art, science and other forms of knowledge that the singularity will bring will make life truly meaningful.
- **The purpose of life is to create and appreciate ever-greater knowledge.**
- The purpose of universe is to reflect the same purpose as our lives: to move toward greater intelligence and knowledge.
- **I set the date for singularity - representing a profound and disruptive transformation in human capability - as 2045.**
The nonbiological intelligence created in that year will be one billion times more powerful than all human intelligence today.

- **Assumption 1:** Within several decades information based technologies will encompass all human knowledge and proficiency including pattern recognition power, problem solving skills, and emotional and moral intelligence.
- **Assumption 2:** By the end of this century, the non-biological portion of our intelligence will be trillion of trillions of times more powerful than unaided human intelligence.

- Power of current brains is much based on the fact that brains can use massive parallelism (one hundred trillion interneural connections operating simultaneously) - future computers can beat that.
- Our thinking is very slow - basic neural transactions are several million times slower than contemporary electronic circuits.

SINGULARITY is APPROACHING....

As the Singularity approaches we will have to reconsider our basic idea about the nature of human life and redesign our institutions - let us explore few of such visions.

- Human bodies and processes in them are to change so radically that we can speak about an evolution as a process from current human bodies, as representing the human body version 1.0 to far more durable, reliable and capable, versions 2.0, 3.0,...
- Human brains processes and performance will change radically. Huge amounts of nanobots will interact with biological neurons. Physical and virtual realities will merge for humans and their brains. Intimate connection between biological and non-biological thinking will profoundly expand human intelligence.
- Human brains will be on-line and that radically changes ways of learning and obtaining knowledge. Main work will be to create knowledge and there will be no distinction between a work and a play.
- Intelligence on and around the Earth will continue to expand exponentially until limits of matter and energy are reached to support intelligent information processing.

Let us now discuss some of these developments in more details.

MAIN IMPACTS on OUR BODIES

- Similarly as sex has already been largely separated from its biological reproduction function, so will be eating.
- The original biological purpose of consuming food is to provide bloodstream with nutrients which are then delivered to each of our trillion cells. Nanobots are seen as one way to provide these supplies in more efficient way and to reduce the goal of eating to that of creating pleasure as does sex.
- Human blood and bloodstream are also expected to be redesigned to be much more efficient.
- Replacement or elimination of defective, aging or not efficient body organs is expected to get new quality. One of the key questions along these lines is whether it would be possible to replace, or remove, heart at all - the heart often breaks down long before other organs.
- In human body version 2.0, hormones and related substances (to the extend they will still be needed) will be delivered via nanobots and that will be controlled by intelligent biofeedback systems to maintain and balanced required levels.
- The human body version 2.0 scenario represents therefore a long-standing trend in which we grow more intimate with our technology.

CAN DIGESTIVE SYSTEM BE REDESIGNED?

- We have already a comprehensive picture of the components of the food we eat. We already know the amount of these components a human body needs and their role. We also know how to enable people who cannot eat to survive - using intravenous nutrition - this has, however, so far only a limited use.
- A way out is through drugs and supplement that could provide much more efficient nutrition - for example, to stop quite easily overweighting.
- Main problem is that of delivery - of proper drugs to proper cells. An extensive research is already now going on to create bloodstream-based intelligent BioMEMS (Biological Micro Electronic Mechanical Systems) for a wide range of diagnostic and therapeutic applications - there are already several major conferences devoted to these projects - and some systems have already been demonstrated. Many approaches are being developed for micro- and nano-scale machines to get into the body and bloodstream.
- One possibility, that seems to be feasible, is that nutrients will be introduced directly into the bloodstream and the body by special nanobots and sensors in our blood stream and body will provide them, through wireless communication, with information on nutrients needed at each point of time.
- The key problem is how such nanobots will be introduced into and then removed from human bodies.
- Of course eating for pleasure will remain.

REDESIGNING THE HUMAN BRAIN - I.

- The processes of redesigning human brains have already started with positive outcomes.
- The basic idea is "Rather than treat the brain like soup, adding chemicals that enhance or suppress certain neurotransmitters, we start to treat brain as circuitry".
- For example, implants are already available for Parkinson's patients that communicate directly with certain regions of the brain to reverse the most devastating symptoms of the disease.
- A variety of techniques is also being developed to provide the communication bridge between the wet and analogue world of biological information processing and between the digital electronics.
- Noninvasive devices are being developed that allow communication with neurons in both ways and can be used to control activities of living creatures.
- It starts also to be feasible to reconnect broken neural pathways for people with nerve damages and spinal-cord injuries.

