

Internship: Virtualizing the camera crew (1700240)

Description

More and more often, events are being recorded or live-streamed to a wider audience. To keep the remote and delayed viewing experience as interesting and engaging as possible, those recordings and streams should be dynamic. Human camera crews excel at this. Camera operators can easily identify the most meaningful events in e.g. an auditorium. They will choose the best vantage point, zoom in and out, and crop the scene according to cinematographic rules. When multiple camera feeds are available, a director will create layouts and video mixes in such a way that the output feed is at the same time informative as well as pleasant and engaging to keep watching. For many smaller events this human crew of experts is unaffordable, take meetings or your typical class or lecture for example.

In this project a smart master-slave PTZ (pan-tilt-zoom) solution will be pursued to “virtualize the camera operator”. The master, wide-angle, high resolution camera will cover and analyze the whole scene, detect the most meaningful subjects, e.g. recognize and localize the teacher, to steer the PTZ camera that can then zoom in and track his head, cropped according to human camera operator’s best practices.

As an extension, “virtualizing the director” can be investigated for cases where multiple camera feeds are available. Probabilistic logic programming could be used to decide when to switch between several views, based on cinematographic guidelines or learning from user preferences.

Keywords: master-slave PTZ camera systems, computer vision, machine learning

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Internship/Thesis: Free view point stereoscopic 3D visualisation (1700401)

Description

VR HMD are great devices to consume stereoscopic 3D content. Yet, HMD are also limited in certain use cases where grouped interaction is required. Immersive projection environments like CAVES, Domes offer an alternative for numerous applications. The challenge is however to support multiple viewpoints while avoiding distortion of the 3D geometries while viewers moving their head.

The goal of this internship will be to prototype a SW pipeline able to support distortion-free stereoscopic 3D dynamic viewpoints in an immersive projection environment.

Focus shall be given to optimizing the computing resources with respect to high frame rate & real time interactivity support, and the type & amount of GPUs.

Keywords: GPU, game engine, stereoscopic 3D, openGL shader programming

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Internship/Thesis: Immersive Visualisation Environments (1700400)

Description

Projection domes are becoming more and more appealing as an alternative for groups, families, etc. to consume 360° / VR content, without having to wear a VR HMD. Very often however, projection domes are complex to set-up, calibrate and maintain. And as immersive experiences are becoming more and more interactive, also real time support will be required in the future.

The goal of this internship/master thesis will be to prototype a SW pipeline for real time auto calibration of a projection dome environment, based on game engines. Different tracks and sensor configurations shall be evaluated and benchmarked. Focus will be on optimizing computing cost as well as set-up time.

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Internship: develop PC based video generator(1700570)

Description

Je staat in voor het ontwikkelen en uitwerken van een PC based video generator voor in de automatische assembly lijn van de Healthcare displays en netwerk producten. Op vandaag worden al GPU kaarten gebruikt, maar niet met het gewenste stabiel gedrag.

De video generator zal een standalone PC worden die instructies krijgt van de bestaande test tools. Deze ontwikkeling gebeurt in nauw overleg met operations en behelst vooral software-ontwikkeling.

Uw Rol:

- Concept study maken a.d.h.v. input van gebruikers en de huidige systeemarchitectuur
- Keuze maken betreffende GPU en operating systeem
- Programma schrijven voor communicatie met huidige test computers.
- Validatie setup bouwen om stabiliteit te controleren
- Inbouwen en integratie van de oplossing in de productielijn
- Verzorgen documentatie.
- Oog hebben voor timing, kost en kwaliteit

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Internship: Ontwikkeling van de software voor een videogenerator(1700871)

Description

Project:

Je staat in voor het ontwikkelen en uitwerken van de software voor een videogenerator opgebouwd uit een PC en een video kaart.

De generator zal gebruikt worden in een afregelstand van een automatische assembly lijn voor Healthcare displays.

De videogenerator moet in staat zijn om te communiceren met onze testsoftware over een lokaal ethernet netwerk.

Deze ontwikkeling gebeurt in nauw overleg met het team van productie- ingenieurs.

Uw rol:

- Concept study maken a.d.h.v. input van gebruikers en de huidige systeemarchitectuur
- Inbouwen en integratie van de oplossing in de (proto)productielijn.
- Testen stabiliteit van oplossing
- Verzorgen documentatie en training operatoren.
- Oog hebben voor timing, cost en kwaliteit

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Internship/masterthesis: displaying high resolution images on low image displays (1700936)

Description

A higher resolution image can be displayed by a lower resolution projection device by repositioning this display-pixels by sub-pixels and applying the correct processed sub-images for the different positions.

