OBS: video recording system for universities

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Declaration of Authorship

I, Anastasiia TRAVERSE, declare that this thesis titled, "OBS: video recording system for universities" and the work presented in it are my own. I confirm that:

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- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated.

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Signed:

_____

Date:

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"When you educate one person you can change a life, when you educate many you can change the world"

Shai Reshef

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Bachelor of Science

OBS: video recording system for universities

by Anastasiia TRAVERSE

Abstract

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Over the past years, the educational process has changed a lot. Most of the lectures now take place either online or even using video. In such realities, teachers, students and university employees face new challenges. Nowadays, when video materials have become the main tool of the educational process, there is also a need to produce them efficiently, quickly and in large quantities. In this work, the idea of creating a small video studio, the elements of which are fully automated, is considered. It is possible to launch all the elements of such a studio with a single "Start" button. In addition, studio booking and all settings could be done online on the studio website as showed on video 1.The paper considers this idea, its functionality, necessary equipment and other elements for its implementation.

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FIGURE 1: Video: OBS account intro video

Acknowledgements

First of all, I want to thank the Applied Sciences Faculty team for these unforgettable 4 years. Also I would like to thank Oles Dobosevych for motivating and helping all 4 years, and a special thank for becoming supervisor for this work. I want to thank my family and friends who believed in me no matter what. Thank everyone who filled these years with positive emotions.

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OBS   One Button Studio
OBRS One Button Recording Studio

Dedicated to my loving and supportive family…

Chapter 1

Introduction

In the modern world, where all life has moved to the Internet, it is inevitable that the learning process will go there as well. Everyone can get information they need in a matter of seconds. This opportunity has simplified many processes. On the Internet, we can find recipes for dishes or instructions for using different technologies. To study new information, people no longer need to run to the library or look for people who possess this information, but they just need to open an Internet browser and enter the question of interest. Slowly, all processes began to move online. We got used to shopping online. There are endless possibilities for watching movies without leaving home. In addition, most entertainment shows have switched exclusively to the online format and have ceased to be broadcasted on television. The whole world has begun to live in this rhythm.

1.1 Motivation

Now the majority of educational processes has also moved to the Internet to provide remote education. For such a step, it became necessary to create an Internet environment, create the systems for remote work of students and teachers, provide the possibility of instant online communication and the ability to share educational materials between participants in the educational process. Many educational institutions have created their own educational systems for the remote educational process with quite different functionalities that were convenient and functional for them.[1]

Over time, video materials have gained popularity, access to which remained with students forever. They can rewatch these videos at a time convenient for them. Such materials provided an opportunity to improve the educational process and enabled students to choose the time of the educational process themselves. Video lectures gained popularity in many places. Not only educational institutions made this type of material, but also online platforms or online courses. Unfortunately, not every teacher has the opportunity to record their lectures in good quality. Renting professional video studios may not always be an affordable solution.

1.2 Idea

With the advent of online education, there is a need for quality online lectures. To create one online educational course, it may need an average of 5 to 20 video lectures. The amount depends on the length of the video. Large universities, educational platforms, online courses have a need for video studios that will always be nearby and free just for their needs. Even if you have a video studio accessible you need a whole team - a videographer, sound engineer and other specialists in the video

sphere. Their work is not only additional difficulties for organising the shooting process, but also added costs.

1.3   Solution

Now it is necessary to create a seamless multi-functional video studio with minimal involvement of other specialists, and easy to use. For such a studio, exactly the same amount of equipment is needed, but with the introduction of an additional system for organizing the interaction of all elements necessary for recording video lectures. It is important to create a system for recording video material by pressing one button "Start record", while the camera, lights and a screen with a lecture will turn on independently. The lecturer will only need to tell his material, and after the end of the video recording, it will be sent to him by e-mail or will be given remote access to the video

1.4   Thesis structure

- **Chapter 2. Background information**

  This chapter contains basic information about trends and needs for video lecture materials. It also describes various possible scenarios for video and the necessary equipment for video studios.

- **Chapter 3. Related works**

  This chapter describes the different automated studios that have been implemented in different universities in different countries.

- **Chapter 4. Realization of OBS**

  This chapter contains basic information about the functions and implementation of OBS. Various software and hardware are considered in order to realize the studio. The architecture and requirements for OBS are also described.

- **Chapter 5. Conclusion**

  In this final chapter, the results of the studio's implementation possibilities are reviewed. At the end, possible options for the further development of the studio are considered.

Chapter 2

Background information

2.1 World trends for video-lectures

In the modern world, where one can find an answer to almost any question on the Internet, not only entertainment but also educational material has become actively popularized. The popularity of online learning is growing exponentially. Over the past year, most universities and schools have switched exclusively to online education and faced new difficulties.[2]

Companies arrange online training for employees, and pupils get to know the world through the Internet. Now universities and educational courses compete on the level of quality of online material. Video lectures are an important learning element. They help students to recall lectures, refresh knowledge and review important sections of the lecture material.[3] An interesting presentation of the material guarantees the successful assimilation of information.

Now one of the most popular online educational platforms has become the Coursera, where people can choose different training courses, get full support from curators and other students, but most importantly, they can watch video lectures at any time convenient for them.[4] The Coursera has gained popularity not only because of the large number of educational areas but also because of the quality material presented on it.[5]

Coursera began to match the style of video lectures. Most often, lectures look so that the lecturer is in the center or in the lower corner, and his presentation is in the background, while he freely and easily tells his material. At the same time, the style of the video lecture is always the same throughout the course - the same background, camera position, light, and format of the lecture itself.

