

MINISTRY FOR DEVELOPMENT OF INFORMATION TECHNOLOGIES AND
COMMUNICATIONS OF THE REPUBLIC OF UZBEKISTAN
TASHKENT UNIVERSITY OF INFORMATION TECHNOLOGIES

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“THE EVOLUTION OF DIGITAL VIDEO ”

Graduate qualification work

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Tashkent 2015

MINISTRY FOR DEVELOPMENT OF INFORMATION TECHNOLOGIES
AND COMMUNICATIONS OF THE REPUBLIC OF UZBEKISTAN
TASHKENT UNIVERSITY OF INFORMATION TECHNOLOGIES

Faculty: Television technologies
Department: Audiovisual technologies
Direction (specialty): 5320600 Audio and
Video technologies

CONFIRM

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«__» _____ 2015

TASK

On final qualifying work

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(Surname, name, patronymic)

1. Theme: The evolution of digital video.
2. Confirmed by University order. № 60 - 18 on the 19th of February 2015 year.
3. Deadline for finishing work 05.06.2015
4. Source data to work: Literature on corresponding subject, surveys
International practice, figures and presentations featuring making videos in different formats and containers.
5. Contents and explanations of work (executive section): Introduction, the term of digital video, its history and general information, digital video compression, formats, digital video standards, video which demonstrates the entire meaning of digital video and its evolution up to present time, life safety activities, conclusion
6. List of graphic materials: Presentation slides of Microsoft PowerPoint program.
7. Date of task issue: 20.01.2015

Scientific adviser _____
(Signature)

Task received _____
(Signature)

8. Consultants on separate parts of final qualifying work

№	Units	Name of	Deadline	
			Task	Task received
1	Introduction	Radjiev A.B	12.02.2015	06.03.2015
2	The term of digital video, its history and general information	Radjiev A.B	02.03.2015	16.03.2015
3	Digital video compression formats. Digital video standards	Radjiev A.B	16.03.2015	07.04.2015
4	Video which demonstrates the entire meaning of digital video and its evolution up to present time	Radjiev A.B	07.04.2015	18.04.2015
5	Making the initial trial of video tutorial	Radjiev A.B	20.04.2015	27.04.2015
6	Making the final video tutorial	Radjiev A.B	28.04.2015	11.05.2015
7	Life safety issues		08.05.2015	18.05.2015
8	Conclusion	Radjiev A.B	19.05.2015	27.05.2015

9. Schedule of work implementation

№	Title	Deadline	Mark of instructor
1	Introduction	11.02-06.03.2015	
2	The term of digital video, its history and general information	03.03-16.03.2015	
3	Digital video compression formats. Digital video standards	16.03-07.04.2015	
4	Video which demonstrates the entire meaning of digital video and its evolution up to present time	07.04-18.04.2014	
5	Making the initial trial of video tutorial	20.04-27.04.2014	
6	Making the final video tutorial	28.04-11.05.2014	
7	Life safety issues	08.05-18.05.2015	
8	Conclusion	19.05-27.05.2014	

Graduate _____ «__» _____ 2015

(signature)

Scientific adviser _____ «__» _____ 2015

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The following final qualifying work is devoted to the evolution of digital video and given information about digital video history, its necessity and all needful information. Besides, digital video formats and compressions are included in this final qualifying work. There is enough information about digital broadcasting television system – DVB-T that has launched in Uzbekistan. In order to be easy and understandable there exists a video tutorial as project work.

Ushbu bitiruv malakaviy ishi raqamli video evolyutsiyasiga ba’gishlangan bo’lib, raqamli video tarixi, uning zarurati va raqamli videoga oid barcha kerakli ma’lumotlar keltirilgan. Bundan tashqari, raqamli video formatlar va siqish usullari ham ushbu bitiruv malakaviy ishi tarkibidan joy olgan. O’zbekistonda yo’lga qo’yilgan raqamli televideniye standarti – DVB-T haqida yetarlicha to’xtalib o’tilgan. Loyiha ishi sifatida o’rganuvchiga oson va tushunarli video qo’llanma yaratilgan.

Эта выпускная квалификационная работа посвящена эволюции цифрового телевидения и была приведена история цифрового телевидения, её потребность и все необходимые данные которые принадлежат цифровому телевидению. Кроме того, цифровые видео-форматы и методы сжатия считаются в рамках этой выпускной квалификационной работы. Было достаточно сказано о стандарте цифрового телевидения – DVB-T установленный в Узбекистане. Для обучающихся был создан простой и понятный видео урок в качестве проектной работы.

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Introduction

Two greatest inventions are book printing which made us sit down at reading, and television which made us stop reading (George Elgozi)

For the time being, as technology increases, there are numerous reforms are being accomplished on the television field, too. As the proof, the law of the Republic of Uzbekistan “Regarding mass media” can be brought. In international extent, many reforms have been done so far. In the extraordinary meeting of International Telecommunication Union in Geneva, a decree recognizing converting to digital broadcasting systems by 2015 was stated. According to this decree, the conception of the President of our country presenting the converting to digital television step by step was endorsed. There marked measures of implemental works of broadcasting and digital production in Uzbekistan National Television company. Also, shown the tasks of broadcasting digital communication networks as well as distribution throughout country. On the basis of this tasks, the first stage of distribution commenced in 2011, and currently, in Tashkent and other regions of Uzbekistan receiving signals in a digital format is successfully being done. To carry out the works, the products of the most advanced television manufacturers around the world are being brought on credits and investment projects.

The importance of diploma work

It will be understandable even to a single person who does not have any specific information about television field. It means that following work increases the interest of Uzbek audience and they will distinguish the difference between analog video and digital video. Then, it will automatically rocket the requirement for digital video in Uzbekistan.

The purpose of diploma work

- 1) Giving theoretical information to learners about the significance of digital video by reforms distributed all over the world.
- 2) Obtaining habits about the preferences of digital video through comparing digital and analog videos;
- 3) The evolution of digital video television standards and having enough information about the position of leading countries in this field;
- 4) Obtaining enough theoretical and practical knowledge about formats and compressions in digital video.

The task of diploma work

- 1) Doing a research into digital video format and compressions
- 2) Highlighting wide information about digital video and its several digital standards;
- 3) Learning solutions of eliminating the backwards of digital video;
- 4) Digital standards of broadcasting launched in our country and having a look at their working principles in detail;
- 5) Representing the evolution of digital video through the mini videos made step by step.

The practical significance of diploma work

It is of high importance to know the difference between analog and digital video. This is because, digital video has superiority over analog video. However, not every person understands it. Therefore, it is significant to create any kind of textbooks or video tutorial to let people know all about digital video as well as its advantages. I made one of them, namely, a video tutorial. The reason why I particularly made it is that a video tutorial is easy to understand and learners can have detailed information about the evolution of digital video. Video tutorial consists of several mini videos representing the quality of videos used before and their relevant formats, including bitrates and resolutions. After watching this video tutorial, audience will find out the

history of digital video, its evolution and even how digital video is made.

Expected results

Ushbu bitiruv malakaviy ishidan kutilgan natija raqamli video haqida to'liq va tushunarli ma'lumotlarga ega bo'lmoqchi bo'lgan foydalanuvchilarga kerakli qo'llanma yaratish hisoblanadi. Bundan tashqari, loyiha sifatida taqdim etilgan video konsultatsiya yordamida o'rganuvchilarga raqamli videoning qanday hosil bo'lishi hamda uning rivojlanish va o'zgarish davrlarini ochib berish orqali amaliy bilim berish.

1. THE TERM OF DIGITAL VIDEO, ITS HISTORY AND GENERAL INFORMATION.

1.1. The definition of digital video and history

Digital video is audio/visual in a binary format. Information is presented as a sequence of digital data, rather than in a continuous signal as analog information is. Information in the natural world, received through the five senses, is analog. That means that it is infinitely variable. Digital audio/visual information, on the other hand, consists of discrete units of data that are placed so close together that the human senses perceive them as a continuous flow. Analog data, such as video recorded on tape, is transmitted as electronic signals of varying frequency or amplitude that are added to carrier waves of a given frequency. To make that information usable on a computer or a modern media player, analog-to-digital conversion translates an analog signal to a series of zeroes and ones, which represent, respectively, "negative" and "positive", "low" and "high."

The history of digital video

Starting in the late 1970s to the early 1980s, several types of video production equipment that were digital in their internal workings were introduced, such

as time base correctors (TBC) and digital video effects (DVE) units. They operated by taking a standard analog composite video input and digitizing it internally. This made it easier to either correct or enhance the video signal, as in the case of a TBC, or to manipulate and add effects to the video, in the case of a DVE unit. The digitized and processed video information that was output from these units would then be converted back to standard analog video. Later on in the 1970s, manufacturers of professional video broadcast equipment, such as Bosch, RCA, and Ampex developed prototype digital videotape recorders (VTR) in their research and development labs. Bosch's machine used a modified 1" Type B transport, and recorded an early form of CCIR 601 digital video. Ampex's prototype digital video recorder used a modified 2" Quadruplex VTR (an Ampex AVR-3), but fitted with custom digital video electronics, and a special "octaplex" 8-head head-wheel. The audio on Ampex's prototype digital machine, nicknamed by its developers as "Annie", still recorded the audio in analog as linear tracks on the tape, like 2" Quad. None of these machines from these manufacturers were ever marketed commercially, however. Digital video was first introduced commercially in 1986 with the Sony D1 format, which recorded an uncompressed standard definition component video signal in digital form instead of the high-band analog forms that had been commonplace until then. Due to its expense, and the requirement of component video connections using 3 cables to and from a D1 VTR that most television facilities were not wired for (composite NTSC or PAL video using one cable was the norm for most of them at that time), D1 was used primarily by large television networks and other component-video capable video studios. In 1988, Sony and Ampex co-developed and released the D2 digital videocassette format, which recorded video digitally without compression in ITU-601 format, much like D1. But D2 had the major difference of encoding the video in composite form to the NTSC standard, thereby only requiring single-cable composite video connections to and from a D2 VCR, making it a perfect fit for the majority of television facilities at the time.

This made D2 quite a successful format in the television broadcast industry throughout the late '80s and the '90s. D2 was also widely used in that era as the master tape format for mastering laserdiscs. D1 & D2 would eventually be replaced by cheaper systems using video compression, most notably Sony's Digital Betacam that were introduced into the network's television studios. Other examples of digital video formats utilizing compression were Ampex's DCT, the industry-standard DV and MiniDV and Betacam SX, a lower-cost variant of Digital Betacam using MPEG-2 compression. One of the first digital video products to run on personal computers was PACo: The PICS Animation Compiler from The Company of Science & Art in Providence, RI, which was developed starting in 1990 and first shipped in May 1991. PACo could stream unlimited-length video with synchronized sound from a single file on CD-ROM. Creation required a Mac; playback was possible on Macs, PCs, and Sun Sparcstations. In 1992, Bernard Luskin, Philips Interactive Media, and Eric Doctorow, Paramount Worldwide Video, successfully put the first fifty videos in digital MPEG 1 on CD, developed the packaging and launched movies on CD, leading to advancing versions of MPEG, and to DVD. QuickTime, Apple Computer's architecture for time-based and streaming data formats appeared in June, 1991. Initial consumer-level content creation tools were crude, requiring an analog video source to be digitized to a computer-readable format. While low-quality at first, consumer digital video increased rapidly in quality, first with the introduction of playback standards such as MPEG-1 and MPEG-2 and then the introduction of the DV tape format allowing recordings in the format to be transferred direct to digital video files on an editing computer and simplifying the editing process, allowing non-linear editing systems (NLE) to be deployed cheaply and widely on desktop computers with no external playback/recording equipment needed, save for the computer simply requiring a FireWire port to interface to the DV-format camera or VCR. The widespread adoption of digital video has also drastically reduced the bandwidth needed for a high-definition video signal.

1.2. The necessity of converting from analog video to digital video.

It is not a secret that not many years ago people used only VHS cassettes to store their daily needed materials such as cinemas and music. However, now we have been using widely the digital form storage – CDs and DVDs for over 20 years. Here is a question, why did we start using digital carriers instead of analog ones? To find out the answer, we will compare the two types of video. There exist many significant differences which can be the reason for converting from continuous waveform to digital sequences.

An analog signal written to a magnetic tape will fade with time, with portions of the waveform eroding away. If you have ever viewed a VHS recording that has been copied repeatedly, with one copy being made from another, you have seen how the signal degrades with each copy generation. A copy of a digital recording is as clear as the original, no matter how many generations of copies have been made, because the ones and zeroes of each copy are identical. It's an all-or-nothing proposition. This capacity to make an infinite number of copies with no degradation is alone enough to justify a move from analog to digital recording methods. Yet, there are still more reasons to make the move to digital.

Maintaining an archive of analog recordings means keeping shelf after shelf full of VHS cassettes (or whatever other recording medium you use), all of which look alike. Paper labels attached to the cassettes can identify the contents — as long as your tape librarian is meticulous in their methods — and no one removes or alters a label. A single tape can hold as much as eight hours of video, and more often than not, only a few minutes of that tape are of evidentiary value. Every time that segment of the tape is viewed, the tape is eroded slightly — especially if the recording is stopped or viewed in slow motion. Those viewing the tape will have to fast-forward and rewind the recording to get to the portion they want to see, and that wears the mechanism more.

Finally, if someone exposes the cassette to a magnetic field accidentally or intentionally, the entire recording can be lost.

Analog recordings can be transferred onto CDs or DVDs, which preserves the recording in digital form. The quality of the recording at the time of transfer will not degrade, but by that time the quality has often deteriorated from the time it was made. The transfer process usually takes place in real time, so the transfer of a two-hour recording will take around two hours.

Video recordings that start life in digital form forego most of these problems. If you know the portion of interest in a continuous video recording occurs at an hour and twenty minutes into the recording, you can go directly to that segment without having to view or skip over everything in between. Copies can be produced rapidly, often requiring only a few seconds to “burn” a good-as-the-original copy onto an inexpensive CD. Instead of filling up a closet or storeroom with tape cassettes, thousands of hours of video can be maintained on inexpensive, large capacity hard drives, ready to be called up at any time.

All afore-given advantages of digital recording are confirmed by many specialists on current field. It says that if there is a better way of capturing video performance, what is the use of utilizing analogue devices? No matter digital devices have few backwards, its advantages outweigh the disadvantages that all media have been moving inexorably towards digital for years now.

1.3. Digital video fundamentals and performance requirements

Understanding what digital video is first requires an understanding of its ancestor –analogue video. The invention of radio demonstrated that sound waves can be converted into electromagnetic waves and transmitted over great distances to radio receivers. Likewise, a television camera converts the color and brightness information of individual optical images into electrical signals to be transmitted through the air or

recorded onto video tape. Similar to a movie, television signals are converted into frames of information and projected at a rate fast enough to fool the human eye into perceiving continuous motion. When viewed by an oscilloscope, the unprojected analogue signal looks like a brain wave scan – a continuous landscape of jagged hills and valleys, analogous to the ever-changing brightness and color information.

PCs, by contrast, deal with information in digits – ones and zeros, to be precise. To store visual information digitally, the hills and valleys of the analogue video signal have to be translated into the digital equivalent – ones and zeros – by a sophisticated computer-on-a-chip, called an analogue-to-digital converter (ADC). The conversion process is known as sampling, or video capture. Since computers have the capability to deal with digital graphics information, no other special processing of this data is needed to display digital video on a computer monitor. However, to view digital video on a traditional television set, the process has to be reversed. A digital-to-analogue converter (DAC) is required to decode the binary information back into the analogue signal.

Digital Video Performance Requirements

Digital video relies primarily on hard disk power and size, and the important characteristic is sustained data throughput in a real-world environment. Video files can be huge and therefore require a hard disk drive to sustain high rates of data transfer over an extended period of time. If the rate dips, the video stream stutters as the playback program skips frames to maintain the playback speed. In the past this was a problem that meant that audio and video capture applications required use of drives with a so-called AV specification, designed not to perform thermal recalibration during data transfer. Generally, SCSI drives were preferable to EIDE drives since the latter could be waylaid by processor activity. Nowadays hard disk performance is much less of an issue. Not only have the bandwidths of both the EIDE and SCSI interfaces increased progressively over the years, but the advent of embedded servo technology means that

thermal recalibration is not the issue it once was.

By late 2001 the fastest Ultra ATA100/UltraSCSI-160 drives were capable of data transfer rates in the region of 50 and 60MBps respectively, more than enough to support the sustained rates necessary to handle all of the compressed video formats and arguably sufficient to achieve the rates needed to handle uncompressed video. However, the professionals likely to need this level of performance are more likely to achieve it via the use of two or more hard drives are striped together in a RAID 0, 3 or 5 configuration.

The other troublesome side effect of this type of event is audio drift, which has dogged DV editing systems since they first appeared. Because of minute variations in data rate and the logistics of synchronizing a video card and a sound card over an extended period of time, the audio track in AVI files often drifts out of sync. High-end video capture cards circumvent this problem by incorporating their own sound recording hardware and by using their own playback software rather than relying on a standard component, such as Video for Windows. Moreover, Microsoft's new ActiveMovie API is itself claimed to eliminate these audio drift problems. The rate at which video needs to be sampled or digitized varies for different applications. Digitizing frames at 768×576 (for PAL) yields broadcast-quality (also loosely known as full-PAL) video. It's what's needed for professional editing where the intention is to record video, edit it, and then play it back to re-record onto tape. It requires real-time video playback from a hard disk, making the hard disk drive's sustained data-transfer rate the critical performance characteristic in the processing chain. However, for capturing video for multimedia movies, for playback from a CD-ROM with or without hardware decompression, it is not necessary to digitize at the full PAL resolution. Usually half the lines are digitized (either the odd or the even 288 lines), and to get the 4:3 ratio each line is split into 384 sections. This gives a frame size of 384×288 pixels

(320×240 for NTSC), thus requiring about 8.3 MBps. A similar resolution (352×288) is required for capturing video which will be distributed in MPEG-1 format for Video CDs. Of course, a large digital-video market is that of video conferencing, including displaying video over the Internet. Here, the limitation is in the connection – whether it's an ordinary phone line and a modem, ISDN, cable, or whatever. For example, a 56Kbit modem is about 25 times slower than a single-speed CD-ROM, so in this case, high-compression ratios are required. And for real-time video-conferencing applications, hardware compression at very high rates is necessary.