Goal is to investigate by simulation and proof of concept the image quality of the achieved resolution according to the different repositioning schemes of the display

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Internship/masterthesis: Virtualisation of display rendering (1700923)

Description

Augmented & Virtual Reality technologies are becoming very rapidly ubiquitous. The immersiveness they provide and the real time interactivity they support between viewers and digital content open an immense world of new potential Entertainment experiences.

Today, most VR content is being consumed on head mouted displays (HMDs), however this platform offers limitations when it comes to large audiences and shared experiences.

The goal of this internship/master thesis will be to develop a prototype of a web-based dynamic display rendering tool for mapping virtual reality / immersive content (as coming out of game engines like Unity or Unreal) onto physical display infrastructures.

The research shall take place at Barco where a number of different display systems configuration will be available for the validation of the prototype.

Keywords: Virtual Reality, Game Engine, WebGL

Requirements:

Master student in Computer Sciences

- Fast Learning, autonomous and critical mindset
- + Passionate about Virtual Reality
- Very good knowledge of Modern C++ (C++11)
- Understanding of (or willing to learn about) Game Engines (Unity or Unreal)
- Understanding of (or willing to learn about) HTML5/Javascript
- Understanding of (or willing to learn about) OpenGL/DirectX/Vulkan

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Internship: Color calibration in projectors (1700980)

Description

Background

In recent years, (re)volutions in visualization technology have resulted in various improvements related to image quality. One of the most notable improvements is related to the color gamut. Using solid-state light sources, broader gamuts can be obtained, resulting in more vivid, vibrant images.

Description

While solid-state light sources have proven to offer major benefits in terms of image quality, some potential enhancements remain, which can further improve the performance. For instance, individual lasers can age in a slightly different way over time, and this may lead to gradual deviations in the hue of the images over time. Moreover, the temperature efficiency of different types of lasers used in the projector can be different, which may also lead to changes in hue, for instance when using the projector in different ambient temperature conditions. Additionally, lasers can have a non-linear relation between their applied current and resulting emitted optical power. Hence, depending on the desired light output level, the driving currents for all lasers should be optimized to cope with such effects.

The goal of this work will be to ensure that projectors are able to unleash the full potential of these new technologies by taking all related effects into consideration, using innovative techniques.

Keywords: lasers, optical modeling, color management

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Internship: Optical component characterization (1700987)

Description

Background

Barco offers a broad product range of high-end projectors. In these products, Barco uses a wide variety of optical components, ranging from projection lenses which allow projecting an image formed on the spatial light modulating device (typically a DMD) to a projection screen, to optical components integrated into the projector's internal structure, such as diffusers, lenses, dichroic filters and mirrors. All the properties of each individual element have to be carefully considered, in order to come to best possible design. Every single element can potentially affect a projector's specifications, including its cost, physical appearance and performance.

Therefore, properly characterizing optical elements in order to obtain a detailed performance assessment of the optical components plays a key role in the optical design of projectors. Although Barco has many tools and setups available to do proper analyses of such components, there are still possible improvements/expansions to be made.

Description

The goal of this work will be to create and optimize suitable setups for the characterization of optical components. This is a multidisciplinary challenge; as such setups require a well-considered mechanical configuration, as well as the proper definition of the measurements to be performed using the best suited devices, and dedicated processing of the acquired data.

Simulation software can be used as a tool for these setups: CAD programs can be used to create mechanical drawings and optical simulation software can help to define the proper tests, and to interpret & validate the obtained results.

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Internship: Innovative medical devices and image processing (1700975)

Description

Background of Barco Healthcare:

Barco develops high-precision medical display systems to bring enhanced visualization and diagnosis across the healthcare enterprise, including radiology, mammography, surgery, pathology, clinical review imaging and dentistry. Barco's full line of color and grayscale diagnostic displays, display controllers and softcopy Quality Assurance (QA) tools facilitate confident diagnoses while guaranteeing perfect image quality over time and across displays. Next to this Barco is also an important player in the Digital OR market with the Barco NEXXIS platform, a unique image management solution that builds on the IP network to ensure complete integration of all devices in and beyond the operating room. The Barco point of care portfolio is increasing hospital efficiency while giving patients a more comfortable stay.

Goal & Description of the project:

Barco Healthcare has decided to broaden its activities, away from pure visualization solutions. We are more and more also exploring image processing algorithms that improve visualization of medical images and make it easier to diagnose.

