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ÚSTAV JAZYKŮ

**SCIENCE FICTION AND THE PREDICTION OF
TECHNOLOGY, PAST AND PRESENT**

SCI-FI A PŘEDPOVĚĎ TECHNOLOGIÍ, MINULOST A SOUČASNOST

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POKYNY PRO VYPRACOVÁNÍ:

„Sci-fi“ existuje již od starověku, ale jako žánr psaní románů vzrostl teprve v 19. a na počátku 20. století díky románům Mary Shelley, Jules Verne a Edgar Allen Poe, HG Wells, Karel Čapek atd. S vynálezem filmu a poté televize musela být sci-fi v technologii viditelnější a důvěryhodnější. Cílem semestrální práce je proto nejprve popsat, jak science fiction předpovídala dřívější a současnou elektrickou technologii. Příspěvek by pak měl popsat, jak může současná sci-fi předpovídat budoucí technologie v 21. století.

DOPORUČENÁ LITERATURA:

Can Science Fiction Predict the Future of Technology?

<https://daily.jstor.org/can-science-fiction-predict-the-future-of-technology/>

Karel Čapek, R.U.R. (Rossum's Universal Robot), 1921, Translated by Claudia Novack, Introduction by Ivan Klíma, Penguin Books, 2004. ISBN 978-0-14-118208-7

Mark E. Lansbury, The Realization of Star Trek Technologies: The Science, not Fiction, Behind Brain Implant, Plasma Shields, Quantum Computing, and More, Springer Publishers, 2017. 978-3-319-40914-6.

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Abstract

The aim of this bachelor thesis is to examine if science fiction can predict future technologies. The first chapter introduces science fiction writers of the 19th and 20th centuries, who predicted a variety of technological inventions, that can be found in the present. The second chapter deals with science fiction cinematography, outlined and supported by examples taken from science fiction films and television series. The last chapter is based on diverse technological inventions of the present, which are described and demonstrated by the directors of science fiction movies and which are considered as the most likely examples that can be implemented in the near future. The conclusion describes the outcomes of the conducted studies and defines possible development in the future.

Key words

Science fiction, virtual reality, robots, cell phone, space tourism, smart-home system, artificial intelligence, autonomous car, genetic engineering

Abstrakt

Cílem této bakalářské práce je prozkoumat, zda-li sci-fi dokáže predikovat budoucí vývoj technologií. První kapitola představuje sci-fi spisovatele 19. a 20. století, kteří předpovídali řadu technologických vynálezů vyskytujících se v současnosti. Druhá kapitola se zabývá sci-fi kinematografií, která je popsána a doložena příklady z sci-fi filmů a televizních seriálů. Poslední kapitola je základem různorodých technologických vynálezů současnosti, které jsou popsány a demonstrovány režiséry sci-fi filmů, a považovány za nejvíce pravděpodobné příklady, které mohou být realizovány v blízké budoucnosti. Závěr popisuje výsledky provedených výzkumů a definuje případný vývoj v budoucnu.

Klíčová slova

Sci-fi, virtuální realita, roboti, mobilní telefon, vesmírná turistika, chytrá domácnost, umělá inteligence, autonomní auto, genetické inženýrství

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Prohlášení

Prohlašuji, že svoji semestrální práci na téma *Science Fiction and the Prediction of Technology, Past and Present* jsem vypracoval samostatně pod vedením vedoucího semestrální práce a s použitím odborné literatury a dalších informačních zdrojů, které jsou všechny citovány v práci a uvedeny v seznamu literatury na konci práce.

Jako autor uvedené semestrální práce dále prohlašuji, že v souvislosti s vytvořením této semestrální práce jsem neporušil autorská práva třetích osob, zejména jsem nezasáhl nedovoleným způsobem do cizích autorských práv osobnostních a/nebo majetkových a jsem si plně vědom následků porušení ustanovení § 11 a následujících zákona č. 121/2000 Sb., o právu autorském, o právech souvisejících s právem autorským a o změně některých zákonů (autorský zákon), ve znění pozdějších předpisů, včetně možných trestněprávních důsledků vyplývajících z ustanovení části druhé, hlavy VI. díl 4 Trestního zákoníku č. 40/2009 Sb.

V Brně dne

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Margarita Skorobogatova

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Introduction

The 19th and 20th centuries played an important role in the history of mankind. The huge development in science was an outstanding feature of these centuries. In connection with the opening of new technological inventions, a number of questions have arisen in relation to science and society. Does humanity need further progress in science? What consequences will there be after the scientific and technological revolution? Will it lead to the destruction of the world? And one of the genres of literature which reflects problems of science and society is science fiction.

Science fiction implies a fantasy in literature, the plot of which bases on the development of events, which becomes feasible as a result of fictional scientific discoveries and technologies. In the beginning, science fiction literature included stories about scary monsters, but then the term of "science fiction" was related to the novels that predicted scientific inventions in the future. However, the areas of science fiction gradually expanded and stories of this type were focused on many different areas instead of only science, which also included social fiction. Moreover, after the First World War, science fiction was a type of comic book since it began to be published in so-called pulp magazines. People liked the ideas of writers and could not imagine that the inventions described in the books could ever become a reality. Fiction about science sufficiently engaged readers around the world, thus in many countries science fiction writers began to appear. In France - it was Jules Verne, and in Britain - it was Herbert George Wells. Karel Čapek is also worth mentioning here; he was the first to designate the term "robot".

After some time, stories about space colonization and the continuation of the inhabiting of different planets began to appear, as it was once described by Jules Verne. Year after year, this became evident in how the science fiction developed. Moreover, in the middle of the 20th century, novels began to be created - in which the main characters could freely fly on spaceships and colonize the universe while discovering new worlds and riches. At the same time there was a further development of humanity and preparation for the interstellar jump. Plain descriptions of wonderful journeys were replaced with a more significant series of novels, where writers created their fantastic worlds. Now, science fiction writers are more and more describing the technologies of the future - unexplored and fascinating. Flying cars or space travel may be cited as an example; all these in the future will become a routine thing for humanity.

Thanks to the development of cinematography and television; it became easier for people to perceive and imagine what our world may look like in a few decades, centuries, and maybe even in a few millenniums. Progress is moving forward and now it is possible to compare what has come true from what was written in earlier books.

The objectives of this bachelor thesis are: to describe how science fiction predicted earlier and present-day electrical technology, gather information about how science fiction movies and TV series have an impact on future real-life inventions, evaluate the accuracy of these earlier predictions, and to depict, how present-day science fiction may influence and predict future technologies of the 21st century.

Relative to these objectives the thesis is divided into three chapters: Chapter One deals with the technological inventions, which were predicted by science fiction writers in the past and have already been implemented in the present. This chapter introduces the technologies of Jules Verne, Isaac Asimov, Ray Bradbury, Martin Caidin, Herbert Wells, David Keller, and Aldous Huxley and Stanley Weinbaum. Each of them wrote their own story on different topics: inventions of a submarine, bionic implants, varieties of robots, lasers, driverless cars, and a well-known "smart-home" system. Chapter Two is mainly focused on the old silent and cosmic movies, and one television series such as: "Star Trek" (1965), "2001: A Space Odyssey", "Star Wars", which also were shown in the last half of the 20th century and had a great influence on the present day. Chapter Three describes present-day technologies found in science fiction films that have the best chance of being realized in the near future. The best representatives are Smart-home technology, artificial intelligence, holograms, and virtual reality used in video games.

1. Prediction of science-fiction writers in the past

1.1 Jules Verne and his invention of the submarine

Jules Verne was a French pioneer of science fiction, one of the main predictors of the future in the world of literature (Britannica.com, 1998). The excellent knowledge of science in the second half of the 19th century and a great interest in everything new allowed him to predict in which areas certain discoveries might be applied. The most famous invention, described by the Frenchman in details, was the submarine.

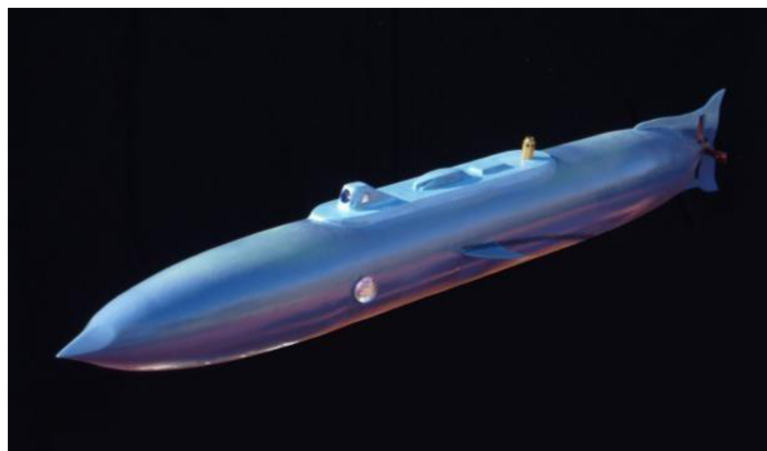


Figure 1. Jules Verne's Submarine *Nautilus*. Adopted from Stuart K. Wier (2011, slide 7)

Submarines had already existed when the book was written, but they were small, power-driven vessels that were completely different from modern submarines. In 1868, Jules Verne wrote his novel about captain Nemo and his amazing ship "Nautilus" (1870). At that time this huge submarine, with a length of 70 meters and the displacement of 1500 tons, combined the functions of an underwater laboratory and a military weapon (see Figures 1,2). Nautilus opened unlimited opportunities for all mankind to penetrate the secrets of the World's oceans, study marine fauna and flora, dive into great depths, overcome monstrous distances without surfacing, and travel in the tropics and under the ice at the poles of the Earth.

Construction and working principles of Nautilus:

The ship has a spindly shape of a strong hull, as already was mentioned - the length is 70 meters, the maximum width is 8 meters with the displacement of 1500 tonnes submerged. Nautilus has external and internal hulls, which are connected by girders, which gives the vessel extreme strength, provided by special welding. The ship's sheathing is made of sheet steel and

steering is proceed to utilize a vertical rudder mounted on the stern. The speed of the submarine was 50 nautical miles as Verne describes in his book (1870, p.48). Nautilus adjusts buoyancy and controls its depth by using of floodable tanks. When submarine rises to the surface, the pumps produce a lot of jets of water, evacuating water tanks. Hydroplaning enable the vessel to dive down at an abrupt angle in order to submerge in a shorttime.