Of course, there are a number of factors that affect the quality of digital video encoding:

- Source format: VHS tape is acceptable for home use, but S-VHS and Hi-8 tape formats give noticeably better results. It used to be that only professional projects could justify the cost of the highest quality source footage that Betacam and digital tape formats could provide. However, the advent of the DV format means that quality is no longer the preserve of the professional.
- Source content: MPEG-1 and software only codecs tend to stumble on high-speed action sequences, creating digital artefacts and color smearing. Such sequences have a high degree of complexity and change dramatically from one scene to the next, thereby generating a huge amount of video information that must be compressed. MPEG-2 and DV are robust standards designed to handle such demanding video content.
- Quality of the encoding system: While video formats adhere to standards encoding systems range greatly in quality, sophistication and flexibility. A low-end system processes digital video in a generic process with little control over parameters, while a high-end system will provide the capability for artfully executed encoding.

Summary

As a summary, it can be said that knowing the history of digital video and some corresponding information helps individuals appreciate the initial understandings of it. Therefore, it is useful to take them into consideration. As someone starts using digital video equipment, he needs to know how to operate on them. Reading this chapter, he can easily handle any problem appeared.

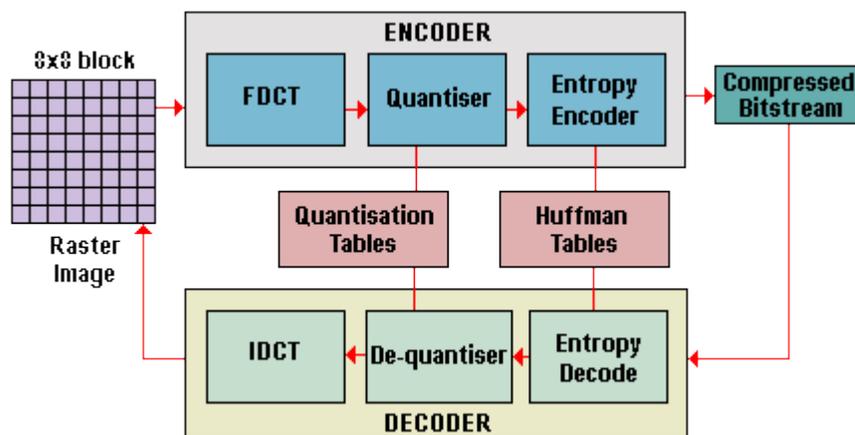
2. DIGITAL VIDEO COMPRESSION, FORMATS. DIGITAL VIDEO STANDARDS

2.1. Digital video compression, format

Video compression is the art of throwing as much data away as possible without it showing. Video compression methods tend to be lossy – that is, what comes out after decoding isn't identical to what was originally encoded. By cutting video's resolution, color depth and frame rate, PCs managed postage stamp-size windows at first, but then ways were devised to represent images more efficiently and reduce data without affecting physical dimensions. The technology by which video compression is achieved is known as a codec, an abbreviation of compression/decompression. Various types of codec have been developed – implementable in either software and hardware, and sometimes utilizing both – allowing video to be readily translated to and from its compressed state. Lossy techniques reduce data – both through complex mathematical encryption and through selective intentional shedding of visual information that our eyes and brain usually ignore – and can lead to perceptible loss of picture quality. Lossless compression, by contrast, discards only redundant information. Codecs can be implemented in hardware or software, or a combination of both. They have compression ratios ranging from a gentle 2:1 to an aggressive 100:1, making it feasible to deal with huge amounts of video data. The higher the compression ratio, the worse

the resulting image. Color fidelity fades, artefacts and noise appear in the picture, the edges of objects become over-apparent, until eventually the result is unwatchable.

By the end of the 1990s, the dominant techniques were based on a three-stage algorithm known as DCT (Discrete Cosine Transform). DCT uses the fact that adjacent pixels in a picture – either physically close in the image (spatial) or in successive images (temporal) – may be the same value. A mathematical transform – a relative of the Fourier transform – is performed on grids of 8×8 pixels (hence the blocks of visual artefacts at high compression levels). It doesn't reduce data but the resulting coefficient frequency values are no longer equal in their information-carrying roles. Specifically, it's been shown that for visual systems, the lower frequency components are more important than high frequency ones. A quantization process weights these accordingly and ejects those contributing least visual information, depending on the compression level required. For instance, losing 50 per cent of the transformed data may only result in a loss of five per cent of the visual information. Then entropy encoding – a lossless technique – jettisons any truly unnecessary bits.



2.1.1-rasm. The sequences of encoding and decoding

Initially, compression was performed by software. Limited CPU power constrained how clever an algorithm could be to perform its task in a 25th of a second – the time needed to draw a frame of full-motion video. Nevertheless, Avid Technology and other pioneers of NLE introduced PC-based editing systems at the end of the 1980s using software compression. Although the video was a quarter of the resolution of broadcast TV, with washed-out color and thick with blocky artefacts, NLE signaled a revolution in production techniques. At first it was used for off-line editing, when material is trimmed down for a program. Up to 30 hours of video may be shot for a one-hour documentary, so it's best to prepare it on cheap, non-broadcast equipment to save time in an on-line edit suite. Although the quality of video offered by the first PC-based NLE systems was worse than the VHS VCRs used for off-line editing, there were some advantages. Like a word processor for video, they offered a faster and more creative way of working. A user could quickly cut and paste sections of video, trim them and make the many fine-tuning edits typical of the production process. What's more, importing an accurate EDL (edit decision list) generated by an NLE system into the on-line computer on a floppy disk was far better than having to type in a list of time-codes. Not only was NLE a better way to edit but, by delivering an off-line product closer to the final program, less time was needed in the on-line edit suite. NLE systems really took off in 1991, however, when hardware-assisted compression brought VHS-quality video. The first hardware-assisted video compression is known as M-JPEG (motion JPEG). It's a derivation of the DCT standard developed for still images known as JPEG. It was never intended for video compression, but when C-Cube introduced a codec chip in the early 1990s that could JPEG as many as 30 still images a second, NLE pioneers couldn't resist. By squeezing data as much as 50 times, VHS-quality digital video could be handled by PCs. In time, PCs got faster and storage got cheaper, meaning less compression had to be used so that better video could be edited. By compressing video by as little as 10:1 a new breed of non-linear solutions emerged in the mid-1990s. These

systems were declared ready for on-line editing; that is, finished programs could essentially be played out of the back of the box. Their video was at least considered to be of broadcast quality for the sort of time and cost-critical applications that most benefited from NLE, such as news, current affairs and low-budget productions. The introduction of this technology proved controversial. Most images compressed cleanly at 10:1, but certain material – such as that with a lot of detail and areas of high contrast – were degraded. Few viewers would ever notice, but broadcast engineers quickly learnt to spot the so-called ringing and blocky artefacts DCT compression produced. Also, in order to change the contents of the video images, to add an effect or graphic, material must first be decompressed and then recompressed. This process, though digital, is akin to an analogue generation. Artefacts are added like noise with each cycle in a process referred to as concatenation. Sensibly designed systems render every effect in a single pass, but if several compressed systems are used in a production and broadcast environment, concatenation presents a problem. Compression technology arrived just as proprietary uncompressed digital video equipment had filtered into all areas of broadcasters and video facilities. Though the cost savings of the former were significant, the associated degradation in quality meant that acceptance by the engineering community was slow at first. However, as compression levels dropped – to under 5:1 – objections began to evaporate and even the most exacting engineer conceded that such video was comparable to the widely used BetaSP analogue tape. Mild compression enabled Sony to build its successful Digital Betacam format video recorder, which is now considered a gold standard. With compression a little over 2:1, so few artefacts (if any) are introduced that video goes in and out for dozens of generations apparently untouched. The cost of M-JPEG hardware has fallen steeply in the past few years and reasonably priced PCI cards capable of a 3:1 compression ratio and bundled with NLE software are now readily available. Useful as M-JPEG is, it wasn't designed for moving pictures. When it comes to digital distribution, where

bandwidth is at a premium, the MPEG family of standards – specifically designed for video – offer significant advantages.

Digital video format

In the late 1990s a new generation of entirely digital cameras and camcorders emerged, and with it a new video format, Digital Video (DV). The DV cassette confers the significant advantage of allowing the entire video processing cycle to remain within the digital domain. Instead of having to be funneled through a process of analogue-to-digital conversion by a traditional video capture card, DV footage – already in a compressed digital format – can simply be downloaded to a PC in real-time with no loss of quality. Panasonic and Sony were the first to use the DV standard on their camcorders and though it wasn't originally intended as a professional format, both companies subsequently announced their own extensions to the standard – Panasonic with DVCPRO in 1995, and Sony with DVCAM in 1996. However, in common with just about every other maker of digital camcorders, both manufacturers have stuck to the MiniDV format for their digital consumer equipment. The DV format uses 1/4in (6.35mm) metal evaporate tapes, capable of recording up to three hours of video in SP (standard play) mode on cassettes which measure 125x78x14.6mm. A major advantage of the MiniDV format is that since the tapes are very small – 1/12th the size of a standard VHS tape at 66x48x1.2mm – the cameras that use it can be incredibly small too. MiniDV can record an hour in standard format or up to 90 minutes of lower quality output in LP (long play) mode at horizontal resolutions of up to 500 lines.

Technically speaking, DV is the summit of the industry's research into video compression and, in particular, complex Discrete Cosine Transformation (DCT) codes. It is an intraframe rather than progressive compression technique, using a three-stage process compress data – each frame being compressed on an individual basis rather

than being compared to adjacent frames. The first stage uses DCT compression, a lossless technique which strips away information that cannot be seen by the human eye. It then separates the information from each pixel into brightness and color and then samples this, favoring brightness over color, which gives a color representation that's acceptable to the human eye but cuts down the data by a third. This is achieved by converting the RGB color information for each pixel into a YUV color space – Y for brightness, and U and V for color. The Y value is sampled four times, the U and V twice, this formula being described as YUV 4:2:2. The video then gets further reduced as the DV codec optimizes the formula to YUV 4:2:0, bunching color information from adjacent pixels in 4×4 blocks. Again, it's a trade-off, but the human eye finds subtle variations in color hard to detect, so in well-lit natural surroundings the difference is imperceptible. Finally, the hardware compression system on the camera compresses the video down further using an algorithm similar to M-JPEG. DV differs by being able to compress different parts of each frame to different ratios. So, the blue sky in an image backdrop can be brought down to, say, 25:1, while the complex forest in the foreground, which needs more detail, is reduced to only 7:1. In this way DV can optimize its video stream frame by frame. M-JPEG, by contrast, has to have a fixed compression rate for the whole video and can't intelligently balance the compression of each image, resulting in more artefacts. It also employs a technique known as adaptive interfield compression, which results in a pair of interlaced fields of a frame (as used by PAL, for example) being compressed together if little difference between them is detected. In theory this means that scenes with less movement are handled better than fast action scenes, although in practice it's difficult to observe any perceivable difference. The DV standard also supports PCM (pulse code modulation) stereo, thereby supporting CD-quality 16-bit audio. Alternatively, 12-bit mode can be used to record two pairs of audio tracks – one for stereo sound recorded at the time of the video and one for music or narration added later. The net result is that DV video information is carried in a nominal

25 Mbit/s data stream – which increases to 36 Mbit/s when audio and the various control and error correction data is taken into account. DV's principal problem is that, unlike MPEG-2, it isn't [scalable](#). It was designed for recording to tape with a fixed 25 Mbit/s data rate. This, and its limited color capacity (4:2:0 or 4:1:1, meaning that there's half as much color information as brightness), mean many consider it unsuitable for professional post-production. For NLE, the data rate is too high for off-line editing and too low for high-end effects and graphics-heavy work. The launch of Panasonic's DVCPRO50 in 1998 – which doubled the data rate to 50 Mbit/s and expands the color depth to a professional 4:2:2 – extended DV's application to the higher end. JVC's Digital-S (or D9) format records an identical 50 Mbit/s DV bit-stream to VHS-sized cassettes. The quality of both formats has been compared to Digital Betacam, yet at the time they were less than half the price.

At the start of the new millennium a split had appeared in broadcasting, with the DV formats and MPEG-2 sitting on opposite sides. However, it appeared that a resolution was on the horizon. DV and ProMPEG are very similar to DCT-based, I-frame-only schemes and it was only a matter of time before someone built silicon to support them all. C-Cube and Matrox were the first to oblige, launching a codec chip in its Digituite DTV video card which supports DV25 and 50 as well as MPEG-2. However, DCT isn't the last word in compression, just a standard whose early development and suitability for real-time codecs chips attracted attention at the right time. Other currently under-developed technologies do promise better pictures at lower data rates. They include wavelet and fractal algorithms. The former has already been implemented in silicon and has the important advantage of both being moderately more efficient than M-JPEG and degrading more naturally, with images appearing grainy rather than blocky at higher compression levels. These alternatives are unlikely to overthrow DCT in broadcasting and consumer electronics. But in the broadband network delivery systems which are likely to replace traditional broadcasting over the

next decade, it's a different story. With increasingly powerful CPUs becoming commonplace, appropriate real-time decoder software can be delivered with the content. Many companies are beginning to offer IP-based streaming solutions for video-on-demand across company intranets. Although MPEG is still the dominant technology, some suppliers have demonstrated other techniques that can stream VHS-quality video in as little as 512 Kbit/s – more than within the scope of the cable and ADSL broadband solutions expect to emerge over the coming years.

2.2. Digital video television, digital television broadcasting standards, adoption by countries including Uzbekistan

For years, the broadcasting and computer industries have proclaimed that “convergence” was just around the corner. Both have had different things in mind, of course, and each has claimed to be the driving force behind the must-have new services that were about to change the consumer's life. However, just because a technology is possible doesn't create demand for it. HDTV is a prime example of that – no-one thought great pictures were worth the extra cost. Likewise, numerous interactive TV offerings have been too dull to warrant dedicated equipment and extra bandwidth, and countless tests have proved that a short walk to the video shop is more attractive than parting with huge sums of cash for video-on-demand.

However, the unrelenting growth in computing power and open standards are impacting dramatically on what's possible – and affordable – and finally helping turn the hype into reality:

- DVD now allows quality video in the home
- hand-held consumer DV camcorders can deliver pictures to rival those of their shoulder-mounted, analogue predecessors – at a fraction of the cost

- broadcast-quality video can be edited and packaged on a desktop PC faster and to a better standard than in a TV edit suite that ten years ago would have cost thousands of pounds to hire for just a few days
- broadband Internet technology is set to slash the cost of distribution.

The result is that just as the hundreds of channels now being made available by DTV (digital TV) services have surpassed the few analogue TV channels available previously, they too will soon be overwhelmed by a limitless number services delivered via the Internet.

Digital television broadcasting standards, adoption by countries including Uzbekistan

Digital television (DTV) is the transmission of audio and video by digitally processed and multiplexed signal, in contrast to the totally analog and channel separated signals used by analog television. Digital TV can support more than one program in the same channel bandwidth. It is an innovative service that represents the first significant evolution in television technology since color television in the 1950s. Several regions of the world are in different stages of adaptation and are implementing different broadcasting standards. Below are the different widely used digital television broadcasting standards (DTB):

1. Advanced Television Systems Committee (ATSC) standards are a set of standards developed by the Advanced Television Systems Committee for digital television transmission over terrestrial, cable, and satellite networks. Uses eight-level vestigial sideband (8VSB) for terrestrial broadcasting. The ATSC standards were developed in the early 1990s by the Grand Alliance, a consortium of electronics and telecommunications companies that assembled to develop a specification for what is now known as HDTV. ATSC formats also include standard-definition formats,

although initially only HDTV services were launched in the digital format.

ATSC 2.0 is a major new revision of the standard which will be backward compatible with ATSC 1.0. The standard will allow interactive and hybrid television technologies by connecting the TV with the Internet services and allowing interactive elements into the broadcast stream. Other features include advanced video compression, audience measurement, targeted advertising, enhanced programming guides, video on demand services, and the ability to store information on new receivers, including Non-real time (NRT) content.

ATSC 3.0 will provide even more services to the viewer and increased bandwidth efficiency and compression performance, which requires breaking backwards compatibility with the current version. ATSC 3.0 is expected to emerge within the next decade. On March 26, 2013, the Advanced Television Systems Committee announced a call for proposals for the ATSC 3.0 physical layer which states that the plan is for the system to support video with a resolution of 3840×2160 at 60 fps (UHDTV).

2. The Integrated Services Digital Broadcasting (ISDB) is a [Japanese](#) standard for [digital television](#) and [digital radio](#) used by the country's [radio](#) and [Television networks](#). ISDB replaced the previously used [MUSE](#) Hi-vision analogue HDTV system. ISDB is a system designed to provide good reception to fix receivers and also portable or mobile receivers. It utilizes OFDM and two-dimensional interleaving. It supports hierarchical transmission of up to three layers and uses MPEG-2 video and Advanced Audio Coding. The core standards of ISDB are ISDB-S (satellite television), ISDB-T (terrestrial), ISDB-C (cable) and 2.6 GHz band mobile broadcasting which are all based on MPEG-2 or MPEG-4 standard for multiplexing with transport stream structure and video and audio coding (MPEG-2 or H.264), and are capable of high definition television (HDTV) and standard definition television. ISDB-T and ISDB-Tsb are for mobile reception in TV bands. 1seg is the name of an ISDB-T service for reception on cell phones, laptop computers and vehicles. The concept was named for its similarity

to ISDN, because both allow multiple channels of data to be transmitted together (a process called multiplexing). This is also much like another digital radio system, Eureka 147, which calls each group of stations on a transmitter an ensemble; this is very much like the multi-channel digital TV standard DVB-T. ISDB-T operates on unused TV channels, an approach taken by other countries for TV but never before for radio. The various flavors of ISDB differ mainly in the modulations used, due to the requirements of different frequency bands. The 12 GHz band ISDB-S uses PSK modulation, 2.6 GHz band digital sound broadcasting uses CDM, and ISDB-T (in VHF and/or UHF band) uses COFDM with PSK/QAM. Besides audio and video transmission, ISDB also defines data connections with the internet as a return channel over several media (10Base-T/100Base-T, Telephone line modem, Mobile phone, Wireless LAN (IEEE 802.11)) and with different protocols. This is used, for example, for interactive interfaces like data broadcasting and electronic program guides (EPG).

