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Studio Production and Directing

Chroma Key

Vladimir Maksimovic

University of Mitrovica (UPKM)

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Introduction

•The chroma key technique is based on replacing one color in the image with another image or video.

•The green or blue background is most often used because they are furthest from the skin color.

•The camera captures the subject in front of a monochrome canvas.

•The software or keyer removes the defined color and replaces it with another image.

•In this way, the subject is "inserted" into the virtual scenery.

•The process takes place in real time for TV production.

•Chroma key is the basis for the development of virtual studies.

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Choice of color in chrome technique

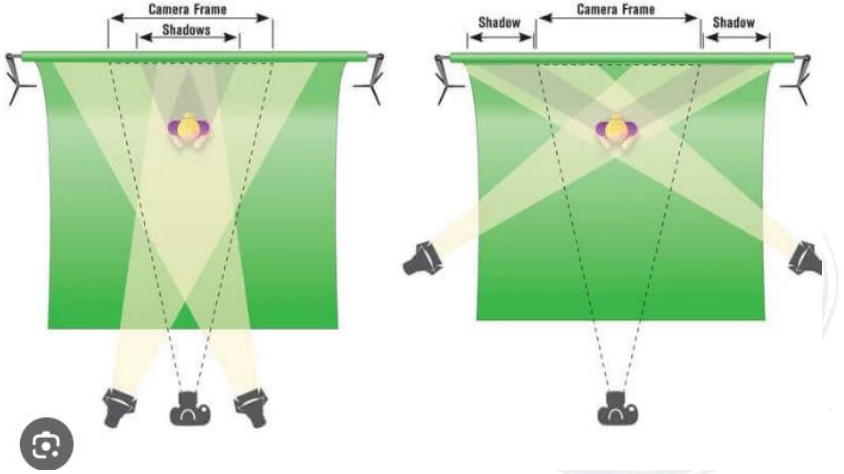
- Green is the most commonly used color in digital systems today.
- Blue was used earlier in film production and analogue TV systems.
- The reason for the choice of color is that it rarely occurs on human skin and clothing.
- Green has a higher luminance and less noise in digital cameras.
- Blue is used when the scene has green elements (e.g. plants, sports).
- There are also experiments with magenta and black background.
- Choosing the right color reduces keying errors.

Advantages of the Chroma key technique

- It allows shooting without physical scenery.
- Producers save time and costs of making decorations.
- Scenery can be changed in real time.
- One studio can be used for different shows.
- Accelerates post-production and material processing.
- Flexible application in film, TV and video production.
- It increases the creative possibilities of directors and set designers.

Limitations of Chroma key technique

- Even and bright backlighting is required.
- Shadows on the canvas cause problems with keying.
- Reflections of green on clothes can “pierce” through the scene.
- Camera movement can lead to an unnatural fusion of subject and background.
- Hair and transparent objects are difficult to accurately key.
- High resolution and signal quality are required.
- In dynamic scenes, the limits of keying are obvious.



Virtual studio in news shows

- It is mostly used in news production.
- Virtual scenery allows for a variable visual identity.
- Graphics and statistics are easily integrated into the background.
- Allows you to view maps, tables and infographics.
- A virtual studio can simulate large spaces.
- Quick adaptation to the emission format.
- Greater impact on viewer perception.

Virtual studio in sports shows

- Virtual scenery is used for sports analysis.
- Allows 3D models and tactics to be inserted in real time.
- Virtual advertisements are placed in sports environments.
- The graphics of results and statistics are directly integrated
- Virtual studio allows quick transitions between scenes.
- It is also used in live broadcasts with AR elements.
- Sport has become one of the main fields of application.

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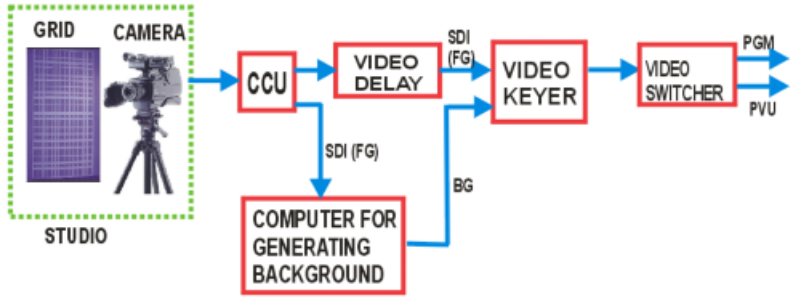
Virtual Studio Essentials

- A virtual studio requires a combination of cameras, lighting, computers and software.
- The basic elements are: camera, keyer, render computer, scenery software.
- Tracking systems allow you to track the movement of the camera.
- A powerful GPU provides real-time rendering.
- Stable synchronization of all components is required.
- Integration with the overhead is key for broadcast.
- All components must operate in low latency.