2.2 World trends for One Button Studio

In 2012, a fully automated studio, One Button Studio, opened at the University of Pennsylvania. It was something completely new. After that, many universities thought that this studio is worth attention. In just one year, the studio was used 4500 times.[6] Many universities have started to open their automated studios on the basis of universities. The University of Pennsylvania contributed to this, as it made public instructions for developing the studio and the materials needed for this.

In addition, in 2012, OBS Studio Contributors released a free video recording software[7]. Thus, it made it possible to simultaneously record the screen and video from the computer camera. Unfortunately, the program itself has become not entirely easy to use for every user, also ordinary user cameras do not provide an opportunity to record a high-quality picture, and the background could only spoil it.

Despite the existence of the OBS Studio program, it becomes necessary to create full-fledged simple studios for recording video material. Such studios are often opened on the basis of universities. Universities such as The Pennsylvania State University, University of Iowa, Drury University, Helena College, Northwestern University, University of Nebraska, and many others have already opened studios to quickly record video lectures. These studios usually have one common name - One Button Studio

2.3 Video lecture scenarios

Video lectures can follow several scenarios. The teacher chooses the scenario that best suits the lecture material. This is especially true if the lecture is held online or recorded on video. For video lectures, there are many scenarios of how it can take place and how different objects will be located in the video. It is possible to distinguish several different scenarios that are popularly used.
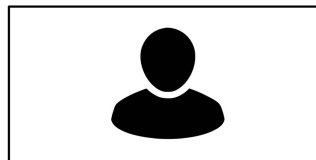
FIGURE 2.1: Video scenarios - Only teacher on video

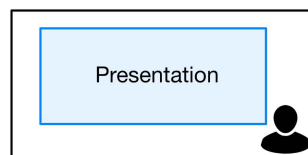FIGURE 2.2: Video scenarios - Only presentation on video

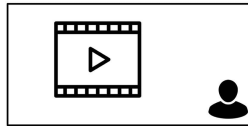FIGURE 2.3: Video scenarios - Teacher and presentation on video

FIGURE 2.4: Video scenarios - Teacher and other material on video

1. Teacher only

   Sometimes for lectures it does not needed anything other than the teacher himself. The teacher can lead a lecture without additional text and visual materials. In this case, the teacher should be located in the center of the video as show on image above 2.1. These videos are more suitable for short informational ads.

2. Presentation only Some lectures do not require a video with the lecturer himself. In this case, his voice and presentation are needed. The teacher tell the material, accompanying it with visual content. In this case, the presentation will be located in the center of the video itself as show on figure 2.2.

3. Teacher and presentation

   A popular script for video lectures is combining presentation and video with a teacher. Thus, most of the video will be occupied by the presentation, and the video with the teacher can be located in the corner so as not to obscure the lecture material itself. The scheme of such video presented on figure 2.3.

4. The teacher and his other material

   Lessons do not always consist of presentations. Sometimes it is necessary to show a video or view a website, it may be necessary to write program code. In this case, user can connect custom material. It will be located in the center and the instructor on the side. Simple scheme is on image 2.4

5. Connecting different scenarios

   To create an engaging lecture, it may needed to tie multiple scripts together. In this case, the video becomes more interesting to watch and can display different material. It is possible to mix four different scenarios that have already described above.

2.4   The necessary inventory for video studios

To implement the One button studio,it is necessary enough equipment that would be in the studio itself. In fact, One Button Studio is the same studio as a regular video studio.

First of all, camera is needed. It is possible get by with one camera - the central one. This camera will perform the main function - video recording. If it needed to expand the studio's functionality, it can be put several video cameras for recording video from different angles. But this may entail additional system requirements. Stitching footage from different cameras can also consume additional time and system resources.

The second most important subject in video studios is light. The quality of the picture itself in the frame depends on the quality and correct light. It can be small softboxes or studio light needed for the video capture area.

For a good picture, a background is needed. It can be an ordinary white background or a special background on which a presentation or any necessary material can be displayed at will.

An equally important element is the microphone. Such a small detail, but a well-chosen microphone, can improve video quality.

In this studio, something is needed to connect them, to carry out all the organizational moments - to launch cameras, light, and save the recorded lectures. This requires a computer which will be the main assistant in working with the studio. Summing up, the minimum required for One Button Studio is a camera, light, microphone, and a computer. It is possible to locate such a studio anywhere, the main thing is to be able to arrange everything needed in this room.

Chapter 3

Related Works

3.1 OBS in Pennsylvania State University

3.1.1 History of creation

Between 2009 and 2011, Pure Digital Technologies produced pocket cameras that were easy to use. The Pennsylvania State University has acquired several of these cameras. As it turned out, they were in great demand among students and teachers.

The video quality from these cameras was not that good. The projects that the students did were interesting, but due to the quality of the video about the projects, it was sometimes hard to hear the students themselves. The background noises, background, and picture quality of the video interfered when watched it. For the heads of the technical department of the university, this became significant and they thought about creating a video studio that could shoot high-quality video, and where it would be possible to control the studio environment.[8]

3.1.2 Studio description

In 2012, the University of Pennsylvania opened a video recording studio where students, teacher, and staff could record quality videos. In 2013, the team introduced free software for Mac computers, which allows other libraries and the university to create their own personal OBS.[6]

In the summer of 2013, the American Library Association recognized OBS by the University of Pennsylvania as a "Cutting Edge Technology" trend [9]. After that, automated video studios began to open more and more often and not only in universities.