Countries and territories using ATSC

-  Bahamas plans for transition to ATSC standards were officially announced on December 14, 2011; national public broadcaster ZNS-TV announced it would be upgrading to ATSC digital television with mobile DTV capabilities, in line with its neighbors, the United States and Puerto Rico.
-  Canada switched to ATSC on August 31, 2011 in provincial/territorial capitals and locations with 300,000 or more people; expected to continue broadcasting analog over-the-air television signals in 22 markets until August 31, 2012.
-  Dominican Republic plans announced August 10, 2010; transition to be complete by September 24, 2015.
-  El Salvador plans announced April 22, 2009.
-  Mexico plans announced July 2, 2004, started conversion in 2013 transition expected to be complete by December 31, 2015.
-  United States switched to ATSC on June 12, 2009, excluding LPTV stations; transition to be complete by September 1, 2015.
 -  Puerto Rico
 -  U.S. Virgin Islands

-  South Korea completed terrestrial transition on December 31, 2012. Allows analog broadcasts on its northern border in order to be received in North Korea. Analog cable is yet to be switched off.
-  United States Minor Outlying Islands switched to ATSC on June 12, 2009, excluding LPTV stations; transition to be complete by September 1, 2015.^[32]
 -  American Samoa
 -  Guam

3. DTMB (Digital Terrestrial Multimedia Broadcast) is the TV standard for mobile and fixed terminals used in the People's Republic of China, Hong Kong, and Macau. The DTMB was created in 2004 and finally became an official DTT standard in 2006. Besides the basic functions of traditional television service, the DTMB allows additional services using the new television broadcasting system. DTMB system is compatible with fixed reception (indoor and outdoor) and mobile digital terrestrial television.

- Mobile reception: is compatible with digital broadcasting TV in standard definition (SD), digital audio broadcasting, multimedia broadcasting and data broadcasting service.
- Fixed reception: in addition to the previous services, also supports high definition digital broadcasting (HDTV).

The DTMB standard uses many advanced technologies to improve their performance, for example, a pseudo-random noise code (PN) as a guard interval that allows faster synchronization system and a more accurate channel estimation, Low-Density Parity Check (LDPC) for error correction, modulation Time Domain Synchronization - Orthogonal Frequency Division Multiplexing (TDS-OFDM) which allows the combination of broadcasting in SD, HD and multimedia services. This system gives flexibility to the services offered to support the combination of single-frequency networks (SFN) and multi-frequency networks (MFN). The different modes and parameters can be chosen depending on the type of service and network's environment.

The sequence of pseudo-random pattern is defined in time domain and the information of the Discrete Fourier transform (DFT) is defined in the frequency domain. The two frames are multiplexed in the time domain, resulting in Time domain synchronization (TDS). This transmission system makes the conversion of the input signal to the output data of terrestrial TV signal. The data passes through the encoder, the error protection process FEC (Forward Error Correction), through the constellation mapping process and then the interleaving processes the information to create the data blocks. The data block and the TPS information are multiplexed, and pass through the data processor to form the body structure. It combines information from the body and the head to form the frame and this is passed through the SRRC (Square Root Raised Cosine) filter to become a signal within an 8 MHz channel bandwidth. Finally the signal is modulated to put it in the corresponding frequency band. The DTMB standard has following features:

- Bit-rate: from 4.813 Mbit/s to 32.486 Mbit/s
- Combination of SD, HD, and multimedia services
- Flexibility of services
- Time and frequency domain of data-processing
- Broadcasting of between 6 and 15 SD channels and 1 or 2 HD channels

Countries and territories using DTMB

-  China
-  Hong Kong
-  Laos
-  Macau
-  Malaysia (experimental)

-  Iraq (experimental)
-  Jordan (experimental)
-  Syria (experimental)
-  Lebanon (experimental)

4. Digital Multimedia Broadcasting (DMB) is a method of delivering television services or multimedia content to mobile receivers or portable devices at high speed. The transmission is done through satellite or modern terrestrial devices or both. It also transmits movies, video clips, music, RSS feeds and text messages. The source of revenue for DMB is advertising, though some of DMB services operate on a fee-based subscription basis charged by the service provider to the subscriber. South Korea provides a free DMB service. DMB technology is based on the established Eureka 147 Digital Audio Broadcast (DAB) radio standard with additional error connection for television, satellite radio or cell phone transmissions. Not only the video and voice but also data files and applications are also delivered through digital broadcasters. This digital transfer system is used to send the data to various receivers such as radios, television sets, mobile phones or PDAs.

There are two ways of using Digital Multimedia Broadcasting:

- S-DMB: Broadcasting via a satellite.
- T-DMB: An ETSI standard, broadcasting via terrestrial emitters.

Digital Multimedia Broadcasting complexity is very huge. Satellite Radio is one of the most spectacular characteristic of digital broadcasting as it offers two main qualities coverage and quality which terrestrial emitters are deficient. Sound quality from a satellite broadcast is very much higher in comparison with AM or FM broadcasts, where the disturbances like the hissing sound and transmission disturbances are eliminated.

There are some examples of Multimedia Broadcast Content

- Text and Audio
- Still or animated graphics
- Audio and full motion video
- Text, Audio and full motion video

- Multiple, concurrent display areas, images or programs
- Most popular application is mobile television
- Movies, video clips, RSS feeds, music and text messages can be transmitted.

Below given technical features of Digital Multimedia Broadcasting

- DMB is based on Eureka 147 DAB standard. Digital television uses the T-DMB, which is made for transmissions on frequency bands III (VHF) and L (SHF).
- T-DMB uses MPEG-4 Part 10 (H264) for the video and MPEG-4 Part 3 BSAC or HE-AAC V2 for the audio. But the satellite radio has some issues like the receiver needs to be in line of the satellite to receive the transmission as it is blocked by landscaping objects.
- DMB uses OFDM-4DPSK modulation and T-DMB is provided by MPEG 2 transport stream de-multiplexer which reduces the negative effect of shadowing and fading present in digital transmissions.

The steps related to working of DMB

- Satellite: Receives the mobile broadcast signal for satellite DMB service.
- Broadcast Program Provider: Offers information to the satellite DMB center.
- Satellite DMB Center: Transmission of Content information to the satellite.
- Gap Filler: Broadcasting information via cellular phone, which enables smooth broadcasting service in shadow areas such as inside buildings and downtown area..
- Terminal: Information received from the Broadcasting center, through mobile terminals can be watched by the customers.

Advantages of Digital Multimedia Broadcasting

- A single broadcast can send programming to thousands of receivers through a process called multicast.

- In order to cover the wide broadcast, digital multimedia broadcasting uses OFDM-4DPSK modulation and a chip of T-DMB receiver is provided by MPEG-2 Transport Stream De-multiplexer.
- Currently there are 2006 Korean gadgets with this functionality since they have 7 TV Channels, 13 Radio Stations, and 8 data channels broadcasting through DMB.
- You can send the data or content that can be a personalized one to the subscriber or end user with the help of DMB.

Currently, DMB is being put into use in a number of countries, although mainly used in South Korea. In 2005, South Korea became the world's first country to start S-DMB and T-DMB service on May 1 and December 1, respectively. As of December 2006, T-DMB service in South Korea consists of, 7 TV channels, 12 radio channels, and 8 data channels. These are broadcast on six multiplexes in the VHF band on TV channels 8 and 12 (6 MHz raster). In October 2007, South Korea added broadcasting channel MBCNET to the DMB channel. But in 2010, this channel changed to n go. In 2009 there were eight DMB video channels in Seoul, and six in other metropolitan cities. South Korea has had Full T-DMB services including JSS (Jpeg Slide Show), DLS (Dynamic Label Segment), BWS, and TPEG since 2006. As of April 2007, S-DMB service in South Korea consists of 15 TV channels and 19 radio channels and 3 data channels. S-DMB service in South Korea is provided on a subscription basis through TU Media and is accessible throughout the country. T-DMB service is provided free of charge, but access is limited to selected regions. Around one million receivers have been sold as of June 2006. 14 million DMB receivers were sold including T-DMB and S-DMB in South Korea, and 40% of the new cell phones have the capability to see DMB.

Receivers are integrated in car navigation systems, mobile phones, portable media players, laptop computers and digital cameras. In Mid August 2007, Iriver, a multimedia and micro-technology company released their "NV", which utilizes South

Korea's DMB service.

Some T-DMB trials are currently available or planned around Europe and other countries:

- In Norway T-DMB services have been available since May 2009. MiniTV DMB service launched by the Norwegian Mobile TV Corporation (NMTV) is backed by the three largest broadcasters in Norway: the public broadcaster NRK, TV2 and Modern Times Group (MTG). The live channels can be viewed in and around Greater Oslo.
- Germany's Mobiles Fernsehen Deutschland (MFD) launched the commercial T-DMB service "Watcha" in June 2006, in time for the World Cup 2006, marketed together with Samsung's P900 DMB Phone, the first DMB Phone in Europe. It was stopped in April 2008 as MFD is now favoring DVB-H, the European standard.
- France on December 2007 chose T-DMB Audio in VHF band III and L band as the national standard for terrestrial digital radio.
- China in 2006 chose DAB as an industrial standard. Since 2007 DAB and T-DMB services broadcast in Beijing, Guangdong, Henan, Dalian, Yunnan, Liaoning, Hunan, Zhejiang, Anhui, and Shenzhen
- In Mexico most cell phone carriers offer DMB broadcasting as part of their basic plans. As of 2008 the vast majority of Mexico receives DMB signals.
- Ghana is running a T-DMB service in Accra and Kumasi on mobile network since May 2008.
- Netherlands: MFD, T-Systems and private investors are planning a DMB service under the name Mobile TV Nederland. Callmax will also deploy a DMB service on the L-Band frequency in the Netherlands.
- Indonesia is currently running a trial in Jakarta.

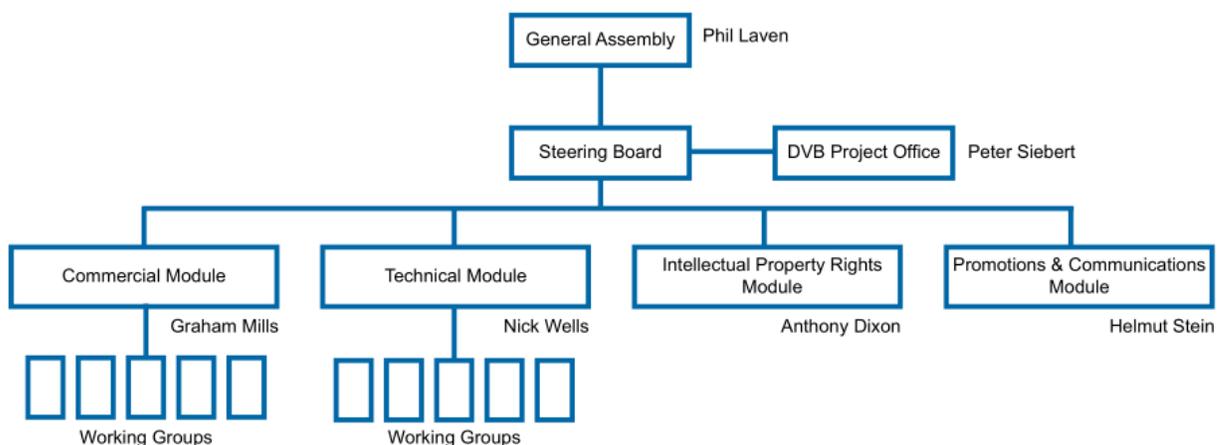
- Italy and Vatican City: RAI and Vatican Radio are currently running a trial some areas.
- Canada has been running trials since 2006 in Ottawa, Toronto, Vancouver and Montreal, done by CBC/Radio-Canada.
- Malaysia has been running trials since 2008 in KL, done by TV3/MPB. Initially, the government was committed to deploying DVB-T for government-owned channels, however as of December 2009, RTM1 and 2, as well as all the radio channels, are available over Band III for DMB-T as in addition to DVB-T. Additionally, the TV3 DMB signal has moved to L Band. The TV3 DMB signals are still limited to the Damansara and Kuala Lumpur area, while the government owned DMB-T signals have a wider coverage and apparently covers most of the Klang Valley area. The government transmissions are part of a two-year trial that is part of a test that also involves the DAB and DAB+ digital radio standard.
- Cambodia on August 2010 chose T-DMB as the national standard for terrestrial digital broadcasting. TVK is currently running a trial.

5. Digital Video Broadcasting (DVB) uses coded orthogonal frequency-division multiplexing (OFDM) modulation and supports hierarchical transmission. DVB Project is an industry-led consortium of around 200 broadcasters, manufacturers, network operators, software developers, regulatory bodies and others committed to designing open interoperable standards for the global delivery of digital media and broadcast services. In 1991, broadcasters, equipment manufacturers and regulatory bodies in Europe came together to discuss the formation of a group that would oversee the introduction of digital TV. A consensus-based framework and Memorandum of Understanding (MoU) were drawn up and signed in 1993, setting out the basis on which competitors in the marketplace would come together in a spirit of trust and mutual respect. The success of the DVB Project is founded on a number of core procedures

and principles:

- The Commercial Module draws up a set of market-based Commercial Requirements for each specification.
- The Technical Module draws up a technical specification that meets these requirements.
- The CM reviews the draft specification and sends it to the DVB Steering Board for final approval.
- It is then sent to ETSI (European Telecommunications Standards Institute) for publication as a formal standard.

There are a number of checks and balances in place to ensure that DVB standards remain market driven and are implementable. The MoU signed by all members includes an article devoted to IPR, ensuring that all DVB members license their technology to all implementers on fair, reasonable and non-discriminatory terms. This aspect of the Project's work is overseen by the Intellectual Property Rights Module. The Promotions and Communications Module ensures that all interested parties are aware of DVB's activities and successes through close cooperation with the DVB Project Office, based at the European Broadcasting Union headquarters in Geneva, Switzerland.



2.2.1-rasm. The staff and technical structure of DVB project.

The first phase of DVB's work involved establishing standards to enable the delivery of digital TV to the consumer via the "traditional" broadcast networks. Thus, the three

key standards during this phase were DVB-S for satellite networks, DVB-C for cable networks and DVB-T for terrestrial networks. In addition to these, a whole range of supporting standards were required covering areas such as service information (DVB-SI), subtitling (DVB-SUB), interfacing (DVB-ASI). Interactive TV, one of the key advances enabled by the switch from analogue to digital, required the creation of a set of return channel standards and the Multimedia Home Platform (MHP), DVB's open middleware specification. DVB then moved to embrace network convergence through the development of standards using innovative technologies that allow the delivery of DVB services over fixed and wireless telecommunications networks (e.g. DVB-H and DVB-SH for mobile TV). After this DVB also moved into areas of content protection and copy management (DVB-CPCM), and made contributions for standardization efforts for IPTV, Internet TV and Home Networks. DVB is dedicated to constant innovation to keep up with both technological developments and market requirements. 2009 saw the completion of the family of second generation delivery standards, with DVB-T2 (terrestrial) and DVB-C2 (cable) joining the already published and deployed DVB-S2 (satellite). Since 2009 DVB has continued work on IPTV, launched 3DTV standards, a new handheld standard (DVB-NGH), expanded its DVB-T2 standard with a mobile profile (T2-Lite), completed upgrades for DVB-S2 (DVB-S2X) and CI Plus, and is investigating the options for companion devices (second screen).

Digital Video Broadcasting (DVB) uses coded orthogonal frequency-division multiplexing (OFDM) modulation and supports hierarchical transmission.