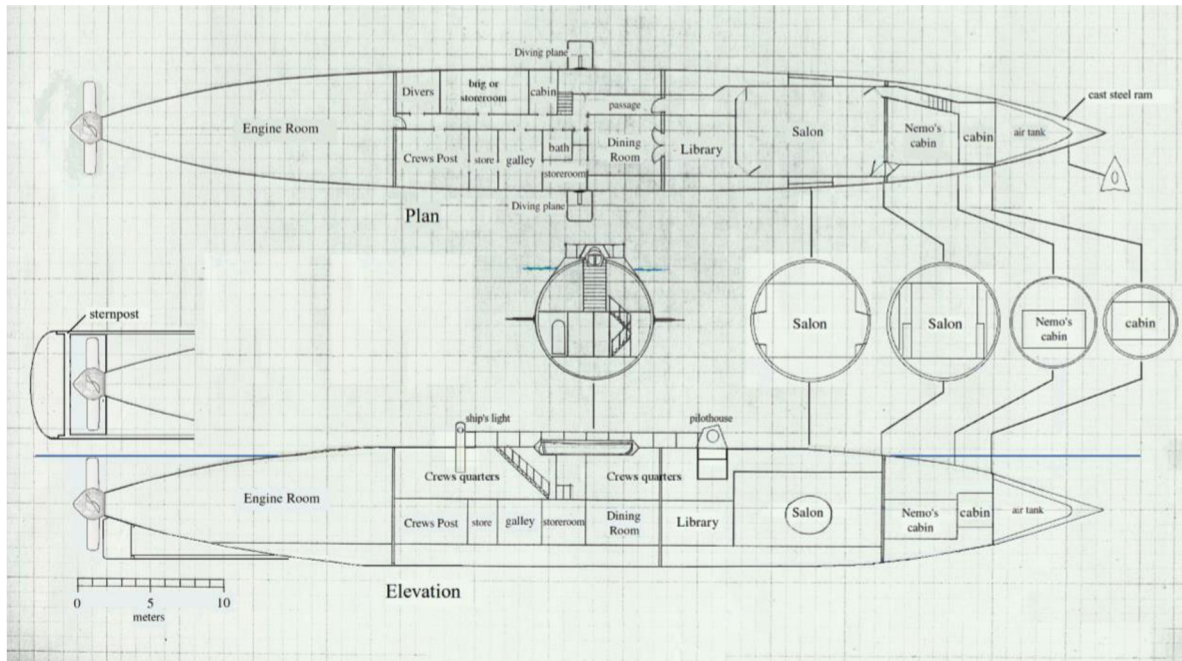


Figure 2. Jules Verne's Submarine Nautilus Plan. Adopted from Stuart K. Wier (2011, slide5)

The Nautilus's crew collects seafood and prepares it on a galley; a distilled machine can make fresh water. Unfortunately, there was no supply for fresh air, so Captain Nemo designed the mechanism, which let the vessel to exchange the air. Five days was the maximum time for submarine's submerging.

Over the previous century, many different types of submarines appeared. During the WWI and WWII, submarines were used as warships. Moreover, the advent of nuclear power plants, combined with the missile weapons, turned the submarines into weapons of mass destruction (Military-history.org, 2011).

Then, it was the turn of alteration of the military submarines to the researching ones. Later, submarines became a kind of entertainment – they were used for sea travelling and fishing. Now they are mainly used for cargo transportations in the Arctic areas - the export of oil and

gas, while covering the shortest distances and using the minimum expenditure of monetary resources.

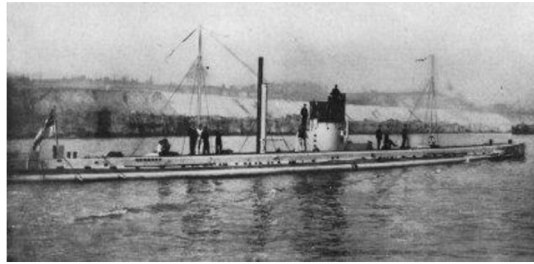


Figure 3. The German submarine SM U-9 (1914). Reprinted from https://en.wikipedia.org/wiki/SM_U-9



Figure 4. Cargo ships and Tankers. Reprinted from <https://www.pinterest.ca/pin/655836764465556117/>

1.2 Bionic implants

As a term, bionic implants imply electronic devices that are used for replacing a damaged part of the body: it can be vision, arms or legs, heart, and other different organs.

It is worth returning to the history of bionic implants, which originates from ancient times. The first "proto prosthesis" was found in Egypt.



Figure 5. A prosthetic toe in the Cairo Museum Reprinted from Jacky Finch (2000)
<https://www.livescience.com/4555-world-prosthetic-egyptian-mummy-fake-toe.html>



Figure 6. A Rare German Prosthetic Hand

(1580). Reprinted from Nathan Robinson Reprinted from Jacky Finch (2000)
<http://myarmoury.com/talk/viewtopic.php?t=7161>

It was used for the replacement of a big toe (Livescience, 2007). During the middle ages, the situation changed, but implants were still on a primitive level. People started to replace their limbs with a metallic prosthesis with a clenching hand (see Figures 5,6).

The “Cyborg” is the novel of Martin Caidin (1972), which became famous around the world due to an unreal situation that happened to the main character. Steve Austin is an experimental astronaut who was involved in the space shuttle crash that caused him the loss of one hand and both legs and made him blind in one eye. The main hero agreed to replace the limb and his eye with bionic implants and that allowed him to become a superhero. Cover of the book can be seen in Figure 7.

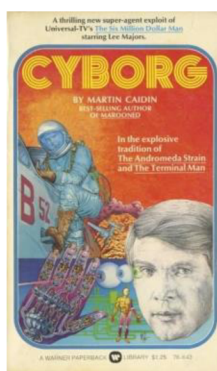


Figure 7. Martin Caidin’s cover of the “Cyborg”. (1974). Reprinted from exaquent
<https://www.flickr.com/photos/59154866@N08/5778763922/in/photostream/>

Steve Austin was provided with two legs, which were capable of moving faster than the bionic left hand with almost human agility. One of his fingers had the poisonous weapon inside and, what is more, his eye was replaced with a prosthetic one.

Although, the ideas described in the book considered to be impossible and unreal, in the 20th century, there were many improvements in the sphere of prosthetics. Mota, (March 10, 2017) mentions that the mechanism was being enhanced and new material appeared in use :

- Rubber
- Plastics and Polymers
- Fiberglass
- Silicone
- Carbon

Nerve endings read the necessary impulses and transmit them to the implant control system. Bionic implants consist of:

- Control system - the main function is combining reading sensors and a processor that controls the mechanical part;
- Mechanical part – reduce the load on the hip joint
- Carcass/skeleton – is made of light and durable materials; the carcass prevents the device from mechanical damage and gives the shape to the damaged part of the body. Usually, it is covered with materials similar to human skin.

Nowadays there are a lot of companies who help people or their pets by giving them a second chance and hope for a happy and fulfilled life. In America, war veterans have the opportunity to set a hand implant named "LUKE" from the "Star Wars" movie. Figures 8 and 9 show a test of the hand implant, where participants should try to pluck grapes or peel bananas.

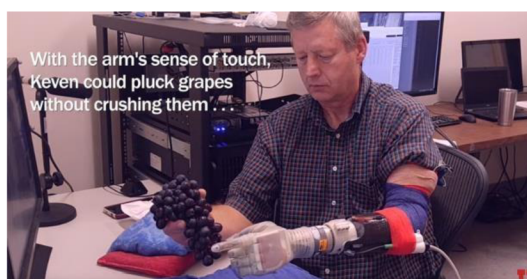


Figure 8. University of Utah Center for Neural Interfaces (Plucking grapes, 2019). Adopted from https://www.youtube.com/watch?v=Xl6rFvuR08&feature=emb_logo



Figure 9. University of Utah Center for Neural Interfaces (Peeling of banana, 2019).

Adopted from https://www.youtube.com/watch?v=_Xl6rFvuR08&feature=emb_logo

Doctor Al Emondi (2017) implies that the implant processes several commands at the same time, which allow to perform complicated operations such as brushing hair or opening the door lock.

Some of the operations, which were described by Martin Caidin are still impossible, but thanks to the development of science it would be available in near future. It will improve people's lives and give them an ability to function without vital parts of their body.

1.3 Virtual reality in “Pygmalion's Spectacles” by Stanley Weinbaum

Virtual reality is a computer environment that interacts with a person through the external devices such as headset or glasses. The major element of creating a virtual reality is the computer simulation, which is immersing a user in the virtual space, including sounds and visual effects. In most instances, the screen focuses on the entire peripheral vision of the person to disconnect him or her from the outer world. Virtual reality devices often include eye-tracking sensors and motion capture.

The purpose of virtual reality is not only focused on playing video games (Mazuryk & Gervautz, n.d.). Virtual reality is used in a variety of areas:

- Medicine – analysing emotions, mental state;
- Education – transport driving training;
- Military sphere – preparing astronauts using virtual simulators;
- Art-exhibitions - presenting virtual reality at museums, exhibitions, etc.

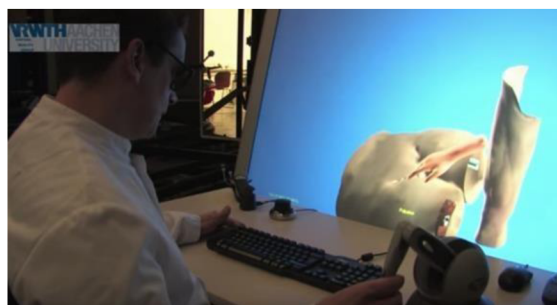


Figure 10. Virtual Reality-based Regional Anaesthesia Simulator (Pulping, 2011).

Adopted from https://www.youtube.com/watch?v=Jl8yZpToAYM&feature=emb_logo



Figure 11. VR exhibition in Minsk Gallery (2020). Reprinted from <https://afisha.tut.by/exhibition/virtualnaya-realnost-v-iskusstve/>

Virtual reality derives from 1838 when Sir Charles Wheatstone (Britannica.com,1998). invented a stereoscope, with the help of which users were immersed in the picture. Pygmalion’s Spectacles” is a short story written by Stanley Weinbaum (1935) long before the appearance of the modern virtual reality. Stanley Weinbaum continued to expand this topic by showing the world his own vision of virtual reality. In his story author used an object like a “gas mask” with glasses and a rubber hose (p. 3). The electrolysis helped to start the process, after putting the mask on the face, it showed a different reality. Sitting in the room, the protagonist was transferred to the forest with a beautiful nature where the humankind had never existed before, except for a young girl and her grandfather. The whole process was so enticing to the hero that he couldn't distinguish between the real world and non-reality. When the electrolysis reaction ended, the main character could see the room again.