- It starts also to be feasible to place sensors in the brain that can be programmed to recognize brain patterns associated with intended movements and then to simulate the appropriate sequence of muscle actions.
- There are already designs for systems (NEMS - nanomechanical systems) that can expand and contract to replace damaged muscles and that can be activated by either real or artificial nerves.
- To find ways to treat mental diseases is main initial motivation for redesigning human brain. However, progress in this direction will inevitably lead to redesigning human brain with the goal to increase its performance.

AR WE BECOMING "CYBORGS"? - YES WE DO!

- The term "Cyborgs" was introduced by
- R. Kurzweil estimated in 2005 that by the 2030's we will become more nonbiological than biological and that by 2040's nonbiological intelligence will be billion of times more capable than our biological one.
- Stephen Hawking in 2001 advocated that "we urgently need to develop direct connections to the brain, so computers can add to human intelligence".
- The human body version 2.0 scenario represents the continuation of a long-standing trend in which we go more intimate with our technology.
- There will be many variations of human body version 2.0 and each organ will have its own course of development. Non-biological evolution will be much faster than biological one that is inherently slow and restricted to build everything from a limited class of materials - namely proteins and to thinking processes that use extremely slow chemical switching.
- What will encompass evolution from human body version 2.0 to that of 3.0. is hard to forecast. Capability to change one's body seems to be one of the options.

- Systems are already developed that provide high-resolution, full-immersion virtual reality at any time. For example: intelligent glasses providing you with tailored information what you see; systems that allow you to hear from a distance what you only can see.
- The Web is expected to be able to provide a variety of virtual environments you can enter and "feel" as real ones. Some may represent real ones and some fiction ones or even ones not satisfying physical laws.
- Systems have already been demonstrated that can change one's visual appearance as seen for others. In addition, you can change that for yourself and to someone (virtually) else. Potentially, you can change appearance of those you communicate with. For example, a system has been demonstrated where a person A gives a talk and, in real time, audience can see on the screen person B doing the same body movements and producing the same, or properly person-adjusted sounds.
- "Virtual reality designer" will be a new job description and a new art form.

- There is a vision that circa-2030 nanobots technology will allow to expand our minds through a merge of biological and non-biological intelligence. The idea is first to augment slow interneural connection with high-speed virtual connections via nanobots communications. That could boost our pattern-recognition and thinking capabilities, as well as to make direct interface with non-biological intelligence and wireless communication with other brains.
- It seems feasible that before 2050 thinking via non-biological substrates will predominate. Technology will develop exponentially, biological base of our brain not.

- Nonbiological intelligence will still be considered as human, since it will be fully derived from human-machine civilisation and based, at least partially, on the reverse engineering of human intelligence.
- As the nonbiological portion of our thinking will start to predominate around 2040 we will be able to move beyond the basic architecture of brain regions - using implants and especially nanobots.
- Nanobots are seen as having potential to communicate with one another, to create any set of new neural connections, break existing ones and to interface with new nonbiological forms of intelligence. They are expected to be programmable.

CAN WE ENVISION IMPLICATIONS FOR SOCIETY AFTER SINGULARITY IS REACHED? - I.

Two basic observations

- Though it may seem difficult to envision the capabilities of a future civilization whose intelligence vastly outperform our own, our capability to create models of reality enable us to produce meaningful insights into the implications of the merge of biological and non-biological intelligence we are creating.
- Our capability to envision future is also based on the belief that we have the ability to understand our own intelligence - to understand our own source code, if you will - and then revise and extend it.

CAN WE ENVISION IMPLICATIONS FOR SOCIETY AFTER SINGULARITY IS REACHED? - II.

- Perhaps the most important implication is that our technology will match, and then vastly exceeds, the refinement and suppleness of what we regard as the best of human traits.

VISION of SINGULARITY from the POSITION of CURRENT DEVELOPMENTS

- The list of ways computers (AI systems) can now exceeds human capabilities is rapidly growing.
- Examples: chess, questions answering systems, medical diagnosis, plane and space probes flying, intelligent automated arms, business and financial decisions, increasing capabilities of handicapped people, analysis of research data, presentation of research outcomes,....
- The performance of these systems is increasingly based on integrating several types of "AI systems"

- There will be very little distinction between human and machine as well as between physical and virtual reality.
- **Basic question 1:** Can the pace of technological progress to speed up indefinitely?
- **Basic question 2:** What would thousand scientists, each thousand times more intelligent than scientists today, and each operating thousand times faster than contemporary humans (because information processing in their nonbiological brains will be so faster) accomplish? - One chronological year would be like a millennium for them. What would they come up with?

WHAT WILL REMAIN UNEQUIVOCALLY HUMAN AFTER SINGULARITY IS REACHED?

First question: what "being human" means?

- Human are species that inherently seek to extend their physical and mental reach beyond current limitations.
- Will humans enriched by technology be still humans. With 1, 10 or 100 implants? With 10, 1,000, or million nanobots in? Can we put a threshold? Likely not.
- All machines we met so far lack the essential subtlety of human biological qualities.