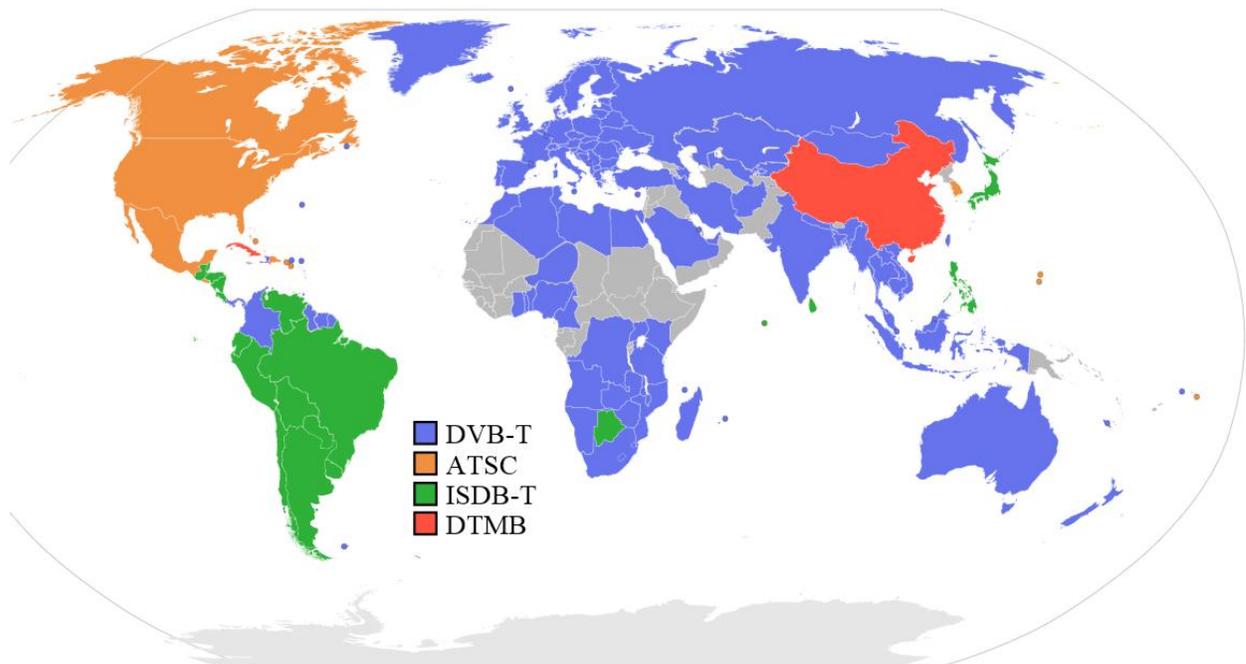
There exist a lot of countries all over the world using DVB's several standards such as DVB-T, DVB-C, DVB-H, DVB-S, and DVB-T2. Some of them are given below:

-  Albania (uses MPEG-2 for SD and MPEG-4 AVC /H.264 for HD transmissions.
-  Austria
-  Belarus (uses DVB-T MPEG-4 AVC /H.264 for SD transmission and DVB-T2 for pay SD transmissions)

-  Bulgaria (MPEG-4 AVC, FEC=2/3, guard interval - 1/4, 64 QAM. Official simulcast started in March 2013, full switch has been done in 30 September 2013.)
-  Czech Republic (MPEG-2, MPEG-4 experimental in Prague and surroundings)
-  Denmark (uses MPEG-4 for SD and HD transmissions.)
-  Estonia (uses MPEG-4 video)
-  Finland
-  France (uses MPEG-2 for free SD and MPEG-4 for free HD, pay SD and pay HD transmissions.)
-  Germany (usually MPEG-2, SD only, Überallfernsehen)
-  Hungary (branded MinDigTV, uses H.264/MPEG-4 AVC video exclusively.)
-  Iceland
-  Ireland (uses MPEG-4 for SD and HD transmissions)
-  Italy (uses MPEG2 for SD, MPEG 4 AVC for HD)
-  Latvia (uses H.264/MPEG-4 AVC)
-  Netherlands (MPEG-2 SD, operated by Digitenne)
-  Norway (uses MPEG-4 for SD and HD transmissions)
-  Poland (uses MPEG-4/H.264 video for SD and HD transmissions; see DVB-T in Poland)
-  Portugal (uses MPEG-4/H.264 video)
-  Romania (uses MPEG-2 for SD and MPEG-4 for HD transmissions.). Since June 2011, shifted to MPEG4 both for SD and HD transmissions, and plans to use DVB-T2 from 2015.
-  Russia (uses DVB-T2/MPEG-4)
-  Spain (uses DVB-T/MPEG-2 for SD and DVB-T/H.264/MPEG-4 for HD transmissions.)
-  Sweden (uses MPEG-2/MPEG-4) for SD and DVB-T2 with MPEG-4 for SD and HD transmissions.)
-  Switzerland
-  Turkey (experimental)
-  United Kingdom (uses DVB-T/MPEG-2 for SD and DVB-T2/H.264/MPEG-4 for HD transmissions.)
-  Ukraine (uses DVB-T2/MPEG-4 for all nationwide broadcasts)
-  Australia (uses DVB-T/MPEG-2 for both SD and HD transmissions.)
-  New Zealand (uses MPEG-4/H.264 video)

-  India (uses MPEG-2 for SD and MPEG-4 for HD transmissions)
-  Indonesia (adopted DVB-T2 on 2 February 2012)
-  Iran (uses DVB-T MPEG-4/H.264/AAC SD :720x576i HD :1920x1080i)
-  Israel (uses MPEG-4/H.264 video)
-  Malaysia (experimental, may also adopt DMB-T/H, also experimenting with DVB-T2 as of 2011, may abandon DVB-T1 and go with DVB-T2 upon launch)
-  Qatar
-  Saudi Arabia
-  Taiwan (uses DVB-T/MPEG-2 for SD and DVB-T/H.264/MPEG-4 for HD transmissions)
-  Thailand (experimental DVB-T2)
-  United Arab Emirates
-  Uzbekistan

Generally, nearly all countries have adopted at least one digital television broadcasting standard. However, most countries chose DVB standard, in the given map of the world, everything is highlighted:



2.2.2-rasm. Countries that adopted at least one digital television broadcasting system

In 2010 Uzbek Telex Electronics company began mass production of digital signal receivers. The production of receivers and transmitters will help the Uzbek government both to intensify the introduction of digital television and reduce the population's costs for new TV services. Uzbekistan will switch completely to digital television by 2015. The transition to digital broadcasting in Uzbekistan began in 2008 with the creation of experimental broadcasting zones in Tashkent and Bukhara for twelve public and commercial television channels in MPEG-4/DVB-T (Digital Video Broadcasting - Terrestrial) digital format. The Uzbek Agency for Communications and Informatization (UzACI) believes that the selected standard is technologically the most advanced and that there will be no problems with the signal quality, TCA reports. The Japanese NEC, German Rode & Schwarz and Dutch IRDETO companies supply the equipment. By the end of 2010, coverage area will be expanded in Tashkent, and digital TV transmitters will begin trial operation in Samarkand, Andijan, and Kashkadarya regions and the autonomous republic of Karakalpakstan. To build the infrastructure and increase the market capacity of digital terrestrial TV (currently, the network capacity is 100,000 users) the UZDIGITAL TV company was created. The technological advantages of digital TV over traditional television are obvious and put it in direct competition with the most popular and affordable cable options. 95% of subscribers of alternative TV currently chose cable service. "If cable television appeared as a result of data starvation, when the users wanted to have more than ten channels, digital television is the next step to control content," said Alisher Khodjayev, UzACI Deputy Director General.

However, Anvar Rasulov of the Uzbek Cable Network has a different opinion, stating that about 70% of households in Uzbekistan receive a television signal not through the air, but through wires. In cities where digital TV is being introduced first, broadcasting is very 'littered' and it is practically useless to transmit a signal through

the air. However, for consumers, the channel's content and cost of services is the main thing. Now, only twelve channels are broadcasting in digital format through the air, and 25-40 channels are broadcasting through cable networks. UzACI promises to resolve this issue soon. Only high costs are a problem that may not be solved in the next couple of years. Tariff plans are yet under consideration, but the estimated cost for receiving additional foreign channels in digital format is from \$20 to \$40 per month. Currently, the basic package consisting of 25 cable television channels in Tashkent costs \$4 per month. Additionally, a digital receiver today costs approximately \$200. For most Uzbek residents, especially those in rural areas who are supposed to be the main TV-services consumers, this price is very high. To simplify the transfer to digital TV, Uzbekistan began production of adaptors for analog TV sets. In September 2009, Telemax Electronics began to build tuners in DVB-T format under contract with the Singaporean Servetechno Pte. Ltd worth approximately \$1.5 million. By the end of 2009, about 2,000 devices were ready. For Telemax Electronics, 96% of which is owned by Uzbekistan's national telecom company Uzbektelecom, digital TV will help restore the production, reduced after the USSR's collapse. In 2010, the partners plan to begin construction of a plant with a production capacity of 100,000 digital receivers per year. The plant will be located in the free industrial economic zone (FIEZ) Navoi. About \$10 million will be invested. According to experts, tax and customs privileges provided by FIEZ will bring the receiver's cost down to about \$80, and the possibility of providing receivers on loan to subscribers of digital TV has not been ruled out. "If cable networks are not simply displaced from the market due to the administrative resource and technological cavils, the TV-services market will become highly competitive," said Ilkhat Tushev, the analyst of Central Asia Investments. According to experts, there is a place for competition. Consumer habits and trust in proven technologies may provide cable TV with a competitive advantage in urban areas where its position is strong, but digital TV may lead the market in regions where smaller

numbers of subscribers make cable TV installation unprofitable or where geographic location makes cable TV installation impossible. As a result, digital TV will serve as a kind of universal source of television for all citizens regardless of their location and income level. As Uzbekistan chose the DVB-T standard for realization of digital video broadcasting, it is of high significance to have a glance at DVB-T.

DVB-T is a technical standard, developed by the DVB Project that specifies the framing structure, channel coding and modulation for digital terrestrial television (DTT) broadcasting. The first version of the standard was published in March 1997 and in the twelve years since then it has become the most widely adopted DTT system in the world. It is a flexible system that allows networks to be designed for the delivery of a wide range of services, from HDTV to multichannel SDTV, fixed, portable, mobile, and even handheld reception. The DVB Project has now created a next generation terrestrial specification, DVB-T2, designed to meet the needs of countries after they have completed Analogue Switch-Off (ASO). When the DVB Project began its work in 1993, the development of standards for the cable and satellite markets was prioritized. Fewer technical problems and a more simple regulatory climate meant that services based on these standards could be launched quite quickly. Indeed, the industry saw solutions for digital satellite and cable broadcasting as a higher priority than those for DTT. The development of a system for DTT would present more challenges, being required to cope with a variety of noise and bandwidth environments and multipath interference. As with all DVB specifications a set of Commercial Requirements was drawn up to define how such a system should perform, and DVB-T was designed to meet these requirements. DVB-T, in common with almost all modern terrestrial transmission systems, uses OFDM (orthogonal frequency division multiplex) modulation. This type of modulation, which uses a large number of sub-carriers, delivers a robust signal that has the ability to deal with very severe channel conditions. DVB-T has technical characteristics that make it a very flexible system:

- 3 modulation options (QPSK, 16QAM, 64QAM)
- 5 different FEC (forward error correction) rates
- 4 Guard Interval options
- Choice of 2k or 8k carriers
- Can operate in 6, 7 or 8MHz channel bandwidths (with video at 50Hz or 60Hz).

Using different combinations of the above parameters a DVB-T network can be designed to match the requirements of the network operator, finding the right balance between robustness and capacity. Networks can be designed to deliver a whole range of services: SDTV, radio, interactive services, HDTV and, using multi-protocol encapsulation, even IP datacasting. Whilst not originally designed to target mobile receivers, DVB-T performance is such that mobile reception is not only possible, but forms the basis of some commercial services. The use of a diversity receiver with two antennas gives a typical improvement of 5 dB in the home and a 50% reduction in errors is expected in a car. The DVB-H system for mobile TV was built on the proven mobile performance of DVB-T. The use of OFDM modulation with the appropriate “guard interval” allows DVB-T to provide a valuable tool for regulators and operators in the form of the “single frequency network” (SFN). An SFN is a network where a number of transmitters operate on the same RF frequency. An SFN can cover a country, such as in Spain, or be used to enhance in-door coverage using a simple “gap-filler”. One final technical aspect of DVB-T worth mentioning is its capacity for Hierarchical Modulation. Using this technique, two completely separate data streams are modulated onto a single DVB-T signal. A “High Priority” (HP) stream is embedded within a “Low Priority” (LP) stream. Broadcasters can thus target two different types of receiver with two completely different services. For example, DVB-H mobile TV services optimized for more difficult reception conditions could be placed in the HP stream, with HDTV services targeted to fixed antennas delivered in the LP stream.

After full adoption DVB-T standard and having some years spent utilizing it

Uzbekistan will replace DVB-T's position into much more powerful standard than the old one, - DVB-T2 standard. So, it will not be excessive, if we have enough information about it. DVB-T2 is the world's most advanced digital terrestrial television (DTT) system, offering more robustness, flexibility and 50% more efficiency than any other DTT system. It supports SD, HD, UHD, mobile TV, radio, or any combination thereof. DVB-T is the most widely adopted and deployed DTT standard. Since its publication in 1997, over 70 countries have deployed DVB-T services and 69 countries have now adopted or deployed DVB-T2. This well-established standard benefits from massive economies of scale and very low receiver prices. Due to the European analogue switch-off and increasing scarcity of spectrum, DVB drew up Commercial Requirements for a more spectrum-efficient and updated standard. DVB-T2 easily fulfils these requirements, including increased capacity, robustness and the ability to reuse existing reception antennas. The first version was published in 2009 (EN 302 755) and the 2011 update added the T2-Lite subset for mobile and portable reception. Like its predecessor, DVB-T2 uses OFDM (orthogonal frequency division multiplex) modulation with a large number of subcarriers delivering a robust signal, and offers a range of different modes, making it a very flexible standard. DVB-T2 uses the same error correction coding as used in DVB-S2 and DVB-C2: LDPC (Low Density Parity Check) coding combined with BCH (Bose-Chaudhuri-Hocquengham) coding, offering a very robust signal. The number of carriers, guard interval sizes and pilot signals can be adjusted, so that the overheads can be optimized for any target transmission channel. Additional new technologies used in DVB-T2 are:

- Multiple Physical Layer Pipes allow separate adjustment of the robustness of each delivered service within a channel to meet the required reception conditions (for example in-door or roof-top antenna). It also allows receivers to save power by decoding only a single service rather than the whole multiplex of services.
- Alamouti coding is a transmitter diversity method that improves coverage in small-

scale single-frequency networks.

- Constellation Rotation provides additional robustness for low order constellations.
- Extended interleaving, including bit, cell, time and frequency interleaving.
- Future Extension Frames (FEF) allow the standard to be compatibly enhanced in the future.

As a result, DVB-T2 can offer a much higher data rate than DVB-T OR a much more robust signal. For comparison, the two bottom rows show the maximum data rate at a fixed C/N ratio and the required C/N ratio at a fixed (useful) data rate.

	DVB-T	DVB-T2 (new/improved options in bold)
FEC	Convolutional Coding+Reed Solomon 1/2, 2/3, 3/4, 5/6, 7/8	LDPC + BCH 1/2, 3/5 , 2/3, 3/4, 4/5 , 5/6
Modes	QPSK, 16QAM, 64QAM	QPSK, 16QAM, 64QAM, 256QAM
Guard Interval	1/4, 1/8, 1/16, 1/32	1/4, 19/128 , 1/8, 19/256 , 1/16, 1/32, 1/128
FFT Size	2k, 8k	1k , 2k, 4k , 8k, 16k , 32k
Scattered Pilots	8% of total	1% , 2% , 4% , 8% of total
Continual Pilots	2.0% of total	0.4%-2.4% (0.4%-0.8% in 8K-32K)
Bandwidth	6, 7, 8 MHz	1.7 , 5 , 6, 7, 8, 10 MHz
Typical data rate (UK)	24 Mbit/s	40 Mbit/s
Max. data rate (@20 dB C/N)	31.7 Mbit/s (using 8 MHz)	45.5 Mbit/s (using 8 MHz)
Required C/N ratio (@24 Mbit/s)	16.7 dB	10.8 dB

2.2.3 –rasm. The graph showing the difference between DVB-T and DVB-T2.

As with DVB-T, the new standard targets not just roof-top and set-top antennas, but also PCs, laptops, in-car receivers, radios, smart phones, dongles, and a whole range of other innovative receiving devices. In countries where DVB-T services are already on air DVB-T and DVB-T2 services are likely to coexist side-by-side for some time to come, but in green-field countries that have not yet deployed DTT services, there is a unique opportunity to leapfrog directly to DVB-T2 instead of first deploying DVB-T. A future-proof solution! Almost all modern TV sets sold in DVB countries have integrated DVB-T2 tuners and the price difference between comparable DVB-T and T2 integrated TV sets is already negligible. The first country that deployed DVB-T2 is the UK, where DVB-T2 services were launched in March 2010, next to an existing DVB-T service. Italy, Sweden and Finland followed shortly after and almost every European

country is now studying plans to switch to from DVB-T to T2. Outside of Europe, DVB-T2 pay TV services were launched in Zambia, Namibia, Nigeria, Kenya and Uganda and many more are expected to follow soon. Trials are taking place across the globe and many more countries are considering DVB-T2 services. So far, 150 countries have trialed, adopted or deployed DVB-T and T2.

Summary

The conclusion of this chapter may be that the formats and compressions are the most needed techniques while working in digital sphere. This is because, nearly all of them are included into the subsequent chapter. Furthermore, digital television broadcasting systems and their adoption by countries take place across the statement. This information will perhaps be profitable and productive.

3. VIDEO WHICH DEMONSTRATES THE ENTIRE MEANING OF DIGITAL VIDEO AND ITS EVOLUTION UP TO PRESENT TIME.

3.1. Adobe After effects, Adobe Premiere Pro and Easel in brief

Adobe After Effects is a digital visual effects, motion graphics, and compositing application developed by Adobe Systems and used in the post-production process of filmmaking and television production. It also functions as a very basic non-linear editor, audio editor and media transcoder. Adobe After Effects is primarily used as a software for video editors, to create motion graphics and also visual effects. It allows users to animate, edit, and compose media be it 2D or 3D space with many different built-in tools and third party plug-ins which can be downloaded from the Internet depending on what type of plug in the user is looking for. It also provides individual attention to variables like parallax and also user adjustable angles of observation. Adobe After Effects is a layer-oriented program software. Each individual media object like video clips, still images, audio clips, etc. runs on its own. In contrast, other Non-Linear Editing Systems use a system where individual media objects can

occupy the same track as long as they do not overlap at the same time. This track-oriented system is more suitable for editing and can keep project files more simple. The layer oriented system that Adobe After Effects has is suitable for extensive video effects work and also keyframing. Other compositing packages, especially the ones that employ tree or node workflows, such as Nuke Software, and eYeon Fusion, are better suited to managing larger volumes of objects within a composite. Adobe After Effects is capable of countering the problem somewhat by selectively hiding layers or by grouping them into pre-compositions. The main interface of Adobe After Effects consists of several panels. Three of the most commonly used panels are the Project Panel, Composition Panel, and the Timeline Panel. The project panel acts as a bin to important still images, videos or audio footage items. Footage files in the Project Panel are used in the Timeline Panel, where layer ordering and timing can be adjusted according to the user. The items visible at the current time marker are displayed in the Composition Panel. Adobe After Effects shares many of the same features with other Adobe programs, such as creating shapes, that are defined by bezier curves. Like Adobe Photoshop and Adobe Illustrator, After Effects can import and manipulate many image formats, filters, and adjustments. Adobe After Effects integrates with other Adobe Software Programs such as Adobe Illustrator, Adobe Photoshop, Adobe Premiere Pro, Adobe Encore and Adobe Flash. Additionally, it works with third party 3D programs like Cinema 4D, Lightwave 3D, and Autodesk 3D Max.