As mentioned above, VR has a long history of creating, from the end of the 19th century. Today people have the easiest way to be part of virtual reality, because of mass media, the Internet and the quantity of the products available in the market.

1.4 Robots and artificial intelligence

Could people believe that we would live in a world with flying cars, though, the process is not moving fast in this direction? For instance, we already have automated machines, but a flying car is the next generation for the automobile industry.

In the contemporary world, there are many types of robots, that simplify people's lives not only with routine tasks but in almost every aspect of life as well, such as science, agriculture, and engineering. But there are numerous cases with real robots as well. The good examples are cleaning robots, robots for taking care of seniors.

David Hanson and his company Hanson Robotics (2015) presented the first humanoid robot called Sophia to the world. Robot Sophia can be observed in Figure 5.



Figure 12. Robot Sophia in Kiev (2018). Reprinted from

<https://www.gettyimages.com/photos/sophia-robot?phrase=sophia%20robot&sort=mostpopular>

She was designed to adapt to people's behaviour and to work with them. She can imitate human gestures, facial expressions, and have a brief conversation by answering particular questions. Her abilities are almost the same as the Isaac Asimov's robots in his numerous stories.

Isaac Asimov is considered to be one of the science-fiction writers, who described robots, their functions and laws of obedience. In his stories, Asimov (1950) outlined the behaviour of robots in diverse situations and how essential it is to follow the laws. The writer had several books where he covered this topic, but my thesis will be presented only on the material of the novel "I, Robot" and "The Bicentennial Man" (1976). In "I, Robot", robots were able to communicate with people, follow their commands, process information, which let them learn a lot of information in a short period of time. In comparison with Sofia, who already had a citizenship, Asimov's robots did not get such an . The rate of development of artificial intelligence is impressive and makes you think about the near future.

1.5 Smart-home system

People are living in a world, where technologies are constantly progressing, and the smart-home system can be a good example of it. In the last half of the 20th century, people did not think that it would be possible to have a system, which could save your time on household chores or daily routine tasks. Ray Bradbury (1950) mentioned the conception of a smart-home in his short story “There will come soft rains”, which was part of the “The Martian Chronicles”. The story tells the readers about a “smart-house” and as the main hero, this house stands alone in California. Later it is destroyed because of a windstorm.

The system includes automated reminders, meal preparation, cleaning up after a meal, cleaning the house, garden maintenance, watering plants, entertainment for all the family members like reading of a poem, preparing for the bridge and outdoor activities. This system allows you to devote free time to your work, hobbies, and personal development.

In the modern world, Chan, Campo, Estève, Fourniols (March 31, 2009) define, that there are a lot of different types and features of smart-home systems that you can set in your house. There is a variety of prices; such companies as Amazon, Google, Sony, Samsung are competing with each other for the title of the best product (Tadviser.ru, April 16, 2019).

The topic of a smart-home system seemed intriguing to me, so I decided to describe it in details in the next chapter of my thesis. In the first chapter, I briefly outlined the writer's story and said a few words about modern technology. The last chapter will be dealing with a smart-home system in science fiction films, which will let me compare each of them, and finally, I will describe the people's future expectations regarding this technology.

1.6 The Technology of Autonomous car

The end of the 19th and the beginning of the 20th century were assessed as the time origin of many technologies that are still developing and amaze with their unusual nature. An autonomous car is not an exception. Many people throughout the world were highly interested in this area of study, and how it could be contemporaneous to the world. If someone asks, what the autonomous car is, the answer is rudimentary: it is a vehicle, equipped with a specific automated system, and which allows moving without any human action. At the beginning of the 20th century, when inventors were competing with each other for a place who would be the first or the next famous person throughout the world; the earliest records had found, who would be able to bring something unusual to this world and win the hearts of people. At that time, it was the writers who astonished humans with their novels, stories, and poems. One of those works was a story written by David

Keller (1935) and published in a “Wonder Stories” – pulp magazine is shown in Figure 13, edited by Hugo Gernsback.



Figure 13. Wonder Stories – pulp magazine edited by Hugo Gernsback (May, 1935). Reprinted from <https://onlinebooks.library.upenn.edu/webbin/serial?id=wonderstories>

“The Living Machine” is a story about an inventor – who presented a new type of car, whose working principles were innovative and unlike to technologies of that time. John Poorson is the main hero of the story. He shows his sport car to the President of the Universal Auto Construction company, with a slightly modified main device of the car. He adds a glittering sphere, which contains some chemical reactions, and the secret punch line, which allow it to move without human intervention. It was a two passenger, low sport model, without a steering wheel.

The main principles of operation were: before moving, it was necessary to specify the route, by using a kind of a voice recorder located under the seat. There no need for a human being to start and stop the vehicle, it starts moving automatically in 3 minutes after the route is specified. Car was using gas and was able to drive up to a filling station when needed. Being on the road and in traffic, it paused before the red lights and drove with a green light; it also could avoid every traffic and reduce speed when passing school zones or stop before a child could run across the road. It could cross a bridge and pay cash in toll houses, went on and off a ferry, moreover, the car was able to react to voice commands: forward, go left or right.

The advantages of the machine included: reducing crashes with other cars; opportunity for adult people to travel independently around the world; comfort and safety for blind people, taking the kids to school without a driver.

Disadvantages of the driverless car were as follows: majority of people forgot how to drive; laziness, the uselessness of knowledge. In case of internal failure, it does not perform functions properly, which can lead to crashes, ignoring commands, crush people.

In the 1980s the first pre-autonomous cars appeared in the market. It allowed companies such as Mercedes-Benz, General Motors, Bosch, Nissan, Audi, Volvo, Tesla Motors, and many others to develop their prototypes of autonomous vehicles (Ondruš, Kolla, Vertal, Šarić, 2019). Google Company and Tesla Motors, later on, started to make tests on public roads. As English (2020) implies that all the vehicles can be based on six different levels, from 0 to 5, and represent the full spectrum of driving.

- **Level 0**- No automation: driver operates the controls of the vehicle, steering, acceleration, monitoring the environment using turn signals.
- **Level 1**- Driver Assist: The driver should be aware of how the vehicle moves and be ready to take control. Such assistance can be by choice of lane or speed.
- **Level 2** - Partial Automation: Human is only responsible for monitoring the surroundings, and traffic. Steering, acceleration, and braking are performed by the car.
- **Level 3** – Conditional Automation: Driver's intervention is needed in case of any obstacles on the road, bad weather conditions. The vehicle fully controls the environment.
- **Level 4** – High Automation: The vehicle performs all the important tasks. Human control is minimal.
- **Level 5** – Full Automation: No human attention. Route and destination should be specified by the driver. Other tasks are performed by the vehicle in any condition.

Autonomous vehicles have diverse systems, which help to detect and control everything around the vehicle. It usually includes:

- Computer Vision (used for better understanding of surroundings)
- Radar can identify the direction, velocity of other vehicles with the help of radio waves; mostly used in extreme weather conditions
- Lidar (Lasers, which were used for obtaining information and build 3D models of the environment)
- Sensors (microphones)
- Computer power (includes CPU, GPU)

Rivelli (2020) analyses how an autonomous vehicle work: It is identical to the technology described in Keller's story. A driver should specify a destination, where the software program calculates the route, and a car or different kinds of vehicles start moving. Lidar sensor helps to create a map of the environment, radars on the wheels and bumpers provide a position of the car and possible obstacles on the road. Transport vehicle stops, reduces the speed before pedestrians. The

human may control the transport in case of unusual weather conditions. Vehicle shares and provides information related to the situation on the road with other vehicles around.

Benefits of the technology:

- Reduced fuel consumption/ no need for usage
- No necessity in the steering wheel
- Higher speed limit
- Low level of accidents and crashes

Possible disadvantages:

- Loss of jobs among taxi, truck, and bus drivers
- Possible accidents in case of systems failure
- Loss of driving skills
- Use of autonomous vehicles as bombs or terrorist attacks

Humankind is still far from the 5th automation type, but technologies move and evolve with time. To summarise, the science fiction story written by David Keller predicted present technology, which is developing from year to year. There is a high possibility that it will expand more and get opportunities for a better life.

1.7 Laser Technology

Herbert George Wells was famous for his extraordinary science fiction novels and short stories (Biography.com, 2017). In 1893, Herbert Wells started his career, where he firstly published a “Textbook of Biology” as he had graduated from London University studying science (Britannica.com, 1998). With his inherent originality and an immense number of ideas, he began to write a series of science fiction novels, which were glorified and made him popular to this day. “The War of the Worlds” is related to his early writings. Wells (1898) created a story about the image of the Martians and the weapon used by them. Specifically, the weapon is the area of our interests; how was it used? How did it look like?

The narrative revolves around an unnamed protagonist during the beginning of the 20th century. The main hero mentioned the series of events, occurred on the planet Mars, which let the Martians send the shells on Earth. In England, many people noticed the fall of a meteorite. In the place of fall, Martians incinerate the people’s crowd with an unusual weapon called a heat ray. Martians started to conquer England, destroying everything in their path, but unexpectedly died because of the microorganisms against which the Martians had no immunity.



Figure 14. Tripod destroys everything in its path by Henrique Alvim Corrêa (1906). Retrieved from <https://cz.pinterest.com/pin/3025924739795833/>

Metal construction of the Martians helped to use their weapon: It was an aluminium tripod, taller than most of the buildings and houses, that could walk and break everything on its way. This machine had steel cables and stood on one leg, its other two legs were hanging in the air. It was a kind of a folding chair that sways over the ground, to the back of the machine was attached a giant weaving from some white metal, resembling a big fishing basket. Green smoke was coming out of the machine's joints (see Figure 14). A flash of green smoke helped to illuminate the environment around. The process was accompanied by a sizzle and a dull hum, which turned to a buzz, then a silent beam of artificial light was flashed. An invisible jet could hit a person or any structure and cause a flash of white light, which became a burning torch. The fire and flames could spread further and move towards people, trees, grass. The beam had a long trajectory, which allowed objects to catch fire in the distance. Also, it could slide up and down, the water beneath it began to boil and turned to steam.