- What could, in the Epoch 6, 1000 scientists, each 1000 times more intelligent than scientists today, and each operating 1000 faster than contemporary humans (because information processing in their non-biological brains will be much faster) accomplish? One chronological year will be as a millennium for them. What could they come up with?
- When scientists will become a million times more intelligent and operate million times faster, an hour would result in a century of progress (in today's terms).

CONSCIOUSNESS and POST-SINGULAR HUMANS

What is actually consciousness? People often talk about consciousness as if it were a clear property of an entity that can be identified, detected, and gauged. However, it is not so.

- G. W. Leibniz observed: **If you could blow the brain up to the size of mill and walk about inside you would not find consciousness.**
- **By saying that a conscious being knows something we usually mean not only that he knows it, but also that he knows that he knows it and that he knows that he knows that he knows it and so on.**
- There is no objective test that can conclusively determine presence of consciousness.

Two questions:

- Will post-Singularity biological-humans merged with technology be viewed as having consciousness?
- **Will post-singularity nonbiological-humans (robots) merged with biosystems be viewed as having consciousness even if they may look and perform better than version 1.0 humans?**

Hard to know. However, there are even harder questions.

WHO AM I? WHAT AM I? AM I ME?

These questions are non-trivial as the following discourse from "Singularity is near" indicates.

- M As far as I am concerned, who I am is pretty straightforward - it is practically this brain and body, which at least this month is in pretty good shape.
- R Are you including the food in your digestive track, in its various stages of decomposition along the way?
- M Okay, you can exclude that. Some of it will become me, but it has not been enrolled yet in my club.
- R Well, 90% of the cells in your body don't have your DNA.
- M Is that so? Just whose DNA they have, then?
- R Biological humans have about 10 trillion cells with their own DNA, but there are about 100 trillion microorganisms in the digestive track - basically bacteria.
- M Are they necessary?
- R Yes, much.

PRINCIPLES THE SINGULARITY INVOLVES

- The rate of paradigm shifts (technical innovations) is accelerating - right now it is doubling every decade.
- The power (price-performance, speed, capacity, bandwidth,...) of information technologies is growing exponentially at an even faster pace - now doubling every year. This principle applies to a wide range of measures - including the amount of human knowledge.
- For information technologies, there is a second level of exponential growth - in the rate (exponent) of exponential growth. The reason being: as technology becomes more cost effective, more resources are deployed for its advancement, so the rate of the exponential growth increases over time.
In the 1940s computer industry consisted of a handful of small projects. Today, it is more than one trillion dollars industry and so research and development budget are comparably higher.
- Human brain scanning is one of those exponentially improving technologies. The temporal and spatial resolution and bandwidth of brain scanning are doubling each year.
Due to that we are now obtaining tools sufficient to begin serious reverse engineering of the human's brain principles of operations.
It is expected than within 2-3 decades we will have a detailed understanding how all regions of the human brain work.

PRINCIPLES SINGULARITY INVOLVES - II.

- It is expected to have hardware to emulate (significant portions) of human intelligence with supercomputers by the end of this decade and with laptops by the end of the following decade.
- We can expect computer to pass Turing test, demonstrating intelligence indistinguishable from that of biological humans, by the mid 2020's.
- When this is achieved, computers will be able to combine the traditional strength of human intelligence with that of machine intelligence - the traditional strengths of human intelligence include ability to recognize patterns as well as to create mental models of reality and to conduct "what-if" experiments with them varying various aspects/parameters of these models.
- Some of the basic advantages of non-biological intelligence: (1) The ability to remember billions of facts precisely and recall them instantly; (2) Once a skill is mastered by a machine, it can be performed repeatedly with high speed, high accuracy and without tiring; (3) Machines can exchange and share knowledge and skills at extremely high speed; (4) Machines will have access, via internet, to all human knowledge and tools; (5) Machines can easily cooperate to combine their resources, intelligence and memories - to make one out of million machines.
- Machine intelligence will have a complete freedom of design and architecture - not constrained by such biological limitations as slow switching speed of interneural connections - as well as consistent performance of them at all times.

PRINCIPLES SINGULARITY INVOLVES - III.

- Once machines achieve the ability to design and engineer technology as humans do, only by far higher speed and capacities, they will have access to their own designs (source code) and the ability to manipulate them. (Humans are now trying to achieve something similar, through biotechnology, but in a much slower and far more limited way.)
- Biology has inherent limitations. For example, living organisms must be built from proteins that are folded from one-dimensional strings of amino acids and therefore they are lacking strength and speed. There is a chance to reengineer all organs and systems of biological bodies to be much more capable.
- In particular, human brain is profoundly limited. There is a room in each of the skulls for only about one hundred trillion interneural connections. A key genetic change that allowed greater cognitive capabilities of humans, compared to our primate ancestors, was the development of a larger cerebral cortex as well as of an increased volume of grey-matter tissue in certain regions of the brain - but that happened on a very slow timescale of biological evolution!
- Machines are expected to be able to reformulate their own designs and augment their capabilities without (currently visible) limits - by using nanotechnology-based designs and this way to achieve capabilities far greater than that of biological brains - without an increasing size or energy consumption.