The university describes the studio itself as a studio that doesn't need previous production experience and help to create a video with high quality. The user just have to insert USB in USB hub in the studio.[10]

Traditional Model	One Button Studio
Reserve/ Visit studio space	Reserve/ Visit studio space
Set up Lights, Microphone and Camera	Record Video
Record Video	Present or publish
Capture Recording	—
Review Video	—
Compress and save video	—
Present or publish	—

TABLE 3.1: Expected Time investment based on The University of Pennsylvania

In table 3.1 depict the path of shooting video recordings in the "Traditional model", that is in usually a video studio and describes the way of using "One Button Studio". In the "Traditional Model", it possible to see that the video recording process consists of 7 steps.[10] Some points require additional knowledge from the field. For example, "Set up Lights, Mic and Camera" requires the user to know how to set up a light, camera, and microphone.

With the absence of this knowledge, the user simply will not be able to use a conventional video studio and, accordingly, will not be able to record video. Whereas the way of using One button Studio is three steps. In OBS stages such as setting up the light, camera, microphone and then editing the video itself disappear. The table above demonstrates that the new OBS provides an opportunity to save not only time, but also energy, and the process of recording video becomes so simple that every adult can handle it.

3.1.3 Studio functionality

- **Studio booking**

  To get into the One button studio at the University of Pennsylvania, user need to fill out the form about project presented on the website of the university itself for the One Button Studio. Basic information must be entered - first name, last name, phone number, email and user role.The screenshot from its request form showed on figure 3.1[11]

  Access to OBS at the University of Pennsylvania is only available to students, teachers, and university staff. This makes OBS is accessible for a limited number of users, which makes it possible to free up work time exclusively for the selected audience.

  Then the user is given the choice of the recording location - in person or through Zoom. Due to the pandemic that started in 2020 [12], the University of Pennsylvania has created the ability to record video footage removed via Zoom. After choosing the recording location, user must select the category of the project for which the video will be made. There are the following options to choose from - Video and Audio, Design, Prototyping, Immersive and other. It also depends on which elements of the studio itself will be involved in the process. This step helps the system prepare in advance for use. An optional field is used to fill in the description of the project. It is possible to choose the number of people in the video who will participate in it. Users can specify for which class the video is being made and for which instructor.

FIGURE 3.1: Screenshot of Appointment Request Form for OBS in The Pennsylvania State University from its website

The main part is behind. The user needs to specify the desired time and date of recording. An additional, alternative date for the entry is also requested. In the end, the user can indicate wishes for his appointment or ask for additional accessories required for shooting.

The application itself is considered within 12 hours by studio manager. If the user has a question or difficulty, the using instructions are described in detail on the site and it is also possible to apply for a consultation, which takes place online in Zoom.

- **Setup In Studio**

  After booking and confirming the booking of the studio, the user just need to come and insert the flash drive into the USB hub, enter the system and click the "Start recording" button. After the end of the recording, it must be pressed the "End recording" button and the video will be saved to the USB flash drive.

- **Setup In Zoom**

  The University of Pennsylvania created the One button studio extension so that it can be used from home, namely with the help of Zoom[13]. This new product was named "One button studio at home". With the help of Zoom, it became possible to create video without leaving home. The University of Pennsylvania website has guidelines on how to make user's video better. Users are advised to create three points of light, remove extraneous noise as much as possible, sit or stand in the middle of the frame and have a neutral, non-distracting background behind. In order to use Zoom as OBS, the user need to go to the website where he should enter his Penn State user ID and password. Then user can press the start button. It is very difficult to achieve the same picture at home as in the OBS, but this expansion and recommendations provide another opportunity to shoot footage remotely from the studio.

3.1.4 Equipment

To create a studio based on a prototype from the University of Pennsylvania, it is needed to collect a minimum set of equipment and download several applications.[14] For the studio will be needed:

1. Mac Computer and download "One button studio" Application

2. Black Magic h.264 Pro Recorder

3. Video Camera

4. USB Thumb Drive

Additionally, there may be necessary a professional light for videos that need to be connected to a computer. If it becomes obligatory to record presentations during video lectures, the list of equipment will expand with a TV. The configuration can expand, it all depends on the need of the studio itself and the new technologies that come out.

3.1.5 Guides and application for OBS creation

The team that worked on One Button Studio at the University of Pennsylvania released a description of how to work with their One Button Studio application for the macOS [14]. They also shared a guide for creating and purchasing the necessary equipment. This file contains approximate prices for each studio item.[15] In this way creating One Button Studio becomes so simple that it needed to purchase equipment from the list, install the program, and only connect everything together.

3.2 OBS in University of Nebraska-Lincoln

3.2.1 History of creation

The team of the University of Nebraska-Lincoln in the United States of America, referring to the technology developed by the University of Pennsylvania, developed a studio for recording video - UNL One Button Studio.

The University of Pennsylvania was their main inspiration for this change. In an article on its website, the University of Nebraska-Lincoln says their typical professional in-house video studio was used approximately 80 times a year, while the new OBS produced over 4,000 videos in one year [16]. These numbers indicate several factors that there is a demand among students, teachers and university staff for recording various video materials, and it is also worth noting that OBS has opened the opportunity for everyone to use the studio without additional effort and knowledge.

3.2.2 Studio functionality

In order to start using it in the studio, user need to make a reservation for the studio, come to it and authorized in the system inside. Press the button for recording video and after finishing press the button "stop recording" again.

- **Make an appointment**

  In order to use the studio itself, it is necessary book it in advance. To do this, user need to log in to the system on the website using the university mail

and indicate the necessary information on the project and the desired date of recording.[17]

- **Set up in studio**

  The University of Nebraska-Lincoln has a very detailed instruction, which explains the use of the studio itself with visual elements [18].