As an intern you will be fully part of an entrepreneurial team that works on innovative medical devices and image processing algorithms.

Qualifications

The exact tasks to be performed during the internship will be discussed together with you. We will take care that each internship student can work on a topic of interest with sufficient challenges. Below is a list of possible tasks to be performed:

- Domain: image processing
 - o Development of image processing algorithms to improve the quality (focus, color, sharpness, ...) of acquired images
 - o Development of image analysis functionality, e.g. to automatically perform size measurements of skin lesions
- Domain: embedded software
 - o Modification of the Android stack
 - o Implementation/optimization of the image processing pipeline on a modern SoC
 - o Development of a front-end app acting as the main interface towards the device
- Domain: cloud software
 - o Development and testing of the cloud platform. Specific challenges here are the real-time aspect, as well as the scalability (thousands of devices in parallel)
 - o Development of a backup/storage module for storing large amounts of skin images

- Domain: front end design
- o Definition and development of a web interface which optimizes the clinical workflow and which allows color accurate representation of the data

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Internship: DMD diffraction modeling (1700983)

Description

Background

Barco has been continuously pushing the boundaries of visualization technology. More specifically related to projection technologies, cutting-edge optical designs have ensured Barco's dominant presence as a market leader in various markets, including digital cinema and simulation. In order to maintain its position, Barco aims at maintaining a firm grasp on the latest technological advancements that can be used in its products.

Barco's current high-end projectors use Digital Micromirror Devices (DMDs) to generate images, making them a key component for Barco's projectors. Such DMDs are spatial light modulators, which contain 2D arrays of DMD pixels. These DMD pixels are small mirrors that can be put in two stable states which determine the direction that light is deflected, which is either towards an absorber, or towards the projection lens. This way, the amount of light that reaches the screen can be individually controlled for each pixel.

Due to the continuously increasing market demand for crisper images, the DMD pixels have continuously decreased in physical size, resulting in challenges in the projector's optical design. The DMD's diffraction has to be taken into account in the design, as it will cause part of the light to deviate from the ideally intended location, possibly affecting the image quality, depending on the specifics of the rest of the optical design.

For this purpose, a dedicated DMD diffraction model, which can be used in optical design software to realize an integrated optical model including the illumination part has been created. This model allows gauging a projector's performance with certain optical design choices, and improving designs for better performance.

More specifically, a diffraction model (Fraunhofer approximation) of the DMD with non-orthogonal conical light incidence has been developed. This is a 3D-model of the DMD's pixel structure with the 2D periodicity in the plane of the DMD and tilt angles of the mirrors (-12° for the OFF-state, 0° for the FLAT-state, $+12^\circ$ for the ON-state). Furthermore the actual dimensions of the mirrors and mirror gap were included in this model.

The DMD diffraction model has been implemented for the optical design program ZEMAX (ZEMAX DLL in C++).

Description

The goal of this work will be to validate this model based on experiments, and to refine the existing model where needed. In order to properly validate the model, the experiments should cover a sufficiently broad parameter range. Therefore, several experimental setups will be made that comprise DMDs with different physical sizes, in combination with lasers with different wavelengths. The results will need to be critically analyzed in order to do a proper assessment and comparison to the model.

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Internship/masterthesis: Research on perceptual rendering intent (1700968)

Description

However this is not always possible. For instance it is possible that the gamut of the color camera is much larger than the gamut of the display system that is used. This means that the color camera is able to produce colors that cannot be visualized on the medical display. Two approaches are now possible. You could choose to represent all colors exactly like how they look. All colors that do not fit within the gamut of the display system are replaced by the closest possible color.

This is called the absolute color intent.

Another possibility is to adapt the colors of the original image to make them fit in the gamut of the display system. All colors will be represented. The difficulty is how to remap the colors. A simple solution is to linearly remap the colors, but this will have a big influence on how the colors are perceived by the human visual system. This is not linear and behaving very complex. So what can be a big color difference in the original image could become a small, hardly noticeable difference in the rescaled image. This is not always wanted. Another possibility is to rescale, taking into account the human visual system, so that the image is perceived by the human as similar to the original image, but mapped on a smaller color scale. This is called perceptual rendering intent. Although the idea is clearly described in the ICC framework, the methods are not and it is also not a straightforward task.

As an intern you will be fully part of a research team and participate to the research on different methods to realize the perceptual rendering intent.

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Internship/ master thesis: software development for Eldim Viewing Angle measurement (1701004)

Description

(Re)Write the software for accessing EZ contrast and creating excel file with data and graphs.