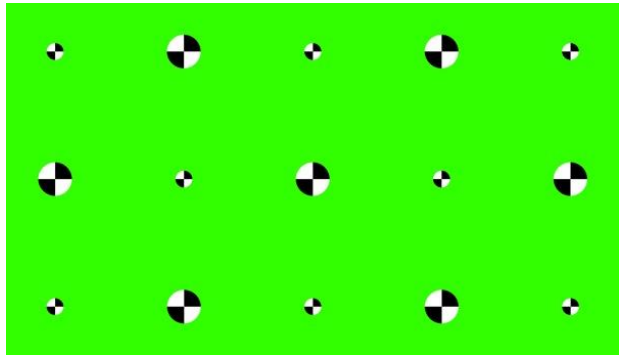
Virtual Studio Workflow

- The subject is filmed in front of the Chroma key screen.
- The camera sends a signal to the computer with the keyer.
- The software removes the color and adds virtual scenery.
- The tracking system monitors the position and movement of the camera.
- Real-time renderer generates a 3D background.
- Lighting is matched to the virtual set.
- The result is sent to the director and broadcast live.



Role of cameras and CCU systems

- Cameras must have a high resolution and stable output.
- The CCU (Camera Control Unit) controls exposure and color balance.
- Accurate synchronization is key to successful keying.
- Cameras are used with tracking sensors or markers.
- Lenses must be calibrated to accurately transfer focus.
- PTZ cameras often have integrated tracking.
- Cameras are the heart of a virtual studio.



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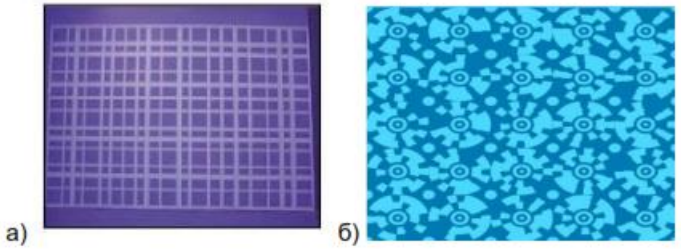
Tracking systems in virtual studio

- Tracking determines the position and movement of the camera.
- Without tracking, the virtual scene looks unnatural.
- There are optical, mechanical and hybrid systems.
- Optical systems use markers or infrared sensors.
- They mechanically use sensors in the tripod head.
- Hybrid combine multiple methods for precision.
- Tracking must work in real time.



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Why camera tracking is important

- Precise camera tracking ensures a natural blend of real and virtual images.
- Without tracking, the background "slides".
- The virtual scene must respond to camera movements.
- Tracking conveys position, rotation, and focus information.
- In modern studios, tracking is mandatory.
- Precision is crucial with moving cameras.
- Enables realistic visual effects.

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Types of Tracking Systems

- Mechanical tracking systems.
- Optical tracking systems with markers.
- Infrared (IR) tracking.
- Hybrid systems – a combination of multiple methods.
- Virtual tracking in the software (without sensors).
- Computer vision-based systems.
- Each has advantages and limitations.

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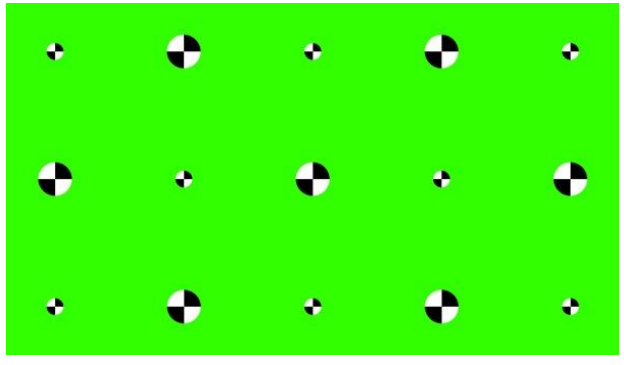
Mechanical tracking systems

- Sensors are located in the tripod or crane head.
- Measures the tilt, rotation, and zoom of the lens
- The information is sent to the rendering system.
- They are accurate but require calibration.
- Independent of lighting and background.
- They are often used in smaller studios.

Optical tracking systems with markers

- Markers are placed on the studio floor or walls.
- Cameras recognize markers using software.
- Monitoring is very accurate and stable.
- The lighting must be constant and free of reflections.
- Larger studies require a dense schedule of markers.
- Disadvantage: complex installation and maintenance.