  When the user comes to the studio he will need to download the Vidgrid mobile application to phone. In this application, it is needed to log in using the university email. As soon as the user logs into the Vidgrid system, he will be presented with several scenarios for taking a video. These scripts offer multiple locations for the presentation and for the user to choose from. It is also possible to choose the location of the camera for shooting. It can be filmed from multiple sides or with one central camera. If necessary, user can align the location of the camera in the application itself using the remote control located on the screen.

  After logging into the system, selecting a scenario and setting up the camera, the "Start" button appears, which on press starts the work of all elements of the studio - light, camera, microphone. After the recording is finished, in the Vidgrid application itself, user must click the "Stop" button and the recording will be stopped. The video will be automatically saved to the Vidgrid account, where the user can later view it. It is advised to watch the video before logging off the system itself.

3.3 OBRS in University of Cologne

3.3.1 Studio description

The University of Cologne, which is located in Germany also has a studio for quick and easy video recording. This studio is called One Button Recording Studio, abbreviated as OBRS. This studio was designed in cooperation between the Medien network, UzK data center and ZHD. This studio follows the main idea of One button Studio, but is done a little differently than the previously reviewed studios. [24]

3.3.2 Studio functionality

In order to use the studio, it is necessary to log into the system on the website and make a reservation for the studio, indicating the description of the project and the desired date for using OBRS [19]. If the user also wants to record a presentation or other visual material and at the same time output the presentation from his computer, then it is worth checking the HDMI output on his laptop. If not, then when booking it is worth requesting an adapter as an additional accessory.

When the user visits the studio, he needs to log in (check) on the tablet and go through a short survey about the desired scenario of the recorded video material. The studio has the ability to record regular short lecture videos. They can be expanded with a presentation. It is also possible to shoot interviews, various discussions and just conversational videos.

After the main settings have been finished, the user can sit at the table and if it is necessary connect a computer or tablet to display information on the TV. There is also a tablet with a Start and Stop button. This button starts and stops video

recording. If it is necessary, the user can adjust the level of the camera and other elements.

The saved video after shooting can be found remotely in the OBRS system. This video can be viewed or shared.

3.4 Comparison of similarities and differences of described studios

This section looked at three different studios at three different universities in two different countries. Each studio has its own unique characteristics that make it different from every other studio. But it is also worth noting that they had much in common. These studios perform the same function in themselves and have mostly the same logic.

3.4.1 Similar elements in the reviewed studios

Since the studios have the same functionality, there is maximum similarity in the key moments of the studio, which preserve its main idea.

- Registration page and studio booking

  Before using OBS it is important to book it. Without this, it will be impossible to log in and start the studio, in the future and save the captured video. The moment of booking carries not only a technical role, but also a managerial one. This stage helps to make sure that everyone can use the studio and there are no disagreements or queues to use it.

- Authorization in the studio itself

  About coming to the studio itself at the appointed time, the user needs to log into the studio system to use it. At this stage, preparation of all elements of the studio begins. This step is necessary in order to set up the background and it is possible to connect custom material, set up the camera, microphone and light. This stage, in addition to logging into the studio, helps to make the video the way the user needs it.

- Start and stop button

  The studio is called "One button studio". The name itself says that the studio has one button. The main studio button is the start and stop button. It is this button that launches the entire technical base - camera, light, microphone, TV monitors and, if necessary, other devices.

  This button can have a physical appearance, like at the University of Pennsylvania, or on a tablet, like at the University of Cologne.

- Save video One of the most important step in the entire studio is saving the video, and the ability to share with it. This stage can be performed virtually, when user have remote access to recorded video, or conventionally physically - the video can be saved to a USB flash drive.

3.4.2 Differences in the reviewed studios

Each university tries to add a touch of its own features. Someone comes up with the idea of adding interactive whiteboards, or creating additional applications for studios, or transferring the studio to the online format. This is the advantage of such studios, they make it possible to create a studio that is exactly what their university needs.

- University of Pennsylvania - OBS at Zoom

  About a year ago, the University of Pennsylvania created the ability to remotely record video. Unfortunately, it is impossible for each user to remotely give access to the technical base of the studio, but the university can give the opportunity to use applications for recording video material remotely. This was done at Zoom. The user needs to log in and download the application. In the future, he will only need to press one button "start recording" and the program will connect to the camera (if there is one) and start recording video and, if necessary, a presentation.

- University of Pennsylvania - Light Board integration [22]

  The ability to use the light board has also been launched in test mode. On this whiteboard, the user can write while recording the video and all information will be transferred to the video itself, as if the user was writing on a whiteboard in the audience. This gave an added advantage. Therefore, video lectures can become more lively and understandable for viewing.

- University of Nebraska-Lincoln - Vidgrid

  At the University of Pennsylvania, all user interaction takes place through the site or or directly physically in the studio. The University of Nebraska-Lincoln went further and created the ability to have their own account to use their OBS. Thus, the user needs to interact with the studio from his phone and account in the "Vidgrid" application.

- University of Nebraska-Lincoln and University of Cologne - remoteness

  To receive the material after the end of filming at the University of Pennsylvania, it will need to be downloaded to a USB flash drive. Today it is not so often that people carry flash drives with them, unfortunately. The University of Cologne and also the University of Nebraska made it possible to access files remotely. At the end of the recording, there is no need to download the material to a USB flash drive, user just need to log into the account on the relevant sites.

- University of Cologne - Design Studio

  A small but noticeable advantage of the studio in Cologne is the design. The restrained and simple design will immediately become one of the recognizable in video materials. When someone later watches the video filmed in OBS at the University of Cologne, it will be possible to recognize the university itself only by the design of their video and video studio. This distinctive feature makes the university recognizable.