Adobe Premiere Pro is a timeline-based video editing software application. It is part of the Adobe Creative Cloud, which includes video editing, graphic design, and web development programs. Premiere Pro is used by broadcasters such as the BBC and CNN. It has been used to edit feature films, such as *Gone Girl*, *Captain Abu Raed*, and *Monsters*, and other venues such as Madonna's Confessions Tour. Moving to its features, Premiere Pro supports high resolution video editing at up to $10,240 \times 8,192$ resolution, at up to 32-bits per channel color, in both RGB and YUV.

Audio sample-level editing, VST audio plug-in support, and 5.1 surround sound mixing are available. Premiere Pro's plug-in architecture enables it to import and export formats beyond those supported by QuickTime or DirectShow, supporting a wide variety of video and audio file formats and codecs on both Mac OS and Windows. When used with Cineform's Neo line of plug-ins, it supports 3D editing with the ability to view 3D material using 2D monitors, while making individual left and right eye adjustments.

Adobe Photoshop is a raster graphics editor developed and published by Adobe Systems for Windows and OS X. Photoshop was created in 1988 by Thomas and John Knoll. Since then, it has become the de facto industry standard in raster graphics editing, such that the word "photoshop" has become a verb as in "to photoshop an image," "photoshopping," and "photoshop contest," etc. It can edit and compose raster images in multiple layers and supports masks, alpha compositing and several color models including RGB, CMYK, Lab color space (with capital L), spot color and duotone. Photoshop has vast support for graphic file formats but also uses its own PSD and PSB file formats which support all the aforementioned features. In addition to raster graphics, it has limited abilities to edit or render text, vector graphics (especially through clipping path), 3D graphics and video. Photoshop's feature set can be expanded by Photoshop plug-ins, programs developed and distributed independently of Photoshop that can run inside it and offer new or enhanced features. Photoshop's naming scheme was initially based on version numbers. However, in October 2004, following the introduction of Creative Suite branding, each new version of Photoshop was designated with "CS" plus a number; e.g. the eighth major version of Photoshop was Photoshop CS and the ninth major version was Photoshop CS2. Photoshop CS3 through CS6 were also distributed in two different editions: Standard and Extended. In June 2013, with the introduction of Creative Cloud branding, Photoshop's licensing scheme was changed to that of software as a service and the "CS" suffixes were replaced with "CC".

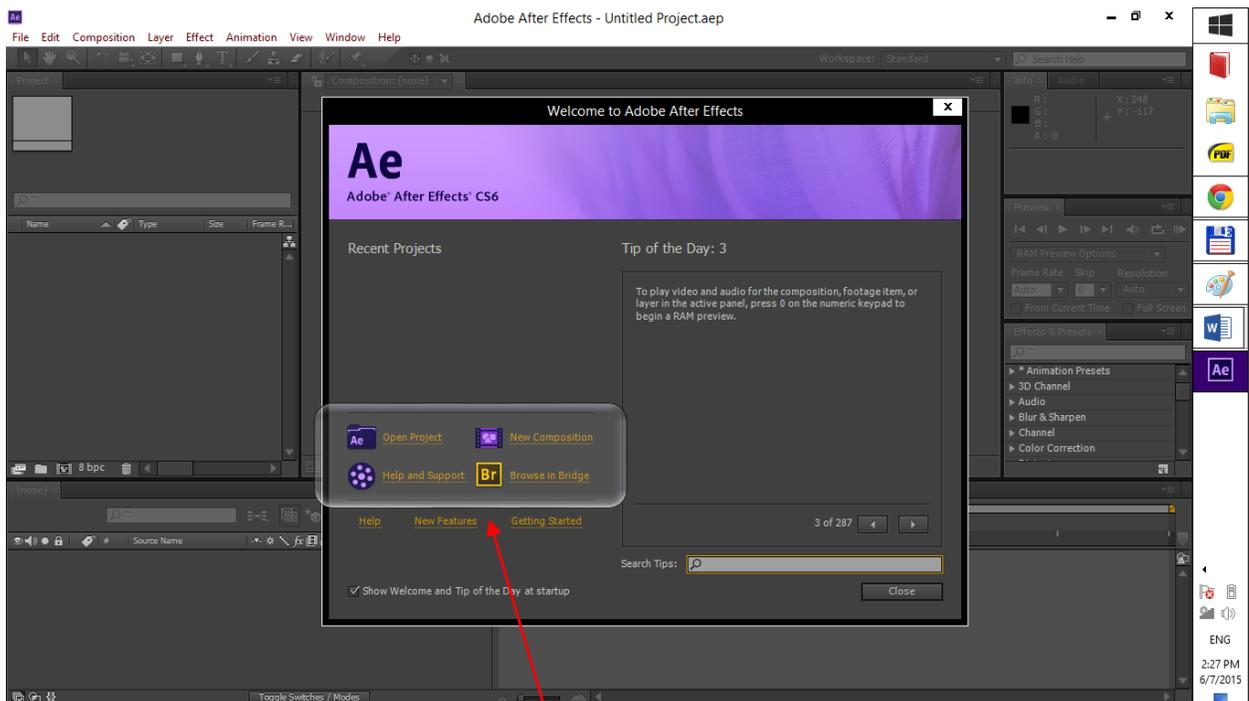
3.2. Definitions representing the sequences of how video is made

To start with, we have to set up our needed software programs: Adobe After Effects, Adobe Premiere Pro and Adobe Photoshop. To implement this action we get a Master collection pack where exist all Adobe software Programs. Then we choose and install them into my hardware. After making a plan what to do, we commence working with Adobe After Effects. When we open the software, its shape reveals as below:



3.2.1-rasm. The opening icon of Adobe After Effects

Then After Effects workstation window opens:



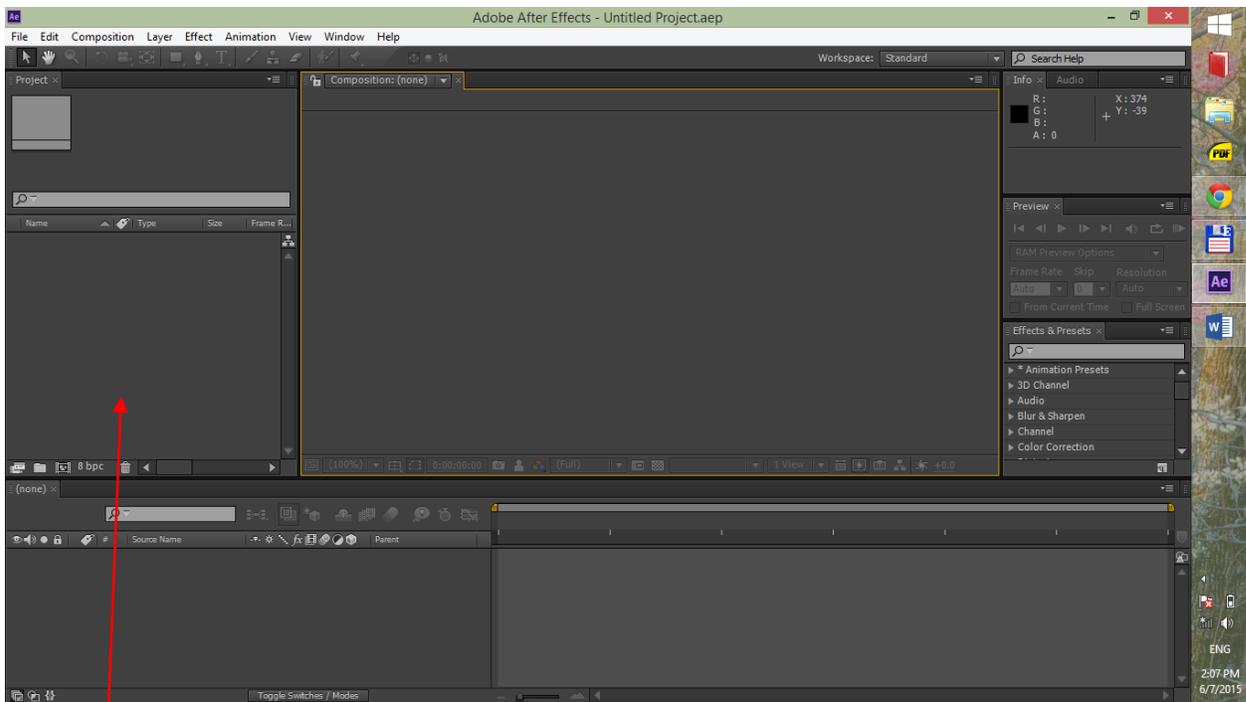
3.2.2-rasm. Workstation of Adobe After Effects.

In it we can see smaller window asking us what direction we choose. For example, we can pick one of above marked panels. We now choose New Composition panel. Then again appears a small window consisting of settings of our new composition:



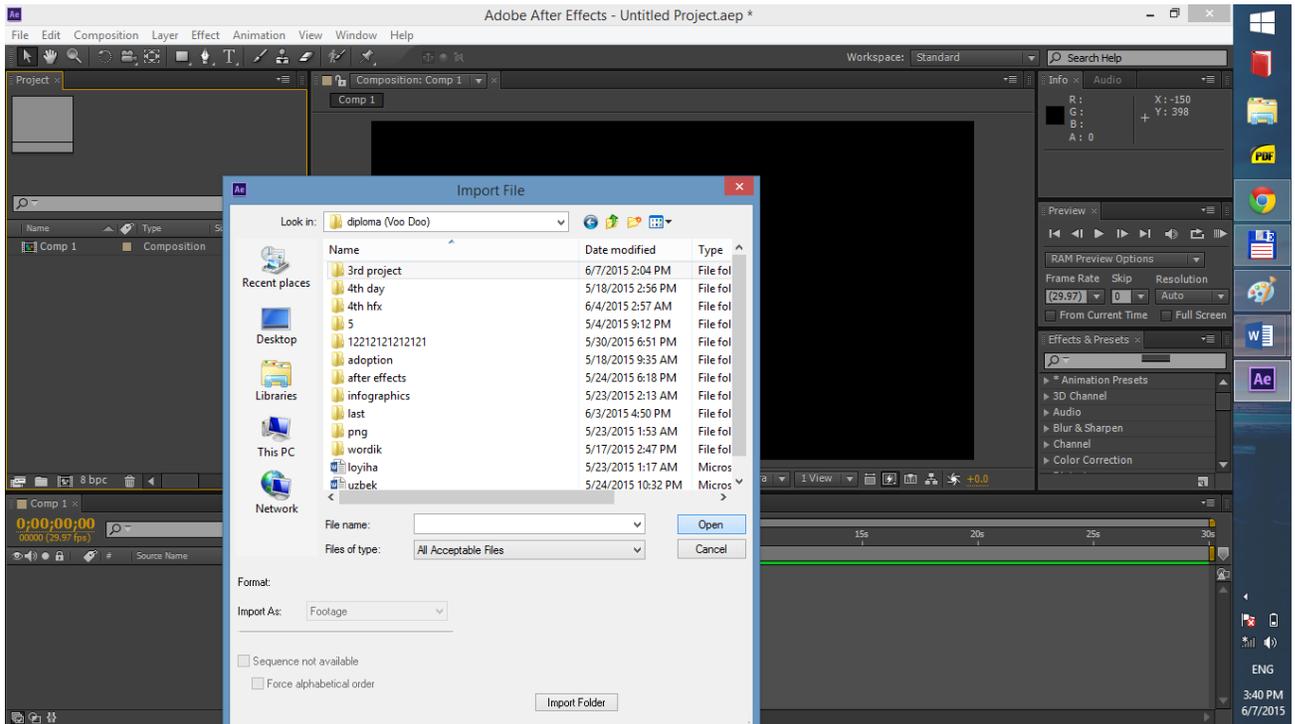
3.2.3-rasm. Composition settings of Adobe After Effects.

After settings have done, we click OK button. Then our set window is shown as below:

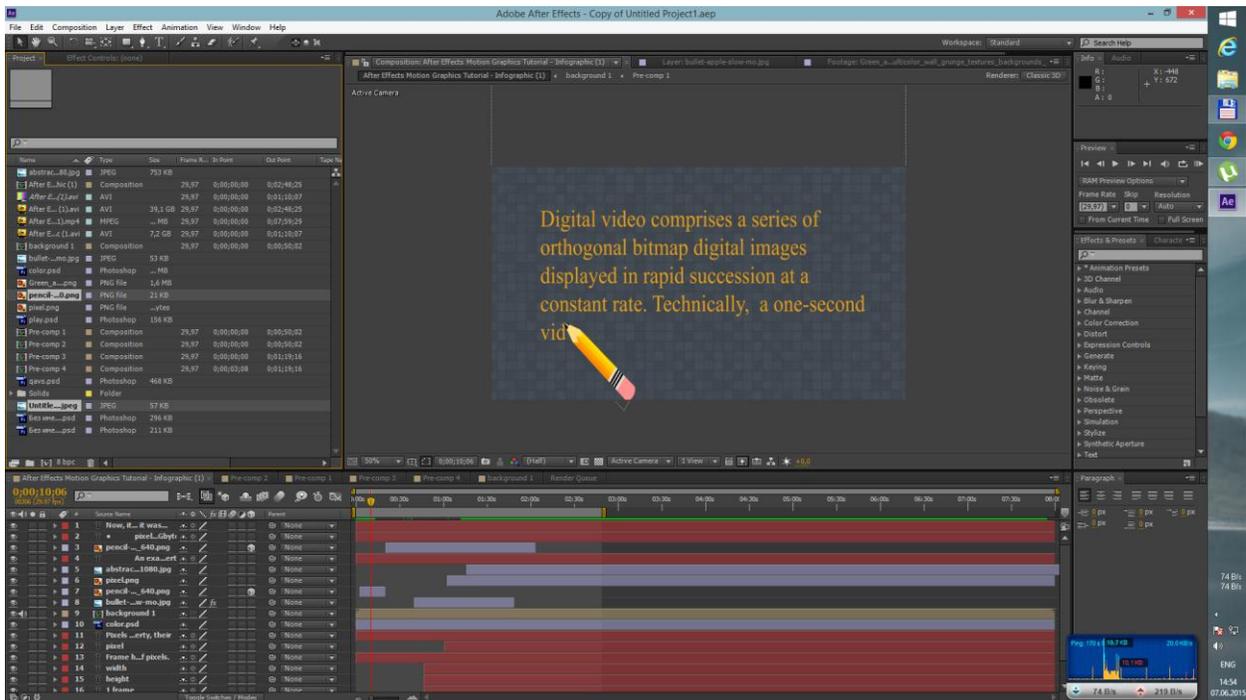


3.2.4-rasm. The window of Adobe After Effects

We double-click the shown area and choose the images and videos to make our video good. There exists another way to add our images or video we need, it is pointing the mouse to the area and right-clicking, then choose Import menu there. However, I think it is easy to double-click the area rather than doing few actions. The picture demonstrated below shows the same way:



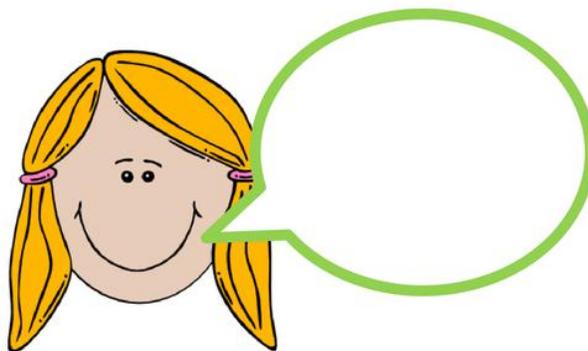
3.2.5-rasm. How to import files into working field in Adobe After Effects
Now, it is time to have the video tutorial started. After Effects has a lot of effects, functions as well as plug-ins which ease the issue and make the product look awesome.



3.2.6-rasm. The commence of the project.

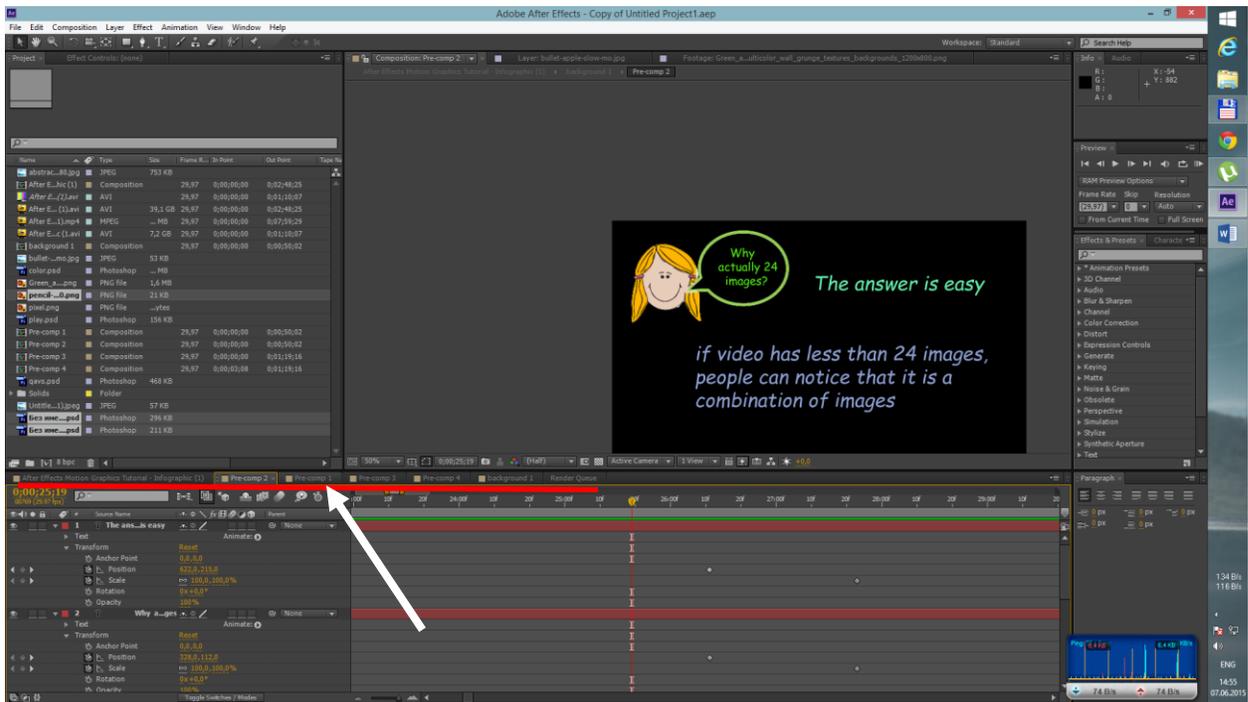
Using a pencil picture and actual position in After Effects we can create incredible products. Some movies and cartoons are professionally made in these types of editing programs.