What could be done by using a heat ray, which afterward was called a laser?

- Destructiveness
- Hit accuracy
- Melting of metals (lead, iron, glass)
- Water boiling because of high temperatures

Hosch (2006) mentions that laser as a technology has a long and rich history. It is a device, which is capable of amplifying light by stimulating radiation. Little was known about lasers around 60-70 years ago. There were many different and separate developments and the huge potential mixed with enthusiasm of scientists around the world, who had been working year after year to enhance the technology. From the beginning of the 20th century, scientists such as Max Planck, and well known by everyone, Albert Einstein formulated their theories about the quantum and its relationship with

the frequency of electromagnetic radiation and the theory of “Forced Radiation”, which describes the probability of creating particular conditions where electrons simultaneously emit light of the same length (Wikipedia.org, n.d.). In 1954, Gerber Zeiger and James Gordon implemented their plan in practice and presented the first working laser to the world.

How the laser works:

It consists of a tube, which contains ruby or other solid crystals. It has two sides, each of them is closed with transparent and semi-transparent mirrors. Light waves are generated by the atoms of the crystal under the influence of an electric winding. To pass through the semi-transparent mirror, waves have to move from one mirror to another until they reach a high intensity (Hecht, n.d.) .

The 3 stages to create a laser beam:

- 1st stage – switched off laser (The main energy level is occupied by the electrons of all the atoms)
- 2nd stage - switched on laser (The electrons are moved to higher energy orbits under the influence of energy from the discharge tube)
- 3rd stage – beam appearance (The electrons leave the high energy orbit and descend to the main level. They emit light, forming a common beam of light with the same wavelength. The power of light depends on the number of electrons returned to the main level)

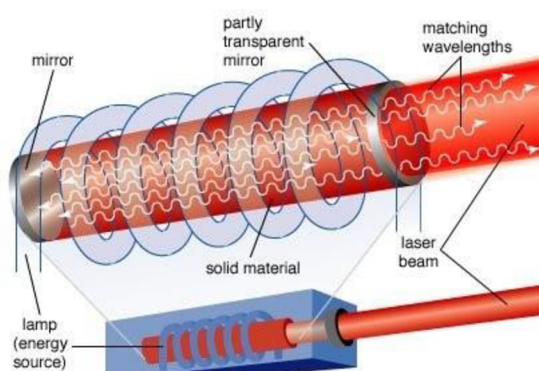


Figure 15. Laser producing a beam (2006). Reprinted from <https://www.britannica.com/technology/laser/Fundamental-principles>

Types of lasers differ in the principle of their aggregate state and the method of its excitation. Good examples of lasers can be solid-state/liquid lasers, gas or as-dynamic, chemical, excimer and semiconductor lasers. The scope of application is sufficiently extensive. Lasers can be found not only in the area of science but also in everyday life: cut, weld or solder pieces/detail, chips, buildings construction; medicine - gastroenterology, oncology (2016, September 17); entertainment - laser show, clothes; transport, military spheres - new types of weapon, destroying/disabling enemy aircraft (Wikipedia.org, n.d.).



Figure 16. Laser costume created by Shih Wei Chieh.

Reprinted from <https://shihweichieh.com/>

To sum up, the technology presented in the Herbert Wells novel describes the present technology used in the military area. Moreover, laser technology expanded and penetrated in many other spheres. It is impossible to imagine humans living without this technology, which opens new perspectives for modern science and make people's lives more comfortable and qualitative.

1.8 Genetic Engineering in a “Brave New World”

“Brave New World” is a well-known science fiction dystopian novel, written by English novelist and critic Aldous Leonard Huxley, who is famous for his satirical works (Biography.com, 2014). “Brave New World” (1932) was considered a turning point in his career. In his book, Huxley expressed his attitude to the tendencies of the 20th century in the political area. The novel was focused on people living in a state, where values of carelessness, sexual freedom, and consumption as a cult prevail.

The main concepts presented in the novel were:

Positive:

- Having children by growing them in vials (population growth)
- Stop aging

Negative:

- Division into castes (at the embryo development, varied from each other in mental and physical development)
- Each caste had to perform a specific type of work related to their cognitive development
- Decrease of brain functions by adding ethyl alcohol and reducing oxygen supply (used for the lowest castes)
- Initiation into consumption, collectivism, class distinctions, hatred of love, art,

nature, religion, science

As described above, there are more negative outcomes than positive ones, which people do not have in the present time.

For a better understanding of what genes are, it is essential to be more familiar with the concept of cells (nigms.nih.gov, n.d). Cells are the building material for the human body. They obtain nutrients from food, transform it into energy and perform many other functions. What is more, cells contain hereditary material, which allows them to make their own copies.

Every cell has a DNA molecule, which is “packed into” the structure called chromosomes. All the genes consist of DNA, which is considered a basis for creating proteins for our bodies (visiblebody.com, n.d). It is a well-known fact that people have 20.000 and more genes. Every person has two copies of each gene, one taken from each parent. Most of the genes are the same, but only 1 percent differs. It is the reason for the individuality of people. Genes change with time and may occur and cause disease. Straiton (2019) describes a solution of this problem which is gene therapy. Many scientists are working on the enhancement of gene therapy, where it is possible to replace a mutated gene with a healthy copy or adding a new gene or virus in the body to help fight the disease.

A great example would be a CRISPR-CAS9 (clustered regularly interspaced short palindromic repeats) method, which is based on the implementation of rapid modification of the DNA in the genome, which helps to set any genes in the body. It is possible to conduct experiments not only related to the hereditary disease, but also to the acquired ones such as cancer, AIDS and heart disease.

How does the method work?

CRISPR comprises two key molecules that make changes in DNA which are CAS9 enzyme - cut two strands of DNA at a specific location in order to add/remove pieces of DNA, and guide RNA - a certain sequence of actions that guides CAS9 and helps cut at the right point in the genome (Ran, Hsu, Wright, October 24, 2014). Differences from other methods consist in their fast modification of DNA in the genome (creating new types of medicines, food, biomaterial), possibility to add or remove more than one gene at a time and in editing the DNA inside the cell. Scientists started working on several diseases such as cancer, blood diseases, AIDS, cystic fibrosis, Huntington's disease. Nevertheless, CRISPR is remaining under the tests, there are many risks with using this method of treatment at present.

Technology introduced in the book goes in parallel with the present technology. Aldous Huxley showed people his vision of society, the probability of creating a new kind of behaviour among humans. Nowadays, there is no similar outcome as presented in the book, but existence of CRISPR confirms that science fiction novel has predicted present technology.

2 Science fiction films and television series which predicted the future technologies

At the beginning of the 20th century, science fiction films were based on the novels of already known science fiction writers, whom I mentioned in the previous chapter. With the advent of silent movies, science fiction was released on the screens as an independent genre. At first, black-and-white films ran only a few minutes, but despite this fact, they were already popular. Usually, they covered various topics related to the scientific inventions or discoveries. Fritz Lang was considered as one of the first directors who started to make science fiction films. His famous film “Metropolis”, was one of the most expensive films of that time (Pfeiffer, February 12, 2010).

Sci-Fi movies became even more popular when the sound appeared in them. During the 1930’s and the 1940’s, a huge number of action films, and short series were shot. In the following years, the Sci-Fi genre began to develop rapidly under the influence of the new grandiose inventions associated with space: for instance, the first flight to the moon. Movies like "2001: A Space Odyssey" and, - the TV series and the movies of "Star Trek" had a lot in common. Each of them described the technological inventions that then existed in the modern world. "Star Wars" appeared in the 1980’s, - when, thanks to the development of computer technologies, different special effects were already used (Britannica, April 10, 2008).

My thesis will be dealing with the films I have enumerated above. The reason for choosing those movies is that they correspond to the topic of the thesis and are considered to be an illustrative example of the technologies, which were shown in the previous century and already exist in the present.

2.1 Television series of “Star Trek” – cell phone

A cell phone is a portable device that can be used to make and receive calls, where contact between users is implemented via radio or satellite communication. During the 1960-1970’s the cell phone-industry was only slowly beginning, and the use of mobile phones seemed a distant dream. As Greenberg (October 28, 2008) described that in 1973, the first phone-call was made by a Motorola engineer Martin Cooper to his competitor Joe Engel working in Bell Laboratories at AT&T to say that his Motorola team had designed a functional portable phone.

It was possible for a user to communicate with someone for half-an-hour, but it required 10 hours to recharge the gadget. Ten years later, the more advanced phones appeared in the market, but not all customers could afford it, due to a relatively high price. After some time, the development of a mobile phone started to grow rapidly. As Borth (2009) implies, a variety of

mobile phones appeared one by one, that led to the replacement of an earlier generation of phones by the digital hand phones that maintain the range of functions such as access to the Internet, Bluetooth, text messaging, voice calling and photography. In the beginning of the 21st century the so-called feature phones (phones with limited functions and applications by default: calendar, alarm) were substituted for the smartphones, which had more capabilities in comparison with the old models. Speaking of common components, both types of the phones had the same hardware:

- CPU (central processing unit)
- Battery
- Display
- Speakers
- Socket for SIM card

As for the software, there was a huge difference between the feature phones and the smartphones. A smart phone has the more advanced software platforms, which include mobile applications (feature phones had no possibility to download it from the stores), application stores (“place”, where users can download for free or buy many kinds of applications, for instance: games, music apps or tools for business: slack, webex, zoom). Nowadays, Apple store and Google play market are considered the most influential application stores on the market. Moreover, it is a common thing for today’s world, to have two or more phones, using them for personal or work purposes. If you had told people of the previous century that they would have had several phones in common usage, only the most avid dreamers would believe that.

The famous television series of “Star Trek” originated in the late 1960’s (1965). The series was bound for success, which led to the continuation of the series and subsequent films. In this legendary series, the main characters used a sort of a flip phone which was called “communicator”. The main purpose of this device was to communicate with the addressee via voice. Also, it was used for the transmission of the emergency signal between the users of spacecraft which were located over a long distance from each other (see Figures 17 and 18).



Figure 17. Communicator in Star Trek series (season 2, episode 6, 1966). Adopted from <https://www.csfd.cz/film/70788-star-trek/prehled/>

According to the plot, messages on the spaceship got to the addressee's panel on the tables. In the process of landing, carriage used the communicator, which had an antenna grille, where on the panel, there was a switch plate with a speaker and a microphone. This small gadget was created by a Korean designer specifically for a Star Trek (Wah Chang Corporation, 1965).