Chapter 4

Realization of OBS

4.1   System requirements of OBS

4.1.1   Functional requirements

- **Register user request**

  Each user who has access should be able to register an application for using the studio without any problems. The system must accept and store the first name, last name, a brief description of the user (student / teacher / employee, etc.), the number of video lectures to record, and personal mail. Also, the user needs to select a free time period when it is possible to use the studio.

- **User authorization**

  When a user visits the studio at a specified time, he must log in to the system via a tablet or computer in the studio, where he must indicate his mail and, if necessary, a unique access code to the studio system. Select the required type of video for recording.

- **Video recording**

  When the user is logged in studio system, he only needs to press the "Start Recording" button. At this moment, the camera and microphone should start working. As soon as the user wants to finish recording, he needs to click the "Stop" button.

- **Viewing video material immediately after recording**

  After the user has finished filming the video, he should be able to review the video itself on a tablet or computer.

- **Deleting Recorded Video**

  User can delete just captured video and overwrite it.

- **Saving video** After the end of all filming, the user will receive the saved video lectures using the selected video saving method.

4.1.2   Non-Functional requirements

The non-functional requirements of One Button Studio include reliability, speed and clarity in use.

- **Reliability**

  When a user books a studio, enters his personal data or shoots a video, it is important that all the data is in a safe place. If we talk about video, it is important

that the video is saved in the specified location and does not disappear in the process.The studio consists of many Software and Hardware elements.

The correctness of the studio's work is possible if each element of the system works correctly. If one element fails, the entire system fails too. That is why all parts of the system require careful attention.

- **Speed**

  Major advantage of One button Studio is its speed. Almost immediately after shooting a video, there should be an opportunity to share it. Thus, it is important to ensure the speed of operation of all elements.

- **Comprehensibility**

  Another advantage of OBS is its ease of use. As a result, it is important to ensure the ease of use and clarity of the elements with which the user will interact. The completeness of the instructions for each step can simplify the work of studio consultants and be useful to the users themselves.

4.2   OBS architecture

In total, the process of using One button Studio consists of 4 stages, which go gradually one after the other - OBS booking, Authorization in studio, Video recording and Saving. The main idea of each step is showed in picture 4.1.
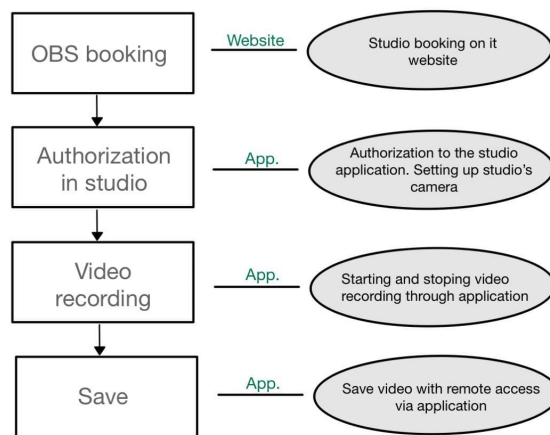

FIGURE 4.1: OBS stage description

Booking a studio is the initial stages. For booking, it is necessary to create or expand the existing website for the studio in the form of a questionnaire, where users can enter all personal data, information about the project and where to indicate the desired time of visiting the studio.

This website is not directly related to the studio itself, but is necessary in order for the studio manager to correctly draw up the studio's work schedule and have a general idea of who and for what the studio will be used . The information is also saved for the next stage of authorization in the studio.

For authorization in the studio itself, it is also needed a website or an application. In the studio there is a computer through which it is possible to enter the system

through university mail. If an application is available, the authorization step can be performed using a tablet, rather than a computer. From the stage of booking the studio, information on the project will be transferred. This step is also required to set up the studio itself and select a video script.

To record from video, the user only needs to press a button. The button can be located on the tablet screen, which will be on the table. In this case, it is needed an application to start recording video. Therefore, it is rational to combine the application for authorization and for the button to start recording.

The video saving step does not require user interaction. Here it is necessary for the program to save the video on a remote server to store the recorded videos or send it by e-mail to the user.

4.3 Necessary technology for realization video recording in studio

The main heart of the studio is the computer to which all the elements are connected and controlled, and records the user's screen if necessary. An additional program should help in order to simultaneously record video from the camera, video from the user's screen and audio recording from the microphone.

4.3.1 Application " One button studio" by Penn State university

Previously reviewed by a video recording studio at the University of Pennsylvania. The university has developed an instruction to implement a studio like theirs [14].

In addition to the instructions for creating such a studio, the University of Pennsylvania has laid out a list of inventory that they advise to use for implementation. Also in this recommendation file, they provided the approximate cost of each element, which gives those who wish to get acquainted with the approximate amount that will be needed for implementation

In addition, they have their own program, which makes it possible to implement an automated studio without developing additional software. Unfortunately, this program is available only for computers with the Mac OS operating system, which is why to use it will needed to put a computer with this operating system in the studio. Anyone with the required operating system can download this application [20]

In its manual, the University of Pennsylvania lists the minimum things required to run their One Button Studio application. There are 4 elements in this instruction -

1. Mac computer and install One button studio with AppStore[20]

2. Black Magic h.264 Pro Recorder

3. Video Camera

4. USB Thumb Drive

It is worth noting that this listing does not include light and microphone. In their instruction file, they provide this list as the minimum necessary things to run the application. For the studio itself, both light and a microphone will still be needed, but for the application it is not necessary.

Before user start using the application, it is recommended to complete two simple steps on computer so that the "One button Studio" application from the University of Pennsylvania can work correctly in the studio itself:

1. Disable sleep mode

2. Set up daily computer reboots in the settings outside the studio's working hours.

   In additional, before user can start using the program, it is required to download three additional applications. They are necessary in order to work correctly with the above 4 necessary elements to launch the One button studio program.