Turning to the project, during the time I was making the video tutorial I downloaded some images and used them as graphic materials to show people understandable work. One of them is shown below:



3.2.7-rasm. Speaking girl.

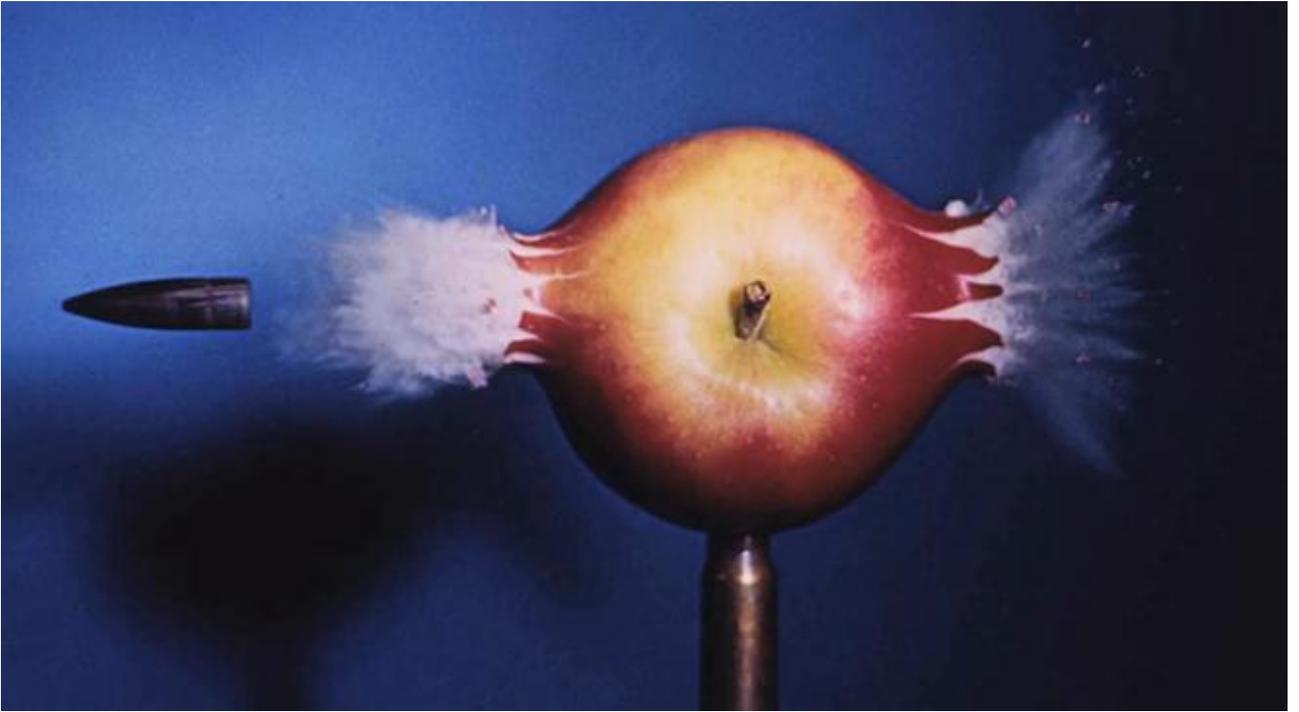
This picture makes people laugh and they automatically pay close attention to the video. So, then come texts explaining the meaning of a part of the project:



3.2.8-rasm. The position of pre-compositions

We create another pre-composition to work comfortably and not to confuse other temporarily unnecessary things with the things which are actually needed. To do this we create a new composition and it is placed in a row with the main composition. The pointer shows where they are in the main window.

For the next pre-composition I used pictures like:

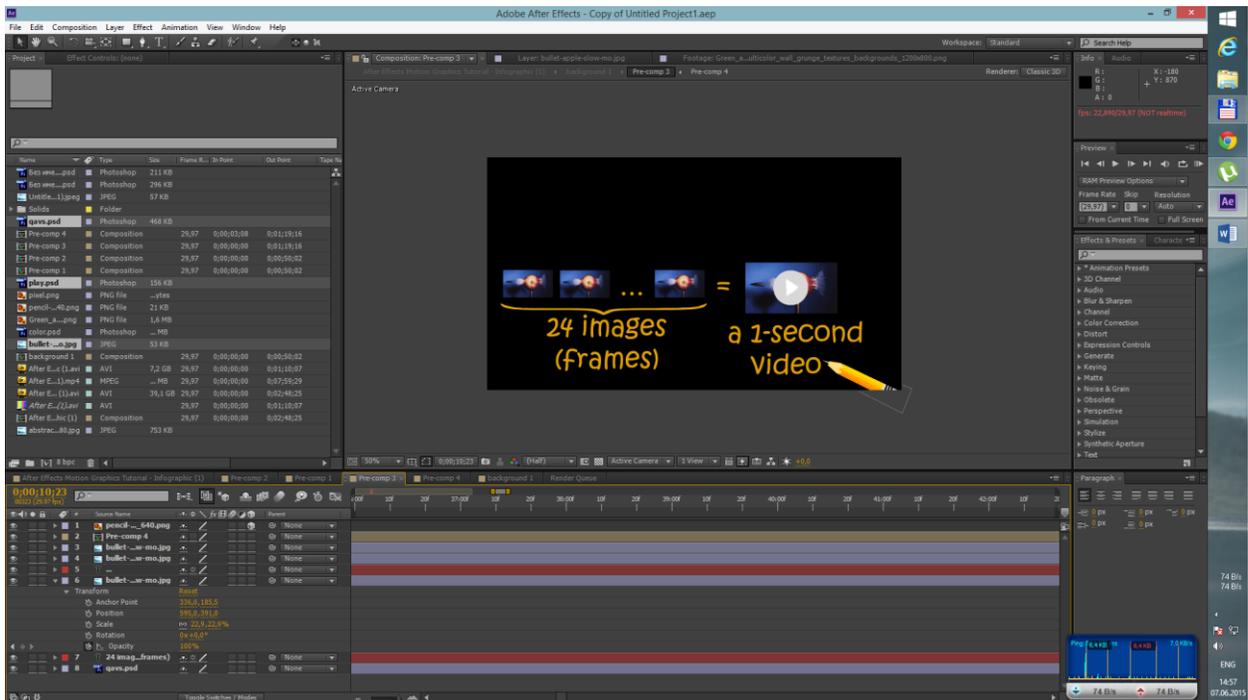


3.2.9-rasm. Bullet apple in a slow motion.



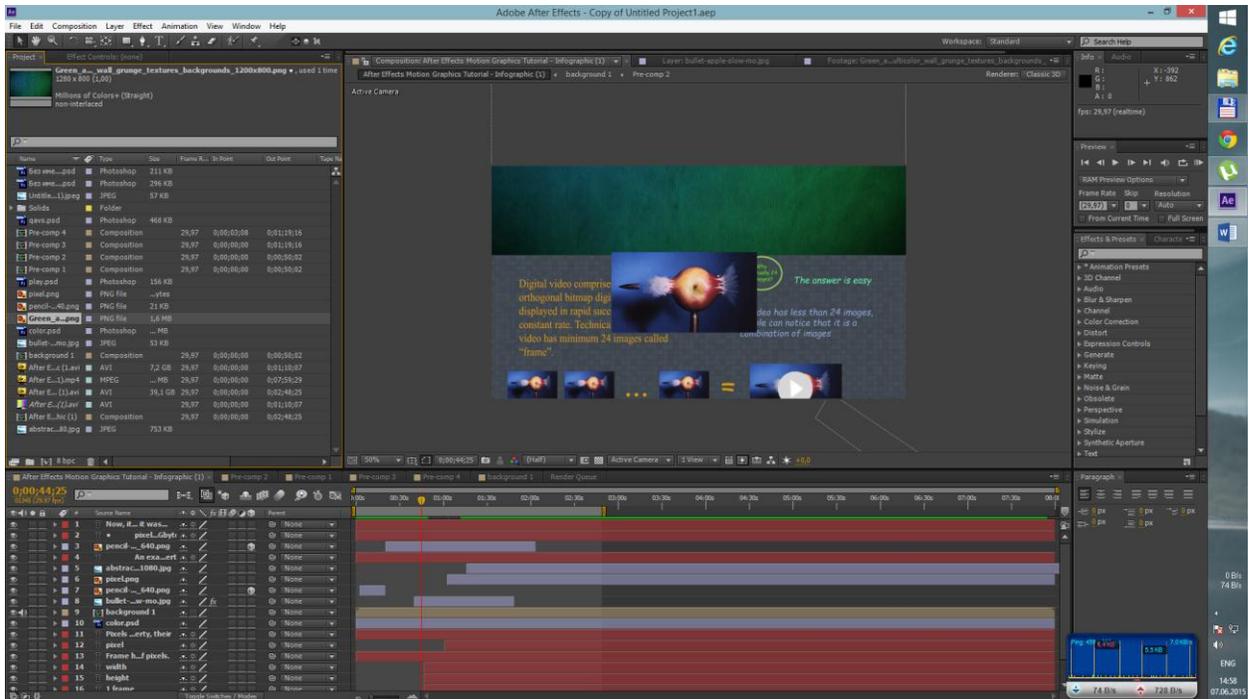
3.2.10-rasm. a bracket

After having a good idea of making a good video, it is easy to locate these pictures. To locate the pictures we have to import them into After Effects composition menu and they will automatically appear on the working screen. Well, now we make a good shape of design and drag pictures to the place where we want to. We use again to write a text which provides the beauty of the project part. All parts of the text are positioned step by step and timed as we wish.



3.2.11-rasm. One pre-composition in Adobe After Effects.

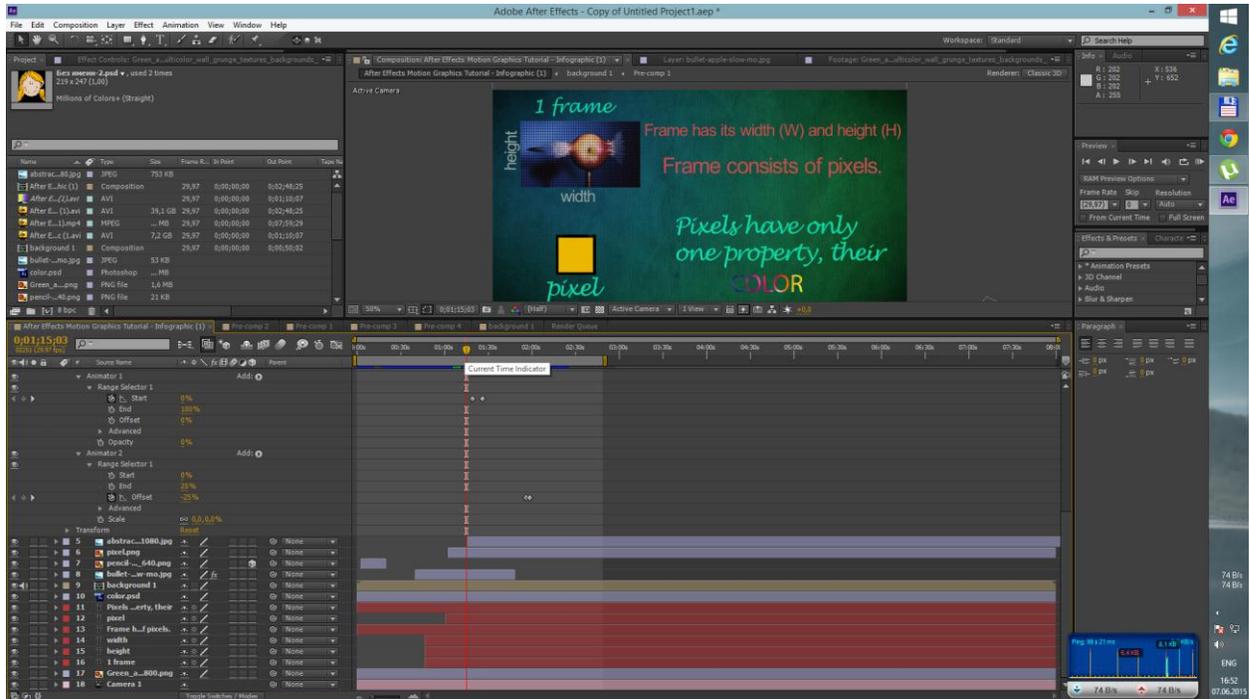
To be easily understood we cut the frame image and pull it to the new background and work out the image by dividing it into pixels.



3.2.12-rasm. Moving to another background in Adobe After Effects.

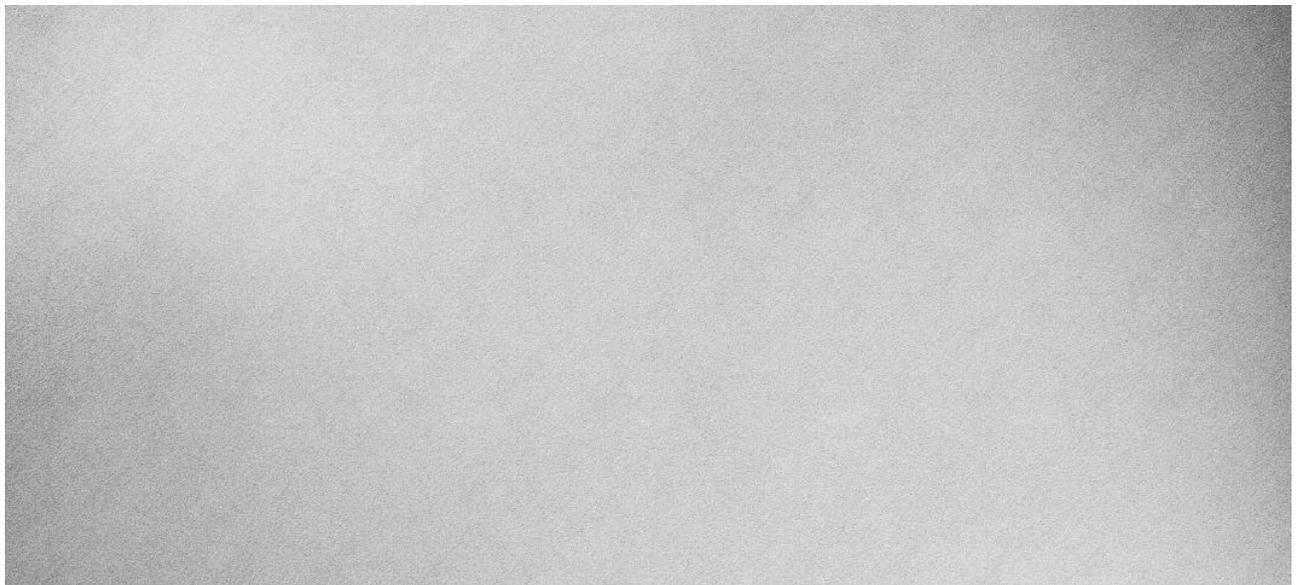
Also, one frame has its width and height and consists of pixels. Pixels have only one

value, their color.



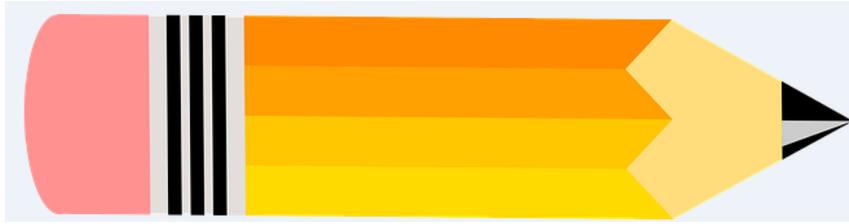
3.2.13-rasm. Stating the true pictures on a background.