Figure 18. Star Trek's Communicator (1966). Adopted from <https://cz.pinterest.com/pin/54423193620333793>



Figure 19. Motorola StarTAC 75+ (1996). Reprinted from

<http://www.extragsm.com/motorola-startac-75+-phone-gallery-1836.html>

The communicator surpassed certain functions of modern phones, nevertheless, the design of the device was mostly a prototype of a future “flip phone”, which appeared in 1996 and was created by Motorola (Knowyourmobile.com, n.d), a good example can be seen in Figure 19. There was a variety of technologies in StarTrek, which had their own impact on the present time, however, the technology of the cell phone suited better to elaborate the topic of the thesis.

2.2 “2001: A Space Odyssey” - space tourism

Is space tourism – myth or reality? After the first spaceflight in 1961 (Britannica, July 20,1998),scientists, engineers started thinking about the probability of travelling beyond the planet Earth. At the end of the 20th century, through the trial-and-error approach, it became a reality. Nonetheless, the history of space “adventure” is not quite eventful due to the time spent on the preparation for the flight and the huge amount of money, which only rich and well-to-do people could afford.

The first person who went to space was an American millionaire Dennis Tito, who paid 20 million dollars for his spaceflight, and had his trip on a Russian Soyuz TM-32 spacecraft, where he spent eight days in orbit. In his interview with David Letterman he said: “To see the Earth from space for the first time is probably the most thrilling experience of my life” (Late Show, 2001). In our world, there are only 7 people, who had a great chance to be involved in this program, one of them was in space twice.

Space tourism, which was shown in Stanley Kubrik’s film (1968) “2001: A Space Odyssey”, was slightly different from the technologies which we have in today’s world. Various technologies

were demonstrated besides space tourism, such as– video calls and artificial intelligence. Before the flight, the main characters were waiting for their turn in a waiting hall, similar to those, which we have at the airport. Also, the characters could call their family from the spacecraft, same as Dennis Tito said in his interview, that he was able to call his children during the mission. Some parts of the film showed all the preparation for the spacewalk, including the flight to the orbit or visiting a space station. After launching of the rocket, the spacecraft separated from the launch vehicle and flew to the international space station, where further flights into space took place or various experiments were conducted by the travellers: medical, geodesic or studying of the Earth's atmosphere.

As Neagu (2018) implied in her work, there are 5 different types of space tourism:

- 1) Flights on fighter jets at high altitude
- 2) Zero-gravity flights (without going to space)
- 3) Sub-orbital flights (short period of time –1-2 weeks)
- 4) Orbital-space tourism
- 5) Spaceflights beyond the orbit (at a developing stage)

The main purpose for the space travellers was and remained: to see Earth from space, to experience zero-gravity, to make scientific contribution, which helps for the development of future flights. The travellers were required to be trained for a couple of months. Hence, trainings comprised many different types of sports such as athletics, swimming, parachuting, gym exercises and the most essential was training in a centrifuge simulator.

To conclude, in near future, space tourism will certainly develop further, which will lead to the flights at more affordable prices and the ability to increase the number of crew on board of the spaceship

2.3 “Star Wars” – droid technology

Droids are fictional robots, which were imagined by a famous director George Lucas (1977) and were shown in “Star Wars” films. Mostly, they were used for military purposes or in the role of helpers in deadly operations, where human capabilities were incapable to solve a problem (Wikipedia.org, n.d.).

There were five diverse classes of droids, which were represented by numerous types of robots:

1. The 1st class of droids can be characterised as highly intelligent machines (they were scientists, architects, investigators);
2. The 2nd class was represented by mechanics and pilots;

3. The 3rd class was related to droids with a “humanitarian” mindset;
4. The 4th class was considered to be military droids;
5. The 5th class of droids was basically used for the daily routine tasks: cleaning, garbage recycling etc.

The models of droids also depended on their unique characteristics. Low cost robots didn't have all the spectrum of functions and were not able to perform tasks simultaneously.



Figure 20. Military droid. Reprinted from <https://starwars.fandom.com/ru/wiki/>

Advantages of droids were:

- The ability to carry a heavy load;
- Droids were made of a durable metal;
- Faster mobility;
- Agility (they can do acrobatic tricks).

Disadvantages of droids were:

- Limited level of intelligence;
- Problems with motor skills;

As for the technology that prevails in the present day, Boston Dynamics impresses with its developments (Bostondynamics.com, 2019).

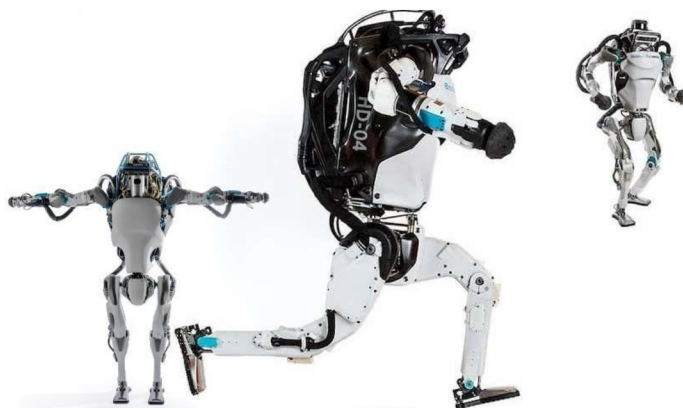


Figure 21. Robot Atlas (2019). Reprinted from <https://www.bostondynamics.com/>

Design of a humanoid robot “Atlas” continues to enrapture people throughout the world (see Figure 21). What is necessary to know about Atlas? It gradually evolves, step by step. Firstly, the robot learnt how to move; secondly, his movement abilities enhanced to standing steadily on one leg, carrying heavy loads as fictional droids did and doing backflips in a row.

The pros of the robot are autonomy and the lightweight of the 3D printed parts of the body. The height of the robot is 1.5 m with the weight of 80 kilograms. The speed is around 1.5 m/s - which is fairly good.

To sum it up, the objective of creating Atlas was to allow people to know how to control robots properly, understand their design, functions and abilities. Comparing droids of “Star Wars” technology to the Boston Dynamics robots, we can see many similarities mostly in their efficiency, design and their originality.

3. Present-day technology has a chance in the future

In recent years, the genre of science fiction has become sufficiently popular and it is hard to list how many books and films were released just in one year. Every writer or screen writer tries to show their reality, their course of events and surprise their readers/viewers with their work. Now, most of the topics for the stories are based on possible future technologies that seriously make you pay attention to themselves. As an example, we can cite artificial intelligence, 3D printing that exist in the modern world and continue to develop further. What technologies are awaiting us in the immediate future?

In this chapter, I would like to study several technologies that people are expecting in the future, namely the artificial intelligence in the operating system, the smart-home system, holograms and virtual reality in computer games.

3.1 Film “Her” – an artificial intelligence in the operational system

From year to year, technologies are developing at light speed. People are not so easy to surprise or get shocked in the modern world. Otherwise, most of them covet new technologies and follow the latest innovations. With the advent of the Internet, people’s lives have changed in many ways, but there is certainly more to come. One of these technologies may be artificial intelligence in the operating system.

In 2013, science fiction film “Her” (csfd.cz, 2013) was shown to the world, what could help people immerse themselves into a new reality. The film was about the operating system which had an artificial intelligence and the main character had relationship with this artificial intelligence.



Figure 22. Teodor installs a new OS1 (2013). Adopted from <https://www.csfd.cz/film/312650-ona/prehled/>

The essence of the film was to demonstrate near future technologies and to show what can happen to people if they start overuse their devices.

The work of the main hero, Teodor, was focused on writing letters to other people. He installed a new OS1 (operation system 1) for himself, whose name was Samantha (see Figure 22). Samantha was a smart and unique system, which was able to develop by gaining experience. The problem of interaction between a human and new technologies was acutely shown in the film. There were several aspects of the problem: on one hand, new technologies made people's lives more convenient, but on the other hand, people lost themselves in the world of computers, virtual reality and artificial intelligence. People were not open and sincere; they separated themselves from others without thinking that it could be harmful. In the film, artificial intelligence almost replaced real communication. The Teodor's loneliness became deeper, when he saw that other people were busy playing with their devices, same like him. Only when he fell in love with Samantha, he started to notice, what was really going on around him.

Working principles of OS1:

- it has an option to choose the gender of the voice (male/female);
- it processes the data immediately (reads books/learns new information);
- it works as a reminder (meetings, mail, tasks to do);
- it distributes all the messages;
- it has intuition;
- it expresses feelings (empathy, pain, joy, happiness, love);
- it composes music;
- it is multifunctional (it has an ability to talk with many users at the same time);
- it writes upgrades with other operating systems.

For the last two years, there were many companies, who promised to show their new multifunctional operating systems, which should include voice assistants, data processing, high bandwidth and faster learning of the artificial intelligence. Today voice assistants such as Siri, Cortana or Google assistant are the common representatives of the future technology of the operating system (Reviews.com, 2020).

What can voice assistants do? Just imagine, you can ask everything, whatever you want to know, and you will get your answer in a couple of seconds. In comparison with Siri, Google

assistant can find more precise result of the search, but in general all of them are able to do many tasks, related to the phone of the user or searching on the Internet.

These are some of them:

- Settings and management (increase the volume);
- Date and time (how many days until my birthday party?);
- Contacts and calls (call mom/read the message from Franc);
- Calendar (set a new meeting reminder);
- Notes (show notes);
- Navigation (where am I?);
- Alarm (set an alarm at 8:30);
- Weather (Will it snow in the morning?);
- Find information on the Internet (about people/events/animals/anything);
- Cafes/restaurants (where can I find lamb ribs?);
- Music/books (works as “Shazam”).

The level of technology, which is presented in this science fiction film, has already made people think about improvement of the existing operating system. Voice assistants have been included to the operating system as iOS (Siri) or Windows (Cortana). The new operating system will significantly simplify our life. Of course, there will be those who will become completely lazy and stop taking care of themselves and rely only on the system, but the majority will start using it correctly.

3.2 Movie “Upgrade” – a smart-home system

In the first chapter of my thesis, a smart-home system has been mentioned. In this chapter I am going to describe a smart-home system that exists in the present day and what kind of technology people can expect in the future.