1. Install black magic software

2. Install and configure Indigo 5

3. Install and configure Griffin Powermate software

   After installing and connecting all the necessary software and hardware, user can run and make the first test videos in the "One button studio" program from the University of Pennsylvania.

4.3.2   Application "Open Broadcaster Studio"

There is already a ready-made application that allows everyone to record video simultaneously from several sources - "Open Broadcaster Studio"[7]. It is free and open source and is available for three operating systems - Linux, Windows and MacOS. Everyone can also download the code from the project's GitHub[21] and, if necessary, expand, improve, or, on the contrary, narrow the application itself. Unlike "One button studio" for Open Broadcaster studio, there is no need to download additional software to run the application itself. There are other difficulties with this application, it is needed to connect everything manually. After downloading and launching the program for the first time, the main interface of the program will be visible.
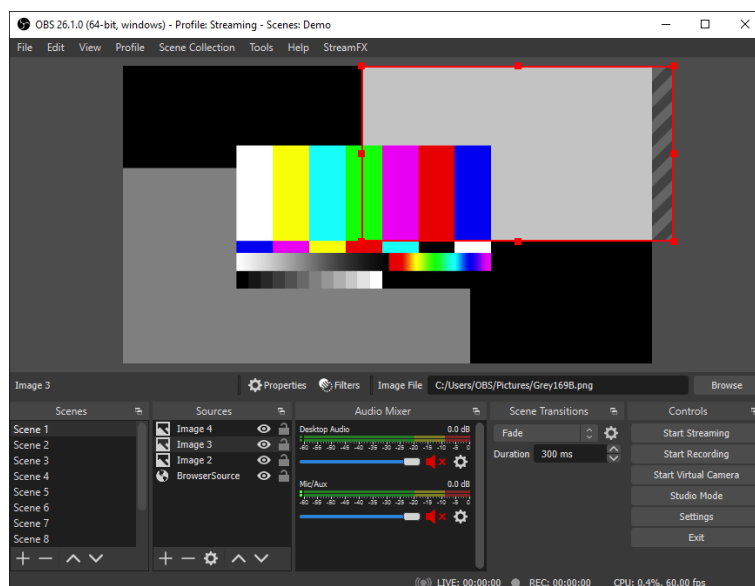

FIGURE 4.2: Main Screen example of Open Broadcaster Studio from its official website

Above is the video itself, and in the bottom line of the program there is conditionally 5 menus for the settings of the video itself as showed in picture 4.2.

In Open Broadcaster studio, it is needed to independently connect and configure all possible video scenarios. After that, it should be configured all sources. This means that user need to choose where to record the video. If the video is recorded from the camera and from the screen, then it is necessary to select the video input from the camera in the "Source" menu in the application itself, and capture the screen in a specific window or the entire desktop on the computer. It is also possible to adjust the sound in the "Audio Mixer" menu, it is important to select the audio input from the microphone connected to the computer in the settings.

After all the settings, it remains to click the "Start Recording" button in the "Controls" menu and the video will start recording.

One of the functions and uses of the "Open Broadcaster Studio" application is to broadcast videos to websites such as Youtube, Twitch and others. Therefore, user can configure the application so that the video is broadcasted immediately to the desired location.

4.4 Realization of OBS at university

4.4.1 Hardware

One of the important steps for creating One Button Studio is organizing and automating hardware.

There should be a lot of items in the studio. An example of the arrangement of objects in the studio is shown in Figure 4.3. This example was compiled according to the recommendations of the previously reviewed OBS.

The dimensions of the room itself can be very different. All elements should be located so that they are easy to connect, while saving space as much as possible. In the studio itself, it is necessary to place:
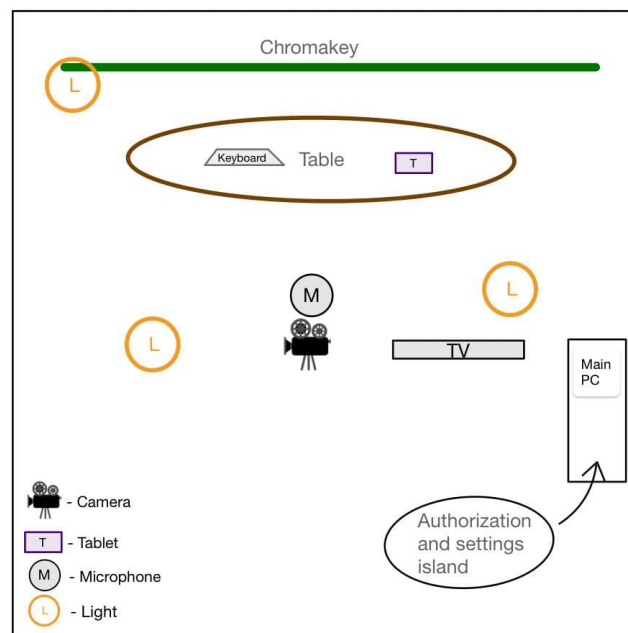

FIGURE 4.3: Studio layout

- **Main computer**

  The main computer is the glue for all things in the studio. It connects with all the elements that need to be controlled. Thus, he is the part that automates everything together. In the studio, it should be located away from all other elements so as not to interfere with the shooting process

- **Chroma key background**

  When installing the equipment, it should be immediately selected the place where the background for video recording will be located. This background is needed to connect multiple videos in one. For example, a user will stand near the background, record material, and then it will be possible to add additional video to this background while editing it. For OBS, a chroma key is required for overlaying presentations or custom material in the background.

- **Table for filming**

  After the Chroma key backgorund has been located, it is important to centrally position the place where the user will stand or sit with respect to the background when shooting. An ordinary small table is best, where user can place everything needed.