Infrared tracking systems

- They use IR cameras and emitters in the studio.
- They emit infrared signals that the camera detects.
- They are resistant to changes in the visible spectrum.
- Acurate in real-time
- A special IC infrastructure is required.
- Disadvantage: more expensive compared to mechanical ones.
- They are used in large TV networks.

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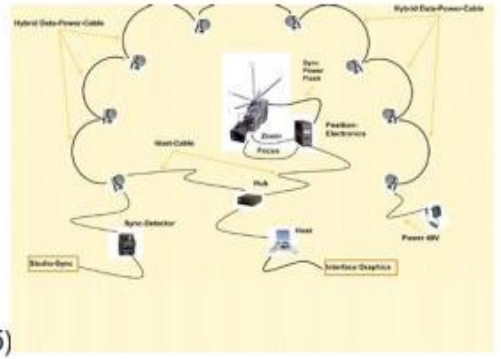
б) 

- In infrared systems, the typical distance between the indicator and the camera is 2 meters.

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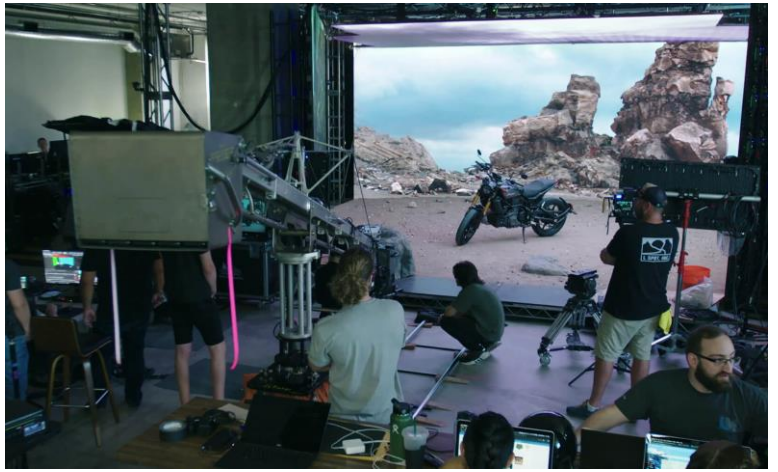
Virtual tracking software

- The software analyzes the image and evaluates the movement of the camera.
- Do not use physical sensors or markers.
- Uses computer vision algorithms.
- Less accurate than hardware systems.
- Useful in smaller studies and educational settings.
- Easily integrates with standard cameras.
- Example: Unity and Unreal plug-in solutions.



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Computers and Rendering Systems

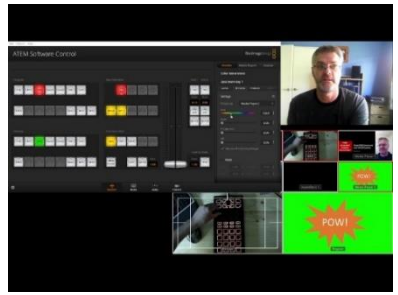
- Real-time rendering requires strong GPUs.
- NVIDIA RTX graphics cards are standard.
- Computers must support low-latency processing.
- Using multiple graphical servers to work in parallel.
- The virtual studio works on network render farms.
- Integration with Unreal Engine or VizRT type software.
- Redundant systems provide stability.

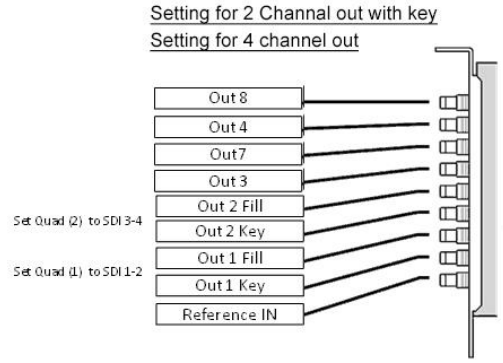
Virtual set design software

- The software generates and renders virtual sets.
- Examples: vMix, VizRT, Unreal Engine, Brainstorm, Avid.
- Allows creation of realistic 3D environments.
- Supports real-time graphics animation.
- Enables integration with statistics and data.
- Virtual sets are designed in 3D applications (Maya, 3D Max).
- The software must be compatible with broadcast systems.

Key role of the keyer

- Keyer is a device or software that removes the green color.
- Hardware keyers are part of TV directing.
- Blackmagic Atem supports chroma key
- Software keyers integrate with rendering systems.
- The precision of the keying determines the quality of the scene.
- Advanced keyers allow the processing of hair and transparent objects.
- There are real-time keyers for live production.
- Keyer is the focal point of the chroma key process.
- It can be used with an intensity card (key, fill) and a software such as vMix





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Questions & Answers

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