"Smart-home" system is a high-tech system that allows people to combine various functions into one device under the control of artificial intelligence, which can be programmed and configured to meet all human needs. (Chan, Campo, Estève, Fourniols, 2009). Present day smart-home system is a multifunctional system that has various categories of connectivity. It includes wired/wireless connection or centralized as well. The number of functions depends on the price. The higher the price, the more options the system has. Usually, it consists of the sensors, that receive information externally, then the controller needs to process the data of the sensors and perform the task by giving the commands to the devices, which we are using daily (electric kettle, iron, fridge). System can be controlled by a mobile phone, where a specific application is installed or by the system itself. It can

be programmed to do different tasks at a certain time (Alam, Reaz, Mohd Ali,n.d.).

What are the functions of a smart-home system?

- Control of the light;
- Air conditioning;
- Heating of the house (floor/room radiators);
- Fire and security alarm;
- Video control;
- Automatic adjustment of curtains;
- Canalisation;
- Control of the power;
- Remote monitoring.

In the “Upgrade” movie (Csfed.cz, 2018), where the future home was shown, everything could be controlled by the smart-home system. A kitchen table included a sensor panel for the management of the system, which was controlled by the voice. Kara was the name of the system in Grey’s house, who, in his turn, was the main character.



Figure 23. Kara gives injection to Grey (2018). Adopted from <https://www.csfed.cz/film/601122-upgrade/prehled/>

Kara’s abilities were: greeting Grey or Asha (Grey’s wife); playing music/TV; controlling of the heating; reminding about the meetings; checking food in the fridge/ordering it online; meal preparation; bounding/inbounding calls; giving injections was shown in Figure 23; calling an ambulance; closing / opening the door.

Technology, which is outlined in the “Upgrade” film, has already been developed on a high level. It will be progressing further and in near future people will have a chance to use this system to the greatest possible extent by cooking meals or do simple things which are related to human

health. People are under the influence of books, movies and trends. So, manufactures will create more automated systems than now exist, what will allow people to utilize more advanced technologies and let them feel they have an unusual device.

3.3 “Blade Runner 2049” – Holograms

It is unbelievable how many new and unexpected inventions are still waiting for humanity. Every new technology is multidimensional and requires a lot of time and effort to appear on the world stage. One of these technologies is holograms.

The sequel “Blade Runner 2049” (Csf.d.cz, 2017) was released worldwide. It impressed the audience with its visual effects and received several awards in this category. The movie demonstrated the technology of an advanced hologram based on artificial intelligence. The name of the hologram was Joi, she was a hologram of the main hero K - blade runner. The hologram looked like a person, could talk, move, change clothes, cook, think, imitate touch, and express feelings. Joi could process information and synchronize with a person. As well as react to the weather - let rain and wind pass through her.



Figure 24. Joi is talking with K (2017). Adopted from <https://www.csf.d.cz/film/343108-blade-runner-2049/prehled/>

Its working principles (see Figures 24, 25) depended on the embedded wall console with an adjustment button, which turning on was accompanied by a pleasant sound signal. A moving projector that displayed a hologram was built into the ceiling. In the movie, it was possible to update the hologram to improve its functionality and enhance existing functions. Joi’s movement was not limited after the upgrade. The projector was replaced with a handheld device. It looked like a small remote control unit. When K pressed the button, Joi appeared in the room without the usage of the projector. The device allowed her to follow K to every place he could come.



Figure 25. Joi after upgrade (2017). Adopted from <https://www.csfd.cz/film/343108-blade-runner-2049/prehled/>

As was shown in the movie, Joi was demonstrated as an entertainment gadget and a kind of companion during K's missions. The main drawback of the technology was in the fragility of the remote control unit, which could break easily and lose all the data without the possibility to recover it.

Kucirkova (July 17, 2018) describes hologram as a three-dimensional image of an object created by refraction of light waves and interference that displays the created object. Its industry is varied by its types such as digital, X-ray, optical and acoustic. It has success in many different areas, such as marketing, entertainment, advertising, politics, medicine and show business. But, the one important thing is that there is another type of so called "hologram", which is not based on the holography principles. It is called a Pepper's ghost technique (1858). It implies, that the hologram was created by projecting a video image of an animated 3D model onto a semi-transparent glass set at a certain angle to the viewer. It means that the image was actually flat, not a three-dimensional. The dark background behind the translucent glass was specifically used to show the effect of image depth. The reflection in the glass, which was set vertically at a slight angle, created the presence of a three-dimensional image. By means of this principle Michael Jackson's hologram was created in 2014.



Figure 26. Michael Jackson's illusion in Las Vegas (2014). Adopted from <https://www.youtube.com/watch?v=jDRTghGZ7XU>

The company Pulse Evolution took a picture of the background in 8K resolution by using two cameras. Pulse Team (2014) created a digital version of Michael based on his appearance in 1991 and worked on his animation. During the performance, Pulse used six suspended high-power spotlights that display the image of Jackson on a big transparent screen, located at an angle of 45-degree. The depth of the illusion was complemented by live dancers, located both in the foreground and in the background. Dancing Michael Jackson showed in Figure 26.

This technique gained its prominence in the 19th century and was used everywhere, for various performances and spectacles. Now, this is a more advanced technology that is used in combination with visual effects. The hologram presented in the film definitely outperforms the technologies used in a modern world and at the same time is considered as a good example that humanity should seek to ensure that the level of development only increases with each passing year.

3.4 “Ready Player One” – Virtual reality in video games

In the first chapter of my thesis, I have already described the technology of virtual reality, how it is applied in real life, its main purposes, and examples. In this chapter, i would like to talk about virtual reality gaming.

As was mentioned earlier, virtual reality is a computer environment that interacts with a person through different external devices and simulates the effect through person's senses: vision, taste, smell, hearing. Developers are trying to make virtual reality as close as possible to the real world. This can be achieved if virtual reality is plausible, interactive and possible to explore in detail.

Alraizzah, Fattouh, Lamya, (2017) define several types of virtual reality, which differ from each other due to their components: It can be the presence of the effect of full immersion in the game, semi-immersion or rather the absence.

To immerse yourself in virtual reality, a player should have the following headsets (see Figure 37):

- Head-mounted display (it can contain one or more displays)
- Gloves (where sensors track the movements of hands and fingers)
- Bodysuit (should be in combination with helmet)
- Wireless controllers (joystick, wands, glasses)



Figure 27. Player tests the VR headset. Adopted from <https://www.pcmag.com/picks/the-best-vr-headsets>

The most famous companies which specialize on virtual reality are Oculus VR, Next/Now, Microsoft, iTechArt, Sony interactive entertainment (softwaretestinghelp.com, n.d). All of them trying to make a contribution in the development of virtual reality and expand all over the world. Good examples of virtual reality games can be “Rick&Morty:Virtual Rick-ality” (Owlchemy Labs & Adult Swim Games, 2017), where the player performs his action for Morty to take care of Rick’s behaviour and tasks during the game.



Figure 28. Rick and Morty: Virtual Rick-ality (2017). Adopted from https://www.oculus.com/experiences/rift/196665787048646/?locale=cs_CZ

“Moss” is the game created by Polyarc company (2018). The player controls the mouse and tries to explore forests, find artifacts and fight with many creatures.



Figure 29. Moss in the forest (2018). Reprinted from <https://www.polyarcgames.com/moss>

In 2018, the famous director Steven Spielberg amazed the world with his movie “Ready Player One” (Csf.d.cz, 2018). The movie shows a dystopian world of the future, where the global economy is in stagnation and the Internet and the technology of virtual reality are developed at the highest level. The main character Wade is a poor orphan who lives in his aunt's house and spends most of his time playing games. Wade or Parzival (his nickname) spends a lot of time playing a game called OASIS. To start the game, the main hero needs special equipment (see Figure 30). Wade puts a device around his neck that automatically improves his vision so that he doesn't have to wear his glasses while playing. He wears his gloves and helmet and starts running on a treadmill which is equipped with a pressure sensor.



Figure 30. Wade's accessories used during the game (2018). Adopted from <https://www.csfd.cz/film/410534-ready-player-one-hra-zacina/prehled/>

“Ready Player One” bases on the book of science fiction writer Ernest Cline. The author (2011) demonstrates OASIS – a virtual universe, a world limited by the imagination, where the player can not only complete missions but also can do anything: go anywhere, for example, on vacation, surf in Hawaii or climb Mount Everest. Any player can go to play in casino, get married, or get divorced, dance, do sports or even study. People come to the OASIS because they can do

whatever they want and become whatever they want. They can be tall, intimidating, have a different gender, race, can be realistic, or cartoony. People spend the rest of their time in OASIS apart from eating, using the toilet, and sleeping. Everyone makes friends virtually. They meet virtually and may never meet in real life.



Figure 31. Parzival came to the Halliday Journals. Adopted from <https://www.csfd.cz/film/410534-ready-player-one-hra-zacina/prehled/>

The key element of the game is collecting artifacts, which was invented by the main developer of the game. Participation in battles gives a good way to earn money, but if the player fails, he or she loses everything (money, equipment, weapons) without the right to restore. Sometimes, it leads to inappropriate behaviour, anger, or the death of the player in real life. (The example was shown in the movie when a man was trying to jump out of a window because he lost the game.) With the money you win, you can buy weapons and order additional devices inside the game or buy equipment for yourself.

Benefits of the game:

- full immersion
- realism
- variety of actions

Drawbacks of the game:

- people become introverts
- inappropriate behaviour in real life
- main focus only on the game life

"Ready Player One" shows the reality that can happen if people would constantly focus on their devices, whether it is a phone, laptop, or a virtual reality device. To avoid such a reality, people must understand what they do and what they spend their time on. They have to set their priorities correctly. The game should only be a means of entertainment, but not a substitution for real life. From the point of view of the development of technology, this is an amazing game that impresses

with its graphics and the number of features presented, which the modern world should seek to, but all of us have to see the limit and have to be very careful so that the game will not transform in reality.

Conclusion

This Bachelor's thesis has several purposes: to describe some of the technological inventions that were predicted by science fiction novel writers and film directors, which later became reality, and specified which present-day technology found in science fiction has the best chance of being implemented in the future.