- Machines are expected also to benefit from using three-dimensional molecular circuits that can be very vast. They are expected to operate at terahertz speed comparing with few gigahertz speed of current chips.
- The cycle of machine intelligence's to iteratively improve their own designs is expected to become faster and faster. It may happen that biological intelligence will no longer be able to follow and make use of it. However, non-biological intelligence is likely able to do that.

- Nanobots are robots, measured in microns, designed at molecular level that are expected to have a large number of roles within human bodies.
- Nanobots are expected to destroy pathogens, remove undesirable parts such as misformed proteins, repair DNA, to reverse human aging; to interact with biological neurons, to vastly extend human experience by creating virtual reality from within the nervous system; to help the brain to vastly extend human intelligence.

- Once nonbiological intelligence gets a foothold in human brain (this has already started with neural implants), the machine intelligence is expected to grow exponentially in our brains. In contrast, biological intelligence is effectively of fixed capacity. Thus non-biological portion of our intelligence will ultimately predominate.

VIRTUAL REALITY STORY

- Nanobots called **folgets** that can manipulate image and sound waves should bring the morphine qualities of virtual reality to the real world.
- Future machine intelligence may also have "bodies" - for example, virtual bodies in virtual reality, or projections in real reality using folgets - in order to interact with the world. These bodies are expected to be far more capable and durable than biological bodies.
- As virtual reality from within the nervous system will become competitive with real reality, in terms of resolution and believability, our experiences will increasingly take place in virtual environments.
- In virtual reality, we can be different persons both physically and emotionally. In fact, other people will be able to select different body for you than you might select for yourself.

One of the main goal of religions has been to rationalize death as a beginning of a new and better after-death existence.

Since singularity offers a possibility of some "immortality", some new type of religion seems to be needed, that is not based on the rationalization of death.

For example, a religion based on two basic principles:

- A respect for human consciousness (that leads to respect for morality and legal principles).
- An appreciation of knowledge (that leads to appreciation of science and technology, art and music,...).

Both principles are driving forces of the progress and stability in community.

- Acceleration of non-biological intelligence is to continue until the matter and energy in our vicinity of universe will be close to "saturation" with our human-machine intelligence.
- Once this is achieved, the machine-human intelligence will start to spread outward to the rest of universe.
- Ultimately, the entire universe will be saturated with our intelligence. This is destiny of universe as seen today.

WHAT CAN WE REALLY EXPECT?

- We have to admit that it is actually impossible to predict fully the behaviour of these smart-than-human intelligence with which (with whom?) we may one day share the planet, because if we could, we would be as smart as they would be.
- There are a lot of theories what may happen.
- Maybe we will merge with them to become superintelligent cyborgs, using computers to extend our intellectual abilities.
- Maybe they will help us to prolong our lives indefinitely or to upload our consciousness into computers and live inside them as software indefinitely.
- Quite common is a belief that our species will be transformed into something that is no longer recognizable as such to humanity circa 2013.

ONE BIG STEP FURTHER

As discussed already before the term singularity in mathematics and astrophysics refers to value that is beyond everything possible around and it is actually beyond our reach.

The term Singularity as used to represent a stage of evolution of our civilization is actually used in a similar manner.

How can we, with our brains each limited to $10^{16} - 10^{19}$ cps, imagine what our future civilization in 2099 with its 10^{60} cps will be able of thinking and doing.

WHAT CAN BE EXPECTED? - I.

When the problems society will face will become more and more complex and machines will become more and more intelligent, people will let machines make more and more of their decisions for them, simply because machine-made decisions will be better than men-made ones.

Eventually, a stage maybe reached at which the decisions necessary to keep the system running will be so complex that human beings will be incapable of making them intelligently.

At that stage the machines will be in effective control. People won't be able to just turn the machines off, because they will be so dependent on them that turning them off would amount to suicide.

WHAT CAN BE EXPECTED? II.

On the other hand, it is possible that human control over the machines may be retained.

In such a case the average man may have control over certain private machines, as car, but control over large systems of machines will be in the hands of a tiny elite - just as it is today, but with two differences.

Due to improved techniques, the elite will have greater control over the masses, and because human work will no longer be necessary, the masses will be superfluous, a useless burden of the system. If the elite will be ruthless they may simply decide to exterminate the mass of humanity. If they will be humane, they may use propaganda or other psychological or biological techniques to reduce the birth rate until the mass of humanity becomes extinct, leaving the world to the elite.