Another step is very easy to do. First, we place a new background:

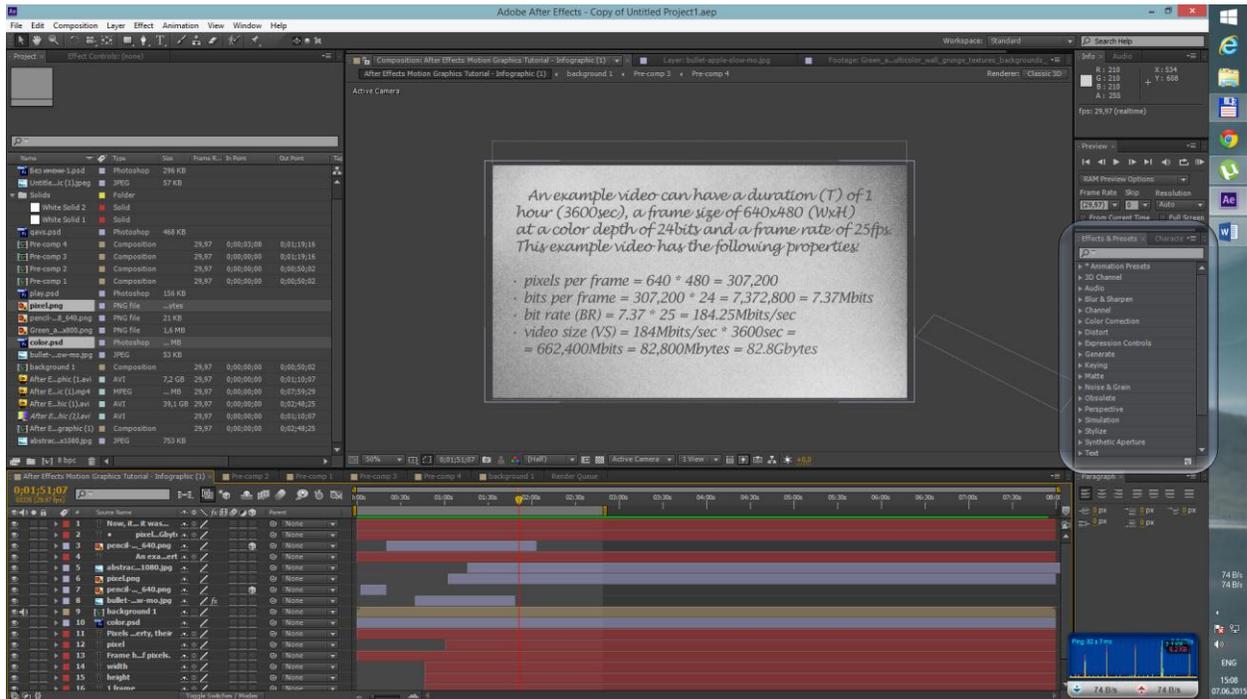


3.2.14-rasm. Background.

Then, a pencil comes the scene. Using it we write our text and practically animate the text by positioning the letters in a text:

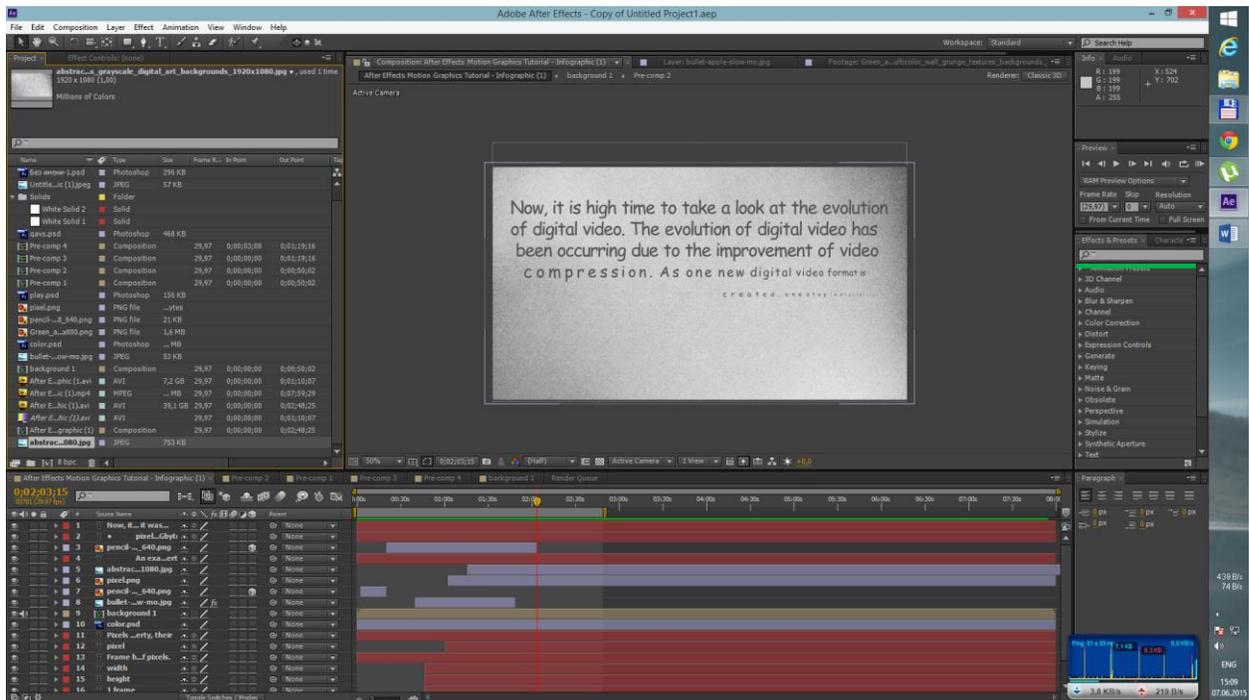


3.2.15-rasm. A pencil.



3.2.16-rasm. The position of effects in Adobe After Effects.

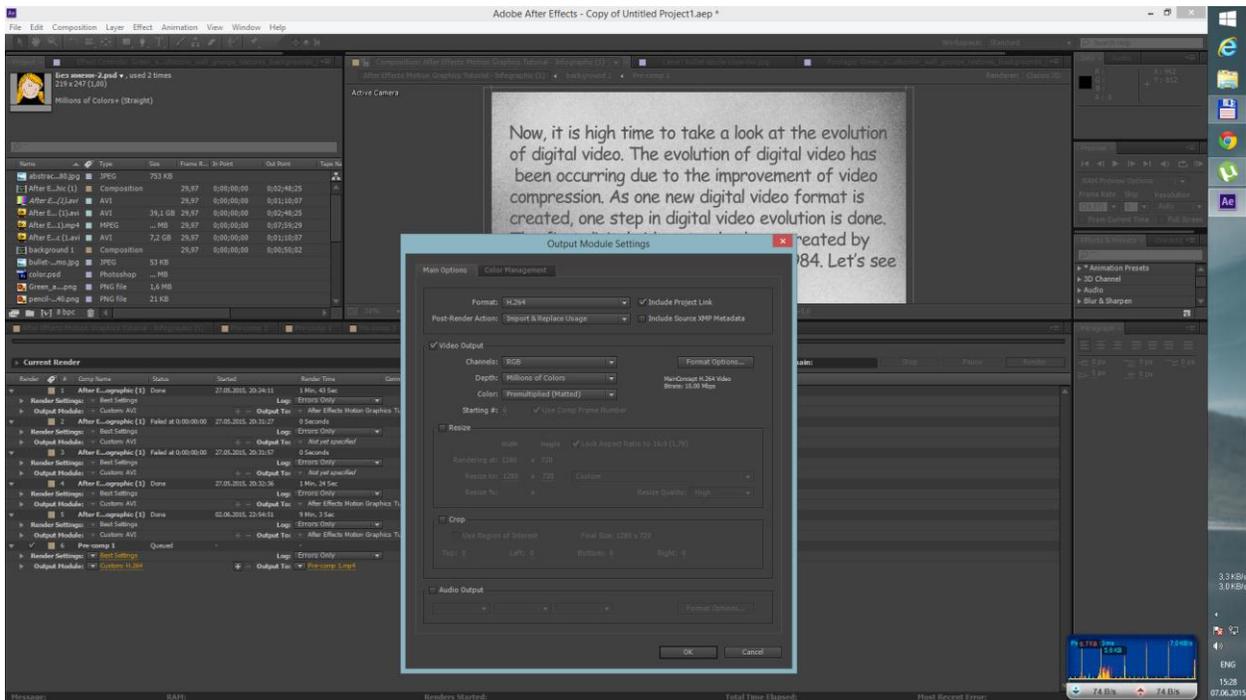
In the above-shown picture, there are lots of effects. We can find them without any difficulty by going to the right side of the following window. Where to find this menu is labelled in a transparent quadrangle.



3.2.17-rasm. Searching place of effects in Adobe After Effects.

If you exactly know the name of the effect you are going to use, you can type it in the white-shaped square, it is underlined green at the right side of the picture.

Finally, we finished the project in Adobe After Effects. To output this module as a media file we have to render it and go to render queue. By clicking the composition as shown below we get a mini window asking us how to output the module:



3.2.18-rasm. Output module of Adobe After Effects.

It is worth if we save the module in H.264 format, also other measures can be accomplished there. Click OK button and your product is ready to audition.

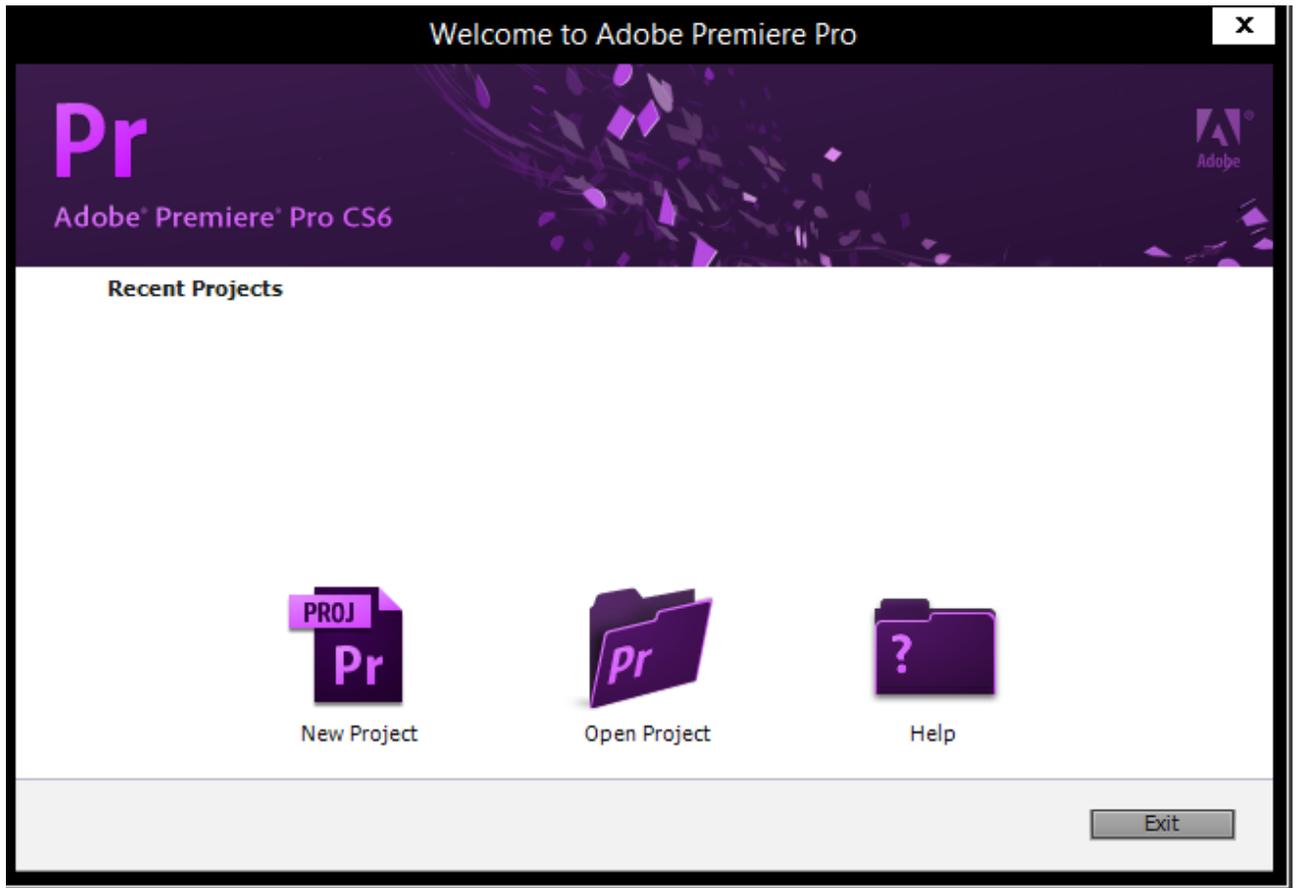
Now it is time to do some work in Adobe Premiere Pro. The opening form of this program is presented on the bottom:



3.2.19-rasm. The opening icon of Adobe Premiere Pro.

The workstation of Adobe Premiere Pro looks like the workstation of Adobe After Effects, but there is a little nuance available. When we first try to open Premiere Pro it

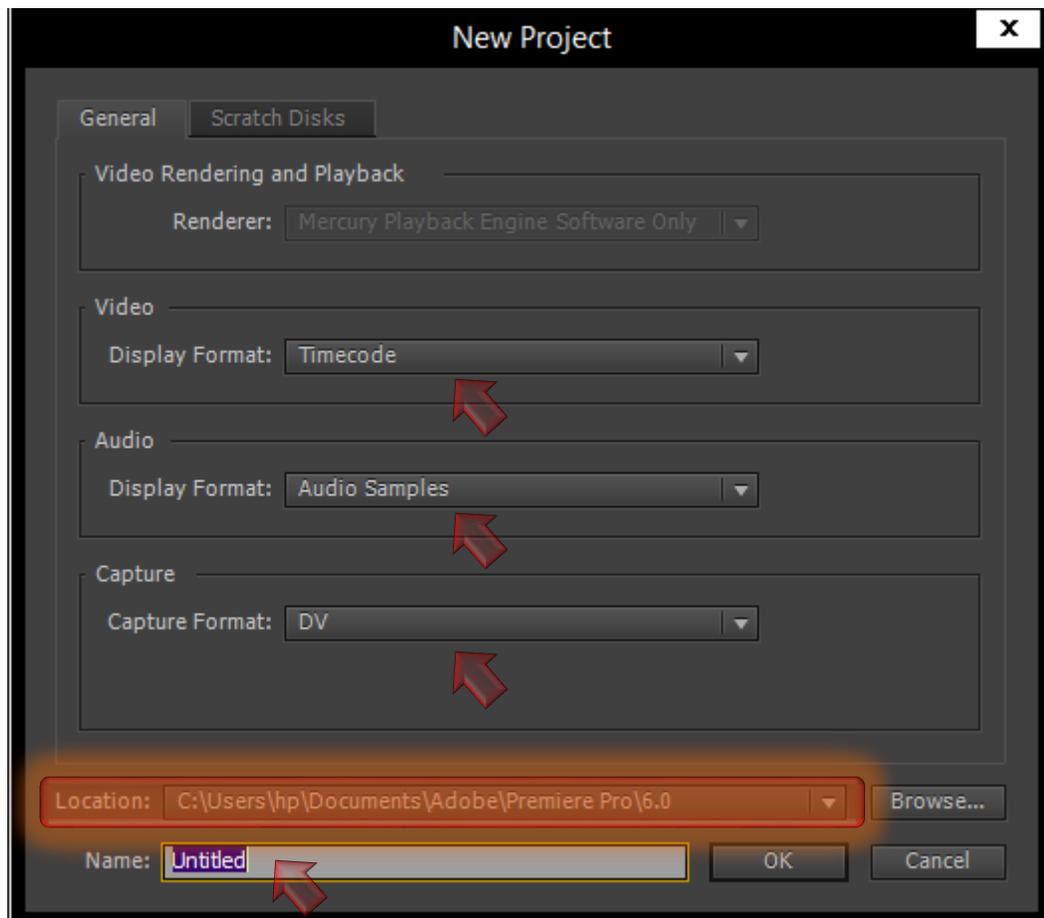
always asks either to create a new project or to open project which is already available in its memory.



3.2.20-rasm. Starting menu of Adobe Premiere Pro.

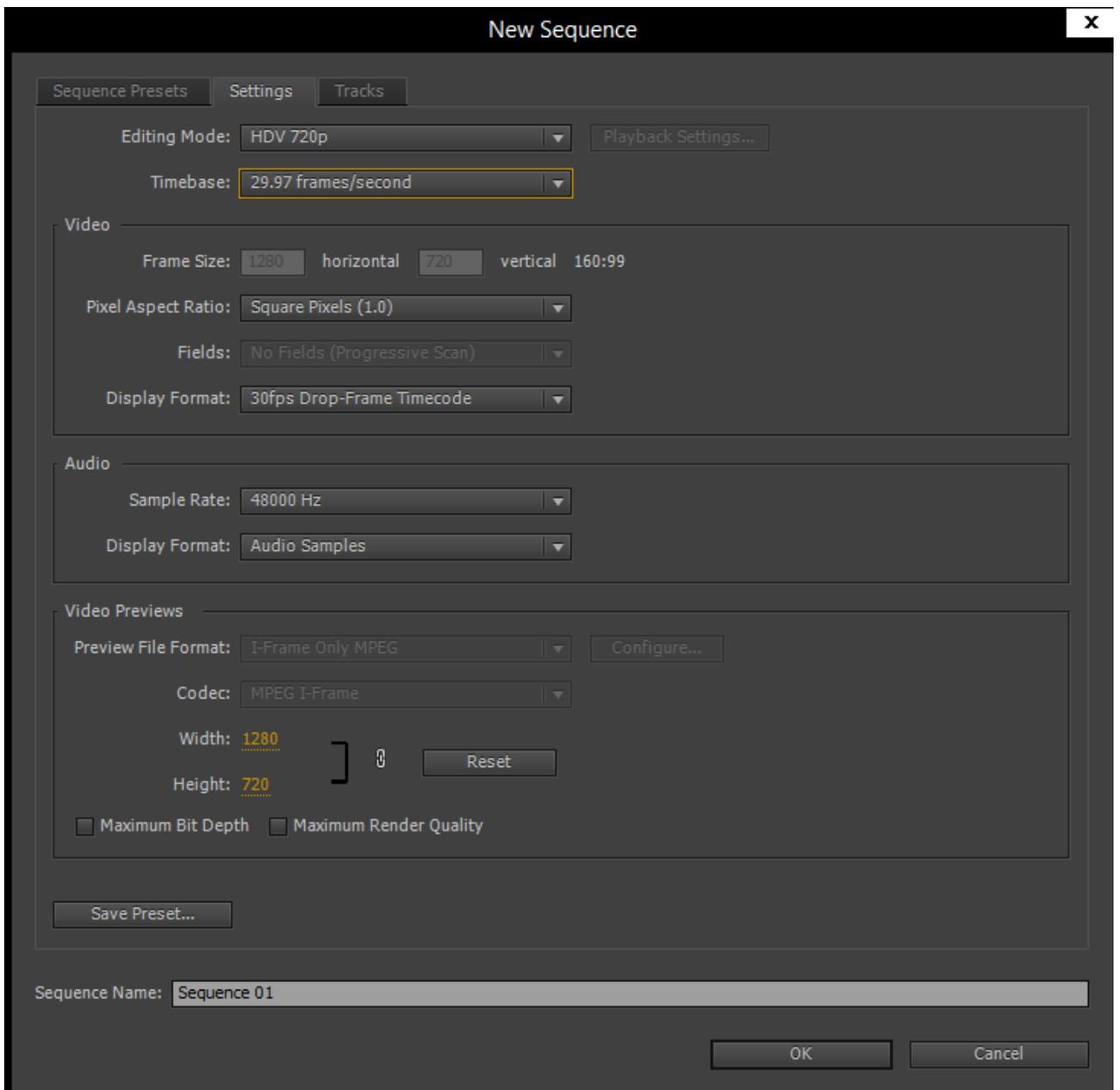


As we want to create a new project, we pick **New Project** panel. Then appears the settings of our new project. There we are free about selecting video and audio display formats. Furthermore, picking a capture format can be done. Besides, we may change the name of our Premiere project which is named “untitled ” as default. After all, it is advisable to remember the place where we save the project in. Let’s have a glance at the setting menu:



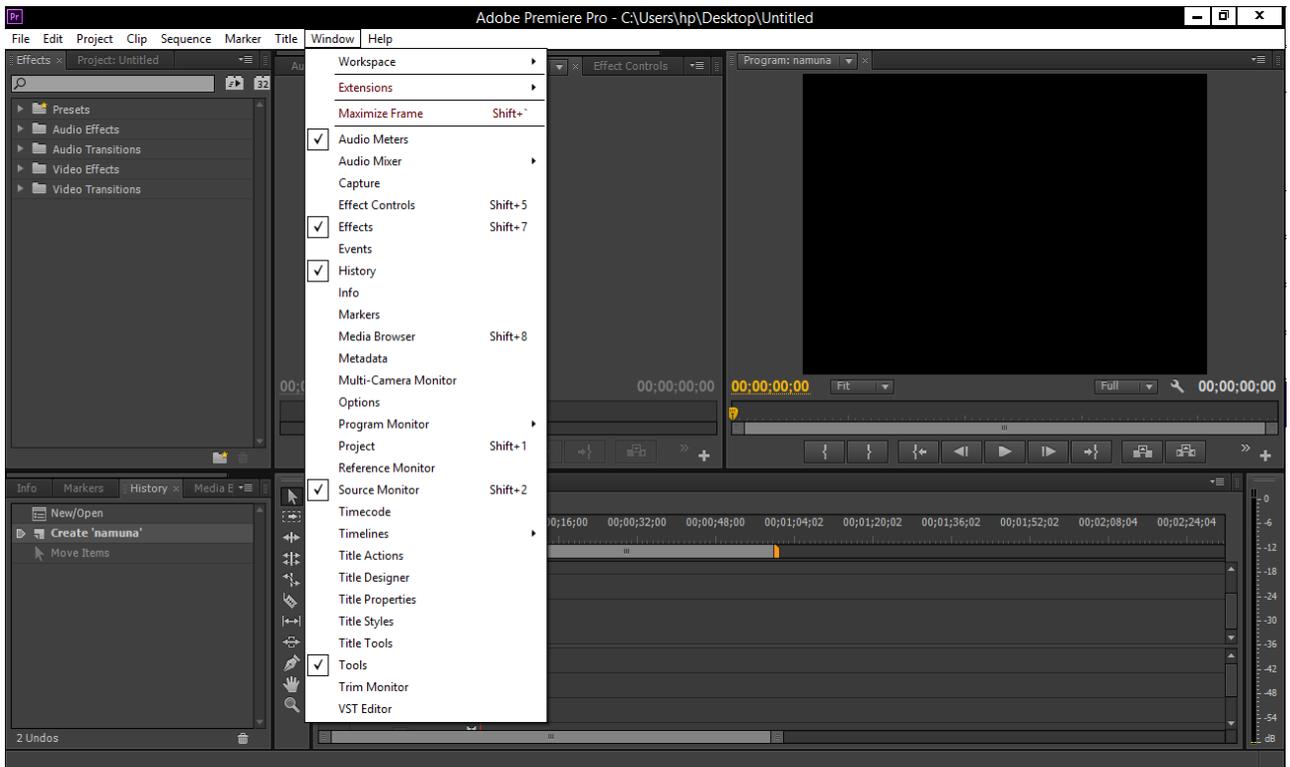
3.2.21-rasm. New project menu of Adobe Premiere Pro.

Then, the new sequence's settings will be visible. There we can set the format of our sequence. Additionally, we can change the editing mode, time-base, audio as well as video settings and others. In video section we select pixel aspect ratio, display format. In audio section we select sample rate and display format. It is also possible to set resolution of a sequence. Utilizing Adobe Premiere Pro we can cut the sequences of video or audio files, also it is possible to add several effects between two sequences. The most important action is to set true settings, although user may change them before completing the project. Because, some characteristics of the program may not be changed after completion. It is no use to say million times, it is useful to see once:



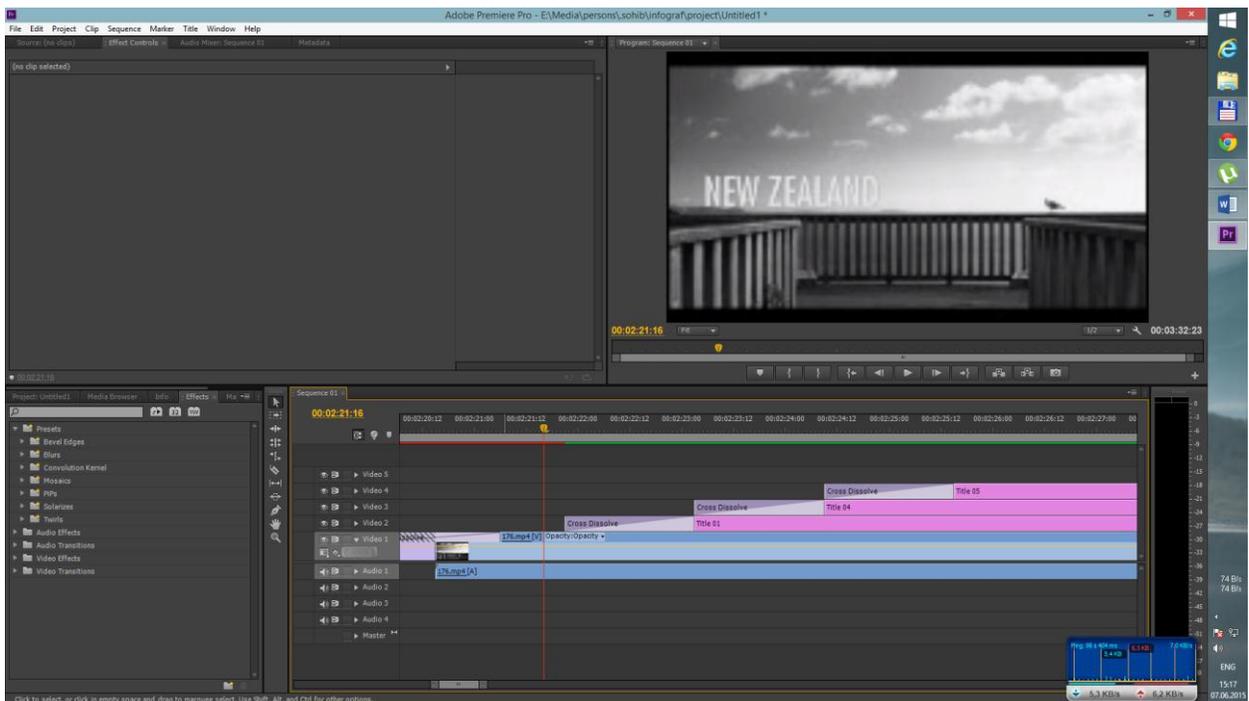
3.2.22-rasm. Settings of a new sequence in Adobe Premiere Pro.

As all editing programs have, Adobe Premiere Pro also has panels where users can some functions such as creating a new projects, importing files, setting up window panels, titling, saving, etc. in window panel, users can set workstation as they like them to be. It is not advised to place all menus and functions, because they make the workstation be complicated.



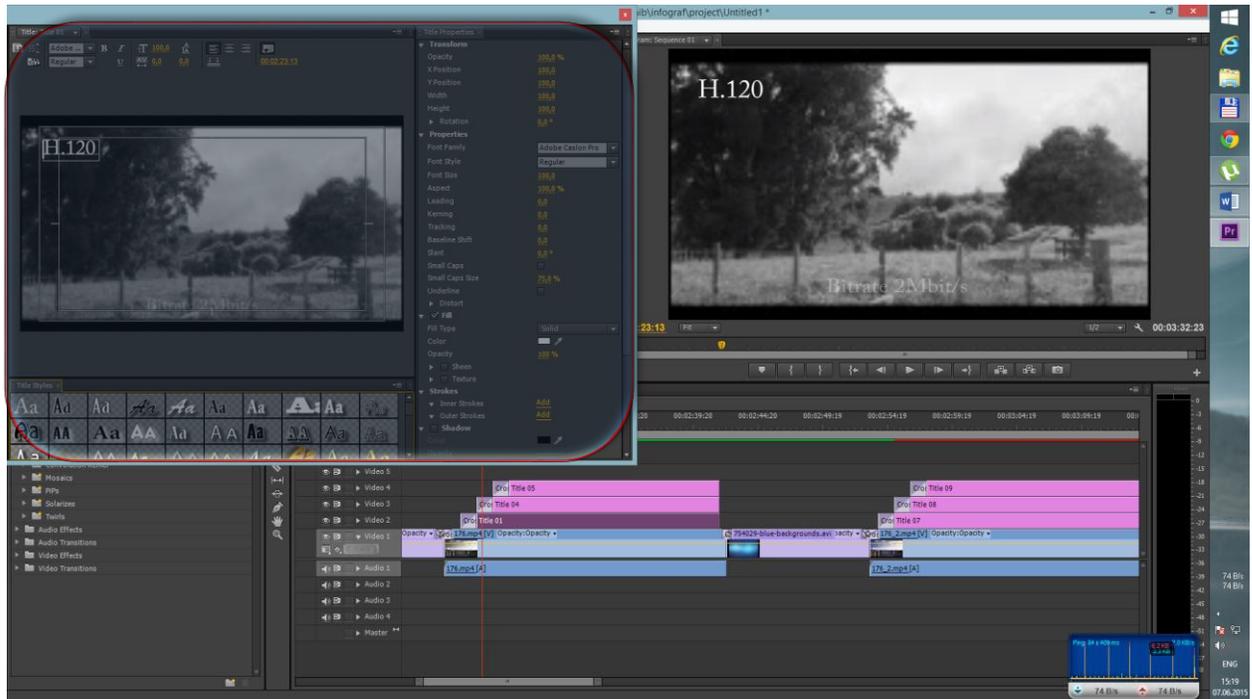
3.2.23-rasm. Window panel of Adobe Premiere Pro

After we set the workstation, we browse the file that we exported from After Effects before. Then we drag the file onto track path and we browse our poor quality video.



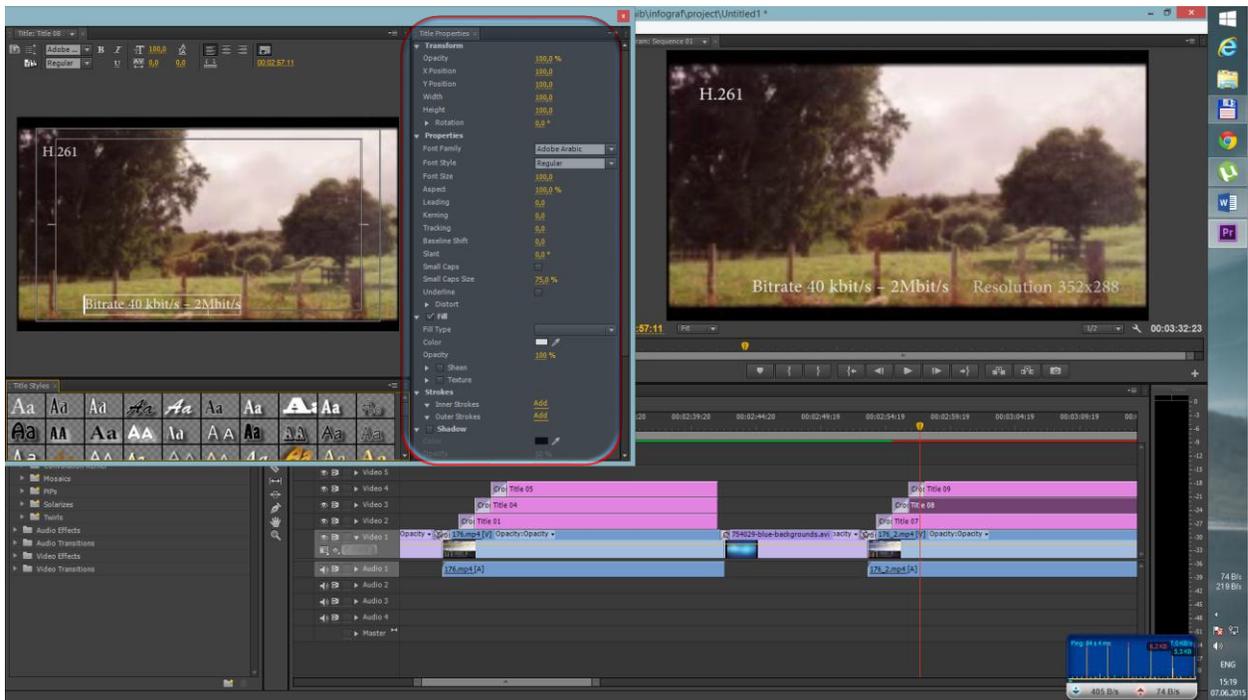
3.2.24-rasm. Adding effects in Adobe Premiere Pro.

Adding some effects, we can create a beautiful video tutorial. To add video or audio effects we simply choose the type of the effects in one section situated up-left of the workstation. To title some texts we choose “title” panel above, appears a separate window to title texts. This way is presented below:



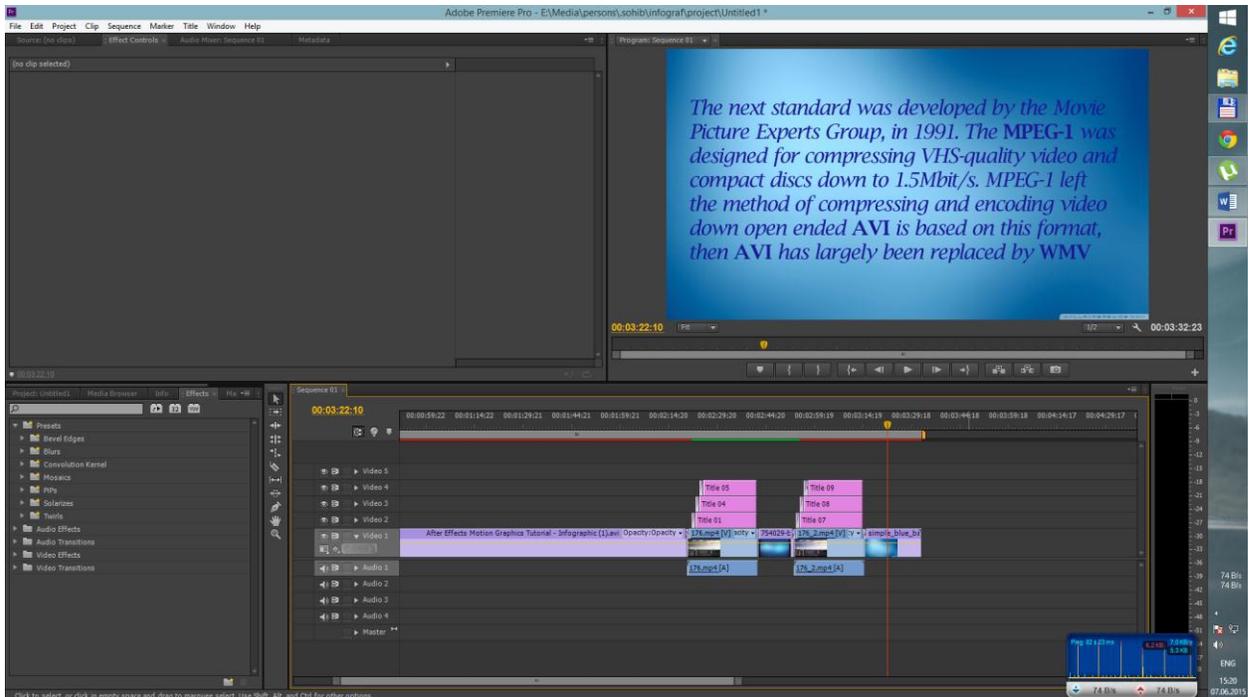
3.2.25-rasm. Title menu of Adobe Premiere Pro (for black and white video).

In title menu users can change the shrift of a text, transform it. Besides those, other functions are available for users. Through Adobe Dynamic Link, compositions from Adobe After Effects may be imported and played back directly on the Premiere Pro timeline. The After Effects composition can be modified, and after switching back to Premiere Pro, the clip will update with the changes. Likewise, Premiere Pro projects can be imported into After Effects. Clips can be copied between the two applications while preserving clip attributes. Premiere Pro also supports many After Effects plug-ins.



3.2.26-rasm. Title menu of Adobe Premiere Pro (for color video).

Above shown picture is aimed to show color video with titles. As you can see there are many functions marked. Using them people may create different shapes of title.



In Adobe Premiere Pro users can create effects like in Adobe After Effects. It is pity that there are not as many effects as Adobe After Effects.