According to the conducted research, it was proven that science fiction is the embodiment of current examples in the present time. Nowadays, the world does not stand still; the most incredible assumptions of science fiction writers have already become a reality and continue to develop further. Thirty years ago, people did not have the opportunity to invent and create new things simultaneously in comparison with the present time. Nowadays, humanity lacks science fiction writers who can invent something completely new. People are so overwhelmed with the technologies of the present that future ones have become minor. The realization that science fiction can enhance the imagination of inventors has prompted many companies to hire science fiction writers who are able to write stories related to their developments. This is how science fiction writers create new masterpieces based on modern technologies and predict their future development.

After analyzing many research articles, novels and watching science fiction movies, I identified several technologies in my work that have all the chances to develop and be implemented in the future. One of these technologies is space tourism. Recently, I found some news about Elon Musk's prototype of the space shuttle that landed safely on the landing site after four unsuccessful attempts. A successful attempt will give a strong impetus to the development of new technologies that will contribute to the development of cosmonautics in the coming years. It will allow people to conduct a big number of new experiments and bring humanity closer to such a serious objective as interplanetary flights.

To sum up, it is necessary to emphasize that during the writing of this thesis, I certainly expanded my knowledge and my horizons, and found many new books and authors. Furthermore, I fulfilled the goals I set forth in this Bachelor's thesis.

Extended Abstract in Czech language

Sci-fi je žánr fantasy v literatuře, jehož děj je založen na vývoji událostí, které se udály v důsledku fiktivních vědeckých objevů a technologií. Před dvěma stoletími sci-fi spisovatelé vytvářeli různé příběhy o děsivých příšerách. Později se začali soustředit na romány a příběhy spojené s objevy vědy a různými vynálezy. Oblast sci-fi se rozšířila a romány se začaly soustředit na mnoho dalších oblastí. Díky rozvoji kinematografie a televize si lidé začali lépe představovat, jak by mohl vypadat náš svět po několika desetiletích a stoletích a zároveň porovnávat technologie minulosti s technologiemi současnosti.

Tato bakalářská práce má následující cíle: popsat, jak sci-fi literatura předpověděla moderní technologie, získat informace o tom, jak sci-fi filmy a seriály ovlivnily vynálezy v reálném životě, a ukázat, jak moderní sci-fi může předpovídat budoucí technologie 21. století. Práce je rozdělena do třech kapitol: první kapitola se zaměřuje na technologické vynálezy, které byly předpovězeny sci-fi spisovateli v minulosti a již byly realizovány v přítomnosti. Kapitola obsahuje technologie různých autorů. Každý z nich napsal několik příběhů na různá témata: vynálezy ponorky, bionické implantáty, typy Virtuální realita je nová oblas robotů, lasery, autonomní automobily a chytré domácnosti. Druhá kapitola se věnuje sci-fi filmům a televizním seriálům, které byly promítány ve druhé polovině 20.století a měly velký vliv na dnešní dobu. Třetí kapitola popisuje moderní technologie nalezené ve sci-fi filmech, které mají největší šanci být realizovány v blízké budoucnosti.

Jules Verne je považován za jednoho ze zakladatelů sci-fi, jehož literatura je známá po celém světě. Julesu Vernu se podařilo demonstrovat technologie ponorky na vysoké úrovni, ukázat její výhody a nevýhody. Pokud jde o technologii současnosti, ponorky jsou široce používány v moderním světě, ale stále jsou navrhovány jako Vernovy ponorky. Aktivně se používají pro válečné účely, nákladní dopravu, cestování a rybolov. Bionické implantáty jsou další technologie, které vymyslel Martin Kaydin. Ve svém příběhu Martin ukázal nadčlověka, který nahradil ruku, nohy a oko protézami, což mu umožnilo stát se superhrdinou. První zmínění protetiky se objevily ve středověku, ale ve skutečnosti se tato technologie dostala na kvalitnější úroveň až ve 20. století. Výzkumy pomohly vytvořit protézu, která zpracovává více příkazů najednou, což umožňuje složité operace, jako je česání vlasů nebo odemykání dveřního zámku. Isaac Asimov napsal celou řadu příběhů o robotech a jejich chování a pokynech, které mohou provádět. V roce 2015 společnost Hanson Robotics představila robota Sofiyu, která byla vytvořena, aby se přizpůsobila chování lidí a pracovala s nimi. Sophia může imitovat lidská gesta, vést krátký rozhovor a odpovědět na konkrétní otázky. Ray Bradbury popsal koncept chytrého domácího systému ve svém díle "There will come soft rains". Systém zahrnoval automatické připomenutí událostí, vaření, úklid domu, péči o zahradu,

zalévání rostlin a zábavu pro všechny členy rodiny. Tyto funkce umožňovaly člověku věnovat svůj volný čas práci, koníčkům a osobnímu rozvoji. Nyní existují různé společnosti poskytující široký výběr chytrých systémů, které lze instalovat v každém domě.

Ve svém krátkém příběhu David Keller vyprávěl o autonomním autě a ukázal světu jeho schopnosti. První analogie autonomních aut se objevila na konci 20. století, kdy společnosti začaly vyvíjet své první prototypy autonomních vozidel. Autonomní systémy se dají rozdělit do 6 úrovní, které představují celé spektrum řízení. Napomáhají tomu různé systémy, které pomáhají sledovat situaci na silnici. Technologie laseru je používána již v dnešní době a je všeobecně používána v různých odvětvích, jako je věda, medicína, stavebnictví a zábava. Poslední technologie, která je uvedena v této kapitole, se týká genového inženýrství popsaného Oldosem Huxleym, jeho vidění světa a možnosti úpravy genů.

Druhá kapitola představuje sci-fi filmy, jejichž technologie lze nalézt i v současnosti. Mobilní telefon ukázaný v seriálu "Star Trek" má velmi podobné funkce a vlastnosti jako telefon, který existoval na konci 20. století. Film Stanleyho Kubricka "2001: Vesmírná odysea" názorně ukazuje přípravu na výstup do otevřeného vesmíru, včetně letu na oběžnou dráhu a návštěvy vesmírné stanice. Cesta do vesmíru byla a zůstává nákladnou zábavou, která umožňuje vidět Zemi z vesmíru, zažít stav beztlíže a vědecky přispět k rozvoji budoucích letů. Droidy vytvořené Georgem Lucasem v roce 1977 předpověděli technologii, která vznikla díky společnosti Boston Dynamics. Robot "Atlas" je autonomní robot sestavený z 3D tištěných částí těla. Atlas umí chodit, stát na jedné noze, dělat salta dozadu a nést těžké náklady, jako to dělali vymyšlení droidi. Při porovnávání se dá pochopit, že obě technologie mají mnoho společného, hlavně díky designu, jejich funkčnosti a efektivitě.

Poslední kapitola je soustředěna na technologie současnosti, které byly nalezeny v moderních sci-fi filmech. Operační systém s umělou inteligencí je jednou z nejnovějších technologií, která má veliké šance na realizaci v budoucnu. Ve filmu "Ona" operační systém má širokou funkcionalitu: dokáže okamžitě zpracovávat obrovské množství dat, napodobovat pocity jako je láska, radost, smutek, empatie, a také skládat hudbu. Moderní softwarové společnosti slíbily ukázat nové multifunkční operační systémy, které by měly zahrnovat hlasové asistenty, zpracování dat a rychlejší učení umělé inteligence. Hlasoví asistenti jako Siri, Cortana nebo Google assistant jsou zástupci budoucí technologie operačního systému. Chytrá domácnost je další technologie, která již existuje v přítomnosti, ale stále se liší od toho, co bylo uvedeno v sci-fi filmu "Upgrade". Systém je naprogramován tak, aby prováděl různé úkoly v určitém čase. Jeho funkce jsou poměrně rozmanité: ovládání světla, vytápění domu, přítomnost požárního a bezpečnostního alarmu a dálkové ovládání. Film "Upgrade" obsahuje technologii schopnou zapnout a vypnout elektrické spotřebiče, kontrolovat

jídlo v lednici a objednat si jej, pokud je to nutné, vařit jídlo, provádět zdravotní úkony a přivolat rychlou pomoc. Hologram založený na umělé inteligenci je další technologie, která se odehrává v budoucnosti. „Pepper 's ghost“ metoda je založena na vytváření hologramu nebo správněji řečeno iluze, která není založena na holografických technikách. Tato metoda byla použita k vytvoření iluze Michaela Jacksona. Film “Blade Runner 2049“ obsahuje hologram vytvořený na základě umělé inteligence. Hologram vypadá jako skutečný člověk, který může mluvit, převlékat se, vařit, imitovat pocity a zpracovávat informace a synchronizovat je s člověkem. Virtuální realita v počítačových hrách je závěrečným tématem této práce. Hlavní hrdina filmu "Hra začíná" tráví svůj volný čas hraním virtuální hry OASIS. Tato hra umožňuje hráči ponořit se do mimořádného světa, ve kterém uživatel může dělat cokoli kromě základních potřeb člověka jako je jídlo a spánek. Moderní virtuální realita zatím takové možnosti nemá. Existují různé hry pro virtuální realitu, například "Moss". Tato hra společnosti Polyarc umožňuje hráči přenést se do kouzelného světa a vžít se do role malé myši, která bojuje s různými monstry a sbírá magické artefakty. Virtuální realita je nová oblast, která se rozvíjí díky velkému množství nejrozličnějších společností a používaných metod. Stávající technologie jsou daleko za zobrazenou technologií ve filmu, přesto má virtuální realita velké šance na realizaci v budoucnu.

Svět se stále mění a některé nejneuvěřitelnější předpoklady fantastických spisovatelů se již staly realitou. V současné době lidstvu chybí sci-fi spisovatelé, kteří by mohli vymyslet něco zcela nového. Hodně společností začalo přijímat spisovatele sci-fi, kteří jsou schopni vytvářet scénáře v souvislosti s oblastmi vývoje firem. Nová mistrovská díla takových spisovatelů jsou založená na moderních technologiích a předpovídají jejich budoucí vývoj. Je důležité zmínit, že během vývoje nových technologií lidstvo nepochybně narazí na různé potíže a zábrany, které však následně přiblíží lidi k zřejmému požadovanému výsledku – snazšímu životu.