- **Tablet**

  The tablet can do many things in OBS. It may contain several applications that will perform the function of authorization, video script settings, video viewing, camera settings, launch the camera and microphone, and other functions. In this case, the tablet must be placed on the table and connected to the host computer. It is possible to connect via Wi-fi, Bluetooth or USB, in order to synchronize the work of the tablet applications and the main computer.

- **TV for displaying user materials**

  When a user shoots a video and at the same time uses his video material, it is also important for him to see what he is broadcasting on the video. That is why a screen or TV should be placed in studio. It will show what is being broadcast and filmed. For example, a user can connect via HDMI to a TV and send a presentation there. While the TV will be connected to the computer to read the displayed presentation. The computer needs this in order to be able to record a video with the user's presentation. In the studio itself, the TV can be placed to the side of the camera.

- **Computer mouse or keyboard**

  Some kind of tool is needed to manage the materials on the TV. It can be a keyboard or a mouse. The keyboard provides more control and input options, but the computer mouse will be more compact. If space allows, then it is better to arrange for convenience two elements - a mouse and a keyboard. To reduce the number of wires, it can be chosen such equipment that works by Bluetooth. It is also possible for the user to enable the control of the material on the TV screen from his device.

- **Camera**

  The camera is one of the main elements in OBS. It is impossible to create a studio without a camera. It is necessary for shooting the user. The camera itself

must be connected via HDMI or USB wire to the host computer. The connection type depends on the camera model itself. In relation to other elements of the studio, the camera should be centered in relation to the place where the user should stand or sit.

- **Microphone**

  Without a microphone, it will be impossible to record sound in the studio. There are several options for connecting a microphone. The microphone can be connected to the camera itself or directly connected to the computer. The second option is better, since it is possible to configure the microphone through a computer and get high-quality sound from it. While from the camera it is much more difficult to control the microphone settings.

  The sound quality that the user will receive at the end of the video depends on the location of the microphone. It is important to position the microphone so that it does not come into contact with other elements of the studio, as background noise will be heard. Studios attach it to the ceiling or above the camera.

- **Three studio lights**

  All the studios reviewed in Chapter 3 use three light sources for video. One lamp should be located at the back of the user. The second lamp is best placed near the camera. This lamp serves as the main light. The third lamp should be positioned slightly to the side of the camera, thus providing a side light. The lights can be turned on and off either automatically through the software on the computer or manually through the switch in the studio. For the first option, it may requested an additional light controller and the use of additional software that will control the light. This option is more difficult to implement, but it may be better for the user, since he does not need to think about light. The second option is simpler and more straightforward, but will require user interaction.
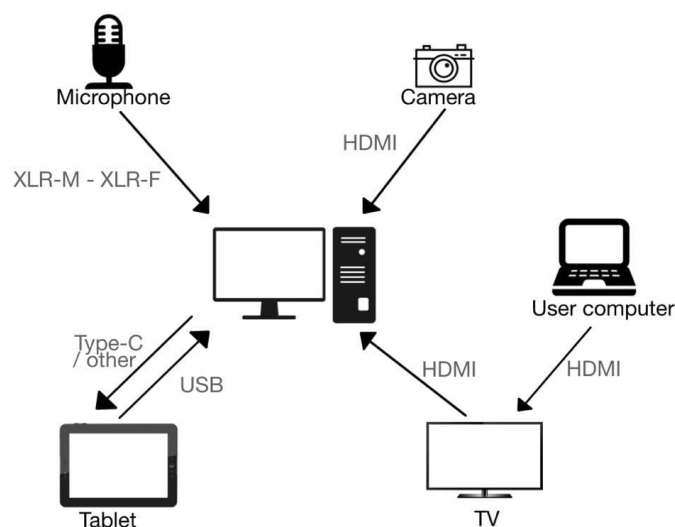
FIGURE 4.4: Elements connections

Figure 4.4 shows an example of how all the elements communicate with the host computer. That is why the main guiding element of the studio is the computer. For it, it will be required to write various scripts and install the necessary programs to work with the studio's apartment elements

4.4.2   Software

In the development of a studio, Software can be conditionally divided into two categories - managerial Software and Studio Software

- Managing software

  There is a need to create a website for the user to book OBS. Only students, teachers, university employees and other users who can use the studio should be able to log in to this site. This website should have a questionnaire with personal and project questions and text boxes for answers. This information should be stored in one remote location where the studio manager can view it and respond to reservations. In the future, this information can be used in the studio itself during authorization.

  Also, the website must have a studio administrator account. In this personal account, the administrator can see all studio bookings and manage them - confirm or reject. The example of such web-site realization demonstrated on Video 1

- Studio software (automated using of all elements)

  In the studio itself, there must be an application that performs the functions of authorization, start and end recording of video material and at the end save it in the required place. There is a need to implement an application that will do all of this. It can be a mobile or a computer application. This application must authorize the user by e-mail or unique password, receive information about project from a remote server.

  Next, it is required to conduct a survey with the user about which video scenario if it has not been done before when user booked studio. In this case, the application must have access to a program that records from the camera and, if necessary, records the screen with user-generated material.

  After all settings, a button for starting video recording should appear on the screen. When button pressed, a script should be launched that starts recording video material with the selected script for video. When the user stops recording, the application should exit the script and stop application that record video and audio.

  In the end, the user should be able to view the captured video and, if necessary, reshoot it. This means that the captured video should appear in the application with the ability to film it one more time. If the user chooses to delete and reshoot option, there should be restarted the video recording script according to the selected scenario. If the video suits the user and he clicks the "Save" button, then the video should be saved in the selected location. It can be sent by mail or stored in a remote location and give the user access.