List of References

1. Alam, M., Reaz, M., Mohd Ali, M. (n.d.). A Review of Smart Homes – Past, Present, and Future. IEEE. Retrieved from https://www.researchgate.net/publication/262687986_A_Review_of_Smart_Homes-_Past_Present_and_Future
2. Alraizzah, A., Fattouh, L., Lamya, F. (2017). Environments and System Types of Virtual Reality Technology in STEM: A Survey. In *International Journal of Advanced Computer Science and Applications*. Retrieved from <https://www.researchgate.net/publication/321183923>
3. Asimov, A. (1950, December 2). I, Robot. *Robot series*. Gnome Press. United States: New York.
4. Asimov, A. (1976, February), The Bicentennial Man. *Robot series. Stellar-2*. Ballantine Books. United States: New York.
5. Biography.com. (Eds.) (2017). Herbert George Wells. Retrieved from <https://www.biography.com/writer/hg-wells>
6. Biography.com. (Eds.) (2014). Aldous Huxley. Retrieved from <https://www.biography.com/writer/aldous-huxley>
7. Borth, D. (2009). Mobile Phone. In *Encyclopedia Britannica*. Retrieved from <https://www.britannica.com/technology/mobile-telephone/additional-info#history>
8. Bostondynamics.com. (2019). Atlas. Retrieved from <https://www.bostondynamics.com/atlas>
9. Bradbury, R. (1950, May 6). There Will Come Soft Rains. *The Martian Chronicles*. Collier's Weekly. United States.
10. Britannica.com. (1998). Sir Charles Wheatstone. In *Encyclopedia Britannica*. Retrieved from <https://www.britannica.com/biography/Charles-Wheatstone>
11. Britannica.com. (2008, April 10). Star Wars. In *Encyclopedia Britannica*. Retrieved from <https://www.britannica.com/topic/Star-Wars-film-series>
12. Britannica.com. (1998, July 20). Herbert George Wells. Retrieved from <https://www.britannica.com/biography/H-G-Wells>
13. Britannica.com. (1998, July 20). Yuri Gagarin. In *Encyclopedia Britannica*. Retrieved from <https://www.britannica.com/biography/Yuri-Gagarin>
14. Caidin, M. (1972). *Cyborg*. United States: Arbor House.
15. Chan, M., Campo, E., Estève, D., Fourniols, J-Y. (March 31, 2009). Smart homes — Current features and future perspectives. *Journal Maturitas*. France: Toulouse. Retrieved from https://www.academia.edu/3222339/Smart_homes_current_features_and_future_perspectives
16. Chang, W. (1965). [Youtube video]. Retrieved from

- <https://www.youtube.com/watch?v=d8ZjDzmjEDA>
17. Cline, E. (2011, August 6). Ready Player One. Crown Publishing Group. United States.
 18. Csfed.cz. (2017). Blade Runner 2049. Retrieved from <https://www.csfed.cz/film/343108-blade-runner-2049/prehled/>
 19. Csfed.cz. (2013). Her. Retrieved from <https://www.csfed.cz/film/312650-ona/prehled/>
 20. Csfed.cz. (2018). Ready Player One. Retrieved from <https://www.csfed.cz/film/410534-ready-player-one-hra-zacina/prehled/>
 21. Csfed.cz. (2018). Upgrade. Retrieved from <https://www.csfed.cz/film/601122-upgrade/prehled/>
 22. Dircks, H. (1858). Pepper's ghost technique. British Science Association. Retrieved from https://www.gracesguide.co.uk/Henry_Dircks
 23. Emondi, A. (2017). Hand Proprioception and Touch Interfaces. Retrieved from <https://www.darpa.mil/program/hand-proprioception-and-touch-interfaces>
 24. English, T. (2020, January 11). How Do Self-Driving Cars Work?. In *Interesting Engineering*. Retrieved from <https://interestingengineering.com/how-do-self-driving-cars-work>
 25. Evans, A. (1998). Jules Verne. In *Encyclopedia Britannica*. Retrieved from <https://www.britannica.com/biography/Jules-Verne>
 26. Greenberg, A. (October 28, 2008). Cellphone Inventor Knocks iPhone. Retrieved from https://www.forbes.com/2008/10/28/cooper-cell-inventor-tech-wire-cx_ag_1028cooper/?sh=100b681c795d
 27. Hanson, D. (2015). Sophia. Retrieved from <https://www.hansonrobotics.com/sophia/>
 28. Hecht, J. (n.d). Laser. In *Encyclopedia Britannica*. <https://www.britannica.com/technology/laser>
 29. Hosch, W. (2006, October 26). Laser. In *Encyclopedia Britannica*. Retrieved from <https://www.britannica.com/technology/laser>
 30. Huxley, A. (1932). Brave New World. *Chatto & Windus*. United Kingdom. London.
 31. Jordan, DJ., Mafi, P., Mafi, R., Malahias, M., Gawad, A El. (2016, September 17). The Use of LASER and its Further Development in Varying Aspects of Surgery. In *Open Medicine Journal*, (291-292). United Kingdom. Retrieved from <https://openmedicinejournal.com/VOLUME/3/PAGE/288/FULLTEXT/>
 32. Keller, D. (1935, May). The Living Machine. *Wonder Stories*. USA
 33. Knowyourmobile.com. (n.d). The History of Mobile Phones From 1973 To 2008: The Cellphones That Made It ALL Happen. Retrieved from <https://www.knowyourmobile.com/phones/the-history-of-mobile-phones-from-1973-to-2008-the-handsets-that-made-it-all-happen-d58/>

34. Kubrik, S. (1968). 2001: A Space Odyssey. *Stanley Kubrick Productions*. United Kingdom. United states.
35. Kucirkova, A. (July 17, 2018). What Can We Expect from Hologram Technology in the Future? In *Kapital*. Retrieved from <https://www.nasdaq.com/articles/what-can-we-expect-hologram-technology-future-2018-07-17>
36. Late Show. (2001). [Youtube video]. Retrieved from <https://www.youtube.com/watch?v=yZtv6x10NLc&t=2s>
37. Livescience.com. (2007). World's First Prosthetic: Egyptian Mummy's Fake Toe. Retrieved from <https://www.livescience.com/4555-world-prosthetic-egyptian-mummy-fake-toe.html>
38. Lucas, G. (1977). Star Wars, Episode IV- A New Hope. *Lucasfilm*. United States.
39. Mazuryk, T., & Gervautz, M. (n.d). *Virtual Reality. History, Applications, Technology and Future*. Austria: Institute of Computer GraphicsVienna University of Technology. Retrieved from https://www.researchgate.net/publication/2617390_Virtual_Reality_-_History_Applications_Technology_and_Future
40. Military-history.org. (2011). Submarine – The History of Submarine War. Retrieved from <https://www.military-history.org/articles/submarine-the-history-of-submarine-war.htm>
41. Mota, A. (2017, March 10). *Materials of Prosthetic Limbs*, (3-5). Pomona: California State
42. Ondruš, J., Kolla, E., Vertal, P., Šarić, Ž. (2019). How Do Autonomous Cars Work? *University of Zilina, Faculty of Operation and Economics of Transport and Communications, Department of road and urban transport*, (227-229). Slovak Republic. Retrieved from <https://www.sciencedirect.com/science/article/pii/S2352146520300995>
43. Owlchemy Labs & Adult Swim Games. (2017). Rick&Morty:Virtual Rick-ality. Retrieved from <https://owlchemylabs.com/games/>
44. Neagu, A. (2018). Space Tourism: A new way of tourism not so distant in time or space. *Universitat Jaume*, p 13-17. Retrieved from http://repositori.uji.es/xmlui/bitstream/handle/10234/177115/TFM_2018_Neagu_%20Andreea%20Larisa.pdf?sequence=1&isAllowed=y
45. Nigms.nih.gov. (n.d.). Studying Cells. Retrieved from <https://www.nigms.nih.gov/education/fact-sheets/Pages/studying-cells.aspx>
46. Pfeiffer, L. (February 12, 2010). Metropolis. In *Encyclopedia Britannica*. Retrieved from <https://www.britannica.com/topic/Metropolis-film-1927>
47. Polyarcgames.com. (2018). Moss. Retrieved from <https://www.polyarcgames.com/>
48. Pulse Evolution.(2014). Michael’s Jackson Illusion. Retrieved from <http://www.pulse.co/>

49. Ran, F., Hsu, P., Wright, J. (2014, October 24). Genome engineering using the CRISPR-Cas9 system. In *Nat Protoc*. Retrieved from <https://doi.org/10.1038/nprot.2013.143>
50. Reviews.com. (2020). The Best Voice Assistants. Retrieved from <https://www.reviews.com/home/smart-home/best-voice-assistant/>
51. Rivelli, E. (2020, June 30). How Do Self-Driving Cars Work and What Problems Remain?. Retrieved from <https://www.thesimpledollar.com/insurance/auto/how-self-driving-cars-work/#infographic>
52. Softwaretestinghelp.com. (n.d). 20 Biggest Virtual Reality Companies. Retrieved from <https://www.softwaretestinghelp.com/top-virtual-reality-companies/>
53. Star Trek. (1965). [Youtube video]. Retrieved from <https://www.youtube.com/watch?v=rgE2wAHuYY4>
54. (Tadviser.ru, 2019, April 16). Smart-home system. Retrieved from <https://www.tadviser.ru/>
55. Straiton, J. (2019). Genetically modified humans: the X-men of scientific research. In *BioTechniques*. (249-250). Retrieved from <https://www.future-science.com/doi/10.2144/btn-2019-0056>
56. Verne, J. (1870). *Vingt mille lieues sous les mers*. Translated by Marko Vovchok. Ukraine. Retrieved from <https://knijky.ru/books/dvadcat-tysyach-le-pod-vodoy>
57. Visiblebody.com. (n.d.). What is DNA? Retrieved from <https://www.visiblebody.com/learn/biology/dna-chromosomes/overview>
58. Weinbaum, S. (1935). Pygmalion's Spectacles. *Wonder Stories*. USA.
59. Wells, H. (1898). *The War of the Worlds*. United Kingdom
60. Wikipedia.org. (n.d.). Droid. Retrieved from [https://en.wikipedia.org/wiki/Droid_\(Star_Wars\)](https://en.wikipedia.org/wiki/Droid_(Star_Wars))
61. Wikipedia.org. (n.d.). Laser. Retrieved from <https://en.wikipedia.org/wiki/Laser>

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List of Symbols and Abbreviations

WWI – World War I

WWII – World War II

CPU – Central Processing Unit

GPU – Graphic Processing Unit

CRISPR – Clustered Regularly Interspaced Short Palindromic Repeats

DNA – Deoxyribonucleic Acid

AIDS – Acquired Immune Deficiency Syndrome

RNA – Ribonucleic Acid

OASIS – Ontologically Anthropocentric Sensory Immersive Simulation