  The end of the user's work with the studio is to exit from application.

  Authorization app and video recording app can be split into two apps or combined in one. In this case, everything depends on the requirements of the studio.

Chapter 5

Conclusion

In this paper, the idea of an automated studio for creating video material was considered. In the modern world, when most of the educational processes have become remote and online, there is a great demand for the creation of video materials from teachers and students. Video has become a new form of communication. Therefore, it is important to create not only high-quality video material, but also create it quickly.

One Button Studio can not only create videos quickly and with high quality, but also no additional skills are required to interact with the studio. The demand for such an automated studio can be estimated from an excerpt from the description on the University of Nebraska-Lincoln website, where they say that their old video studio was visited only 80 times a year, when OBS opened, 4,000 videos were made in it in the first year.

After recording a video in OBS, user can immediately share it, which makes it possible to no longer worry about editing it. An imperceptible advantage of such a studio is that most of the videos made in it will have the same style. This is used at the University of Cologne, where the style of their video immediately makes it clear to the viewer that he is watching video material from this particular university.

An automated studio at a university can become a sought-after place and a distinctive feature among other universities in the country. This paper also considered that several universities were creating their own guidelines for the creation of OBS. There are even ready-made application that immediately automate all the elements, but these programs are unsuitable for expansion, or if it used a different technical base, the programs may not support them.

In the end, It is necessary to note that each studio requires a separate approach. Although the studios generally have a common idea and functionality, when requirements and technical base change, additional attention may be required for all automation. But the creation of a studio opens up opportunities for the creation of various materials for teachers, students and for university at all.

5.1   Further work

- **Podcast studio**

  On the basis of the developed One Button Studio, it is possible to implement Podcast Studio, for audio recording of interviews, podcasts or just audio lectures. To do this, it will be necessary to additionally configure the studio and software, since the main hardware elements are in the studio.

- **Broadcasting video to various Internet resources**

  With additional setup of the studio, it is possible to expand its functionality, making it so that the video is broadcast to various Internet resources, such as

Youtube or Facebook. This expansion of the studio will make it possible to conduct online open lectures for a larger audience.

- **Light board**

  The functionality of the studio itself can be expanded by adding a Light Board. This looks like a usual board on which the lecturer can write notes or explain the material in writing, and all his notes will be recorded as video material.

Chapter 6

Bibliography

[1] "Learning Management Systems: An Overview" Darren Turnbull, Ritesh Chugh(Engineering and Technology, Central Queensland University, Melbourne, VIC, Australia) and Jo LucK (School of Engineering and Technology, Central Queensland University, Rockhampton, QLD, Australia, School of) - (page 2-3)

[2] - "Online Learning and Emergency Remote Teaching: Opportunities and Challenges inEmergency Situations" Fernando Ferri, Patrizia Grifoni and Tiziana Guzzo - paper link , 13 November 2020

[3] - "Using Video Lectures to Make Teaching More Interactive" - M. Ronchetti Universita di Trento, Trento, Italy - doi:10.3991/ijet.v5i2.1156 , June 2010

[4] - Coursera review - https://upskillwise.com/reviews/coursera/

[5] - "Online Learning.How to Increase Engagement, Satisfaction, Skill Development, and Career Impact Worldwide", Alan Hickey, Alexandra Urban, Eric Karsten

[6] - "Penn State's One Button Studios Now Used 4,500 Times Per Year" ,Matt Enis, 7 August 2014 -
http://www.thedigitalshift.com/2014/08/hardware-2/penn-states-one-button-studios-now-used-4500-times-per-year/

[7] - Open broadcaster studio -
https://obsproject.com

[8] - "Penn State's One Button Studios Now Used 4,500 Times Per Year". URL:
http://www.thedigitalshift.com/2014/08/hardware-2/penn-states-one-button-studios-now-used-4500-times-per-year/

[9] - "Four local libraries honored for offering cutting-edge services".URL:
http://www.ala.org/news/press-releases/2014/02/four-local-libraries-honored-offering-cutting-edge-services

[10] - "The Pennsylvania State University One button studio". URL:
https://onebutton.psu.edu

[11] - "The Pennsylvania State University One button studio. Consultation Appointment Request". URL:
https://mediacommons.psu.edu/appointment-request-form/

[12] - "Rolling updates on coronavirus disease".URL:
https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen

[13] - "One button studio at home". URL:
https://mediacommons.psu.edu/one-button-studio-at-home/

[14] - "One Button Studio Setup Guide". URL: OBS Setup Guide link

[15] - "One Button Studio Equipment Guide". URL: OBS Equipment Guide link

[16] - "One Button Studio offers easy video production". URL:
https://news.unl.edu/newsrooms/unltoday/article/one-button-studio-offers-easy-video-production/

[17] - "the University of Nebraska Space Reservations and Events page". URL:

https://unlscheduling.nebraska.edu

[18] - "OBS 2020". URL: OBS 2020 Guide by The Nebraska University

[19] - "Willkommen bei Netzwerk Medien". URL:

https://netzwerkmedien.simren.de/users/sign$_i$$nLinktowebsite$

[20] - "One Button Studio application in AppStore". URL:

https://apps.apple.com/us/app/one-button-studio/id735337684?mt=12

[21] - "Open broadcaster studio". URL:

https://github.com/obsproject/obs-studio

[22] - Light board idea in The Pennsylvania State University. URL:

https://mediacommons.psu.edu/faculty/using-your-one-button-studio/

[23] - "One Button Recording Studio" - URL:

https://www.hf.uni-koeln.de/40040

[24] - OBRS - One Button Recording Studio - URL:

https://www.hf.uni-koeln.de/40040?lang=2