Measuring the viewing angle of a display should be done in an automated way. The software should communicate with the Eldim EZ contrast measurement head, but also commanding the image generator to set different colors and/or video driving levels. At the end there should be a report generated in excel with graphs and raw data.

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Internship: Enriching a projectors capabilities and controlling it from a distance (1700921)

Description

A projector has many features, going from lens shifting to warping images. This functionality is fully developed in C++11/14 and is running on a Linux operating system. Having a built-in camera, infrared pointer... can lead to several additional functionalities.

For this project we are looking for a student who can make use of these components to extend the functionality of a projector.

Controlling the projector can be done in different ways: using a remote control, a mobile device... For this project, we are looking for a student who can make suggestions on controlling the projector in a uniform way.

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Internship: Embedded Software Development (1701085)

Description

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- We work in close contact with our customers, so that we can experiment and learn rapidly what brings them most value.
- We use the latest technology to ensure we can create a state-of-the-art experience.
- We strongly believe in continuous integration and testing to ensure that what we deliver is qualitative.
- We believe in people as the cornerstone of our way of working.

All year long, we are open for internships for people who really want to be learn about software development. Based on the interview and the moment of the internship, we can see in which team you could fit best.

As our intern you will:

- learn a part of software craftsmanship in one of our agile teams
- contribute to our development of our real time media platform

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Internship: Cloud Software Development (1701086)

Description

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- We strongly believe in continuous integration and testing to ensure that what we deliver is qualitative.
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Internship: Logging framework for Healthcare Products (1700967)

Description

Barco Healthcare is continuously searching how the work of doctors can be made more efficient and how they can be supported in making the correct diagnosis. These are 2 very important factors when developing new products and visualization solutions.

However it is important to understand and to know how the Barco products are used and which available functions are very well known by the doctors and which functions are for instance too much hidden inside the menu structure. These are very important usability aspects.

A way to obtain this information is to observe users, doctors, during their daily activities. This is the most valuable source of knowledge, but this is not always practically feasible and the number of end users that can be observed is limited.

Another approach is to build a framework that can collect automatically information from all the Barco Healthcare products installed in the field. The biggest advantage is that you do not have to visit the end users locally to gather the required information and that a very large group of users is giving input, what makes it possible to make more general conclusions.

Despite this is a very valuable source of information for improving the healthcare products of Barco, it has not been realized so far. The task is indeed challenging.

Firstly the logging framework has to be general and must be able to log data from a broad range of different medical devices, each with their own capabilities and limitations. It is also not always known upfront what the question will be that has to be studied and which data will be required for this. So it must be possible to log new data without the need to adapt the logging framework.

Secondly the amount of data that can and will be collected will be huge. It is not obvious to retrieve only that information that you need to be able to draw conclusions. So a part of the research will be attributed to the visualization and the aggregation of the collected data in function of the topic that has to be studied.

Thirdly Europe has correctly a severe privacy regulation, called GDPR. The logging framework needs to respect the privacy of every end user and the end user needs to give permission before sending his data. This also has to be part of the framework.

As an intern you will be fully part of a research team and participate to the research on and the implementation of a general logging framework for medical products. This research should result in a demonstration of how this logging framework can be used for drawing conclusions about the usability of the Barco Healthcare products.

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Delphine Van Hoorebeke
Stages@Barco.com
+32 56 23 39 91

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Internship: lifetime model enhancement in solid-state based projectors (1700982)

Description

Background:

Solid state light sources are a key technology in Barco's current and future projection systems. One of the major benefits of this light source technology is its long lifetime, resulting in cutting-edge products with tremendous light output over thousands of hours. While lasers are very performant over extended periods of time, their lifespan does depend on their particular modes of operation. Barco has a lot of in-house physical models that allow predicting the lifespan in particular (combinations of) such modes of operation, which allows engineers to optimally design the light sources. In addition, Barco has a lot of experimental data obtained from extensive lifetime tests.

While experimental validation of the lifetime models has been done to a great extent, further enhancement of the created models can be done, which eventually result in even better lifetime predictions and even more optimal designs.

Description:

During this internship, experimental data will need to be gathered, and critically analyzed, preferably by creating automated tools that allow a fast and clear analysis of the obtained results over time. The obtained results can subsequently be used for the model validation & refinement.

Keywords: data processing, optical modeling, laser performance

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Internship: visualisation of system-events in a surgical environment (1700869)

Description

NMS (management software for Nexxis Digital OR) has ,next to a HTTP-Rest-API, an eventing-mechanism through which it can notify external clients (such as a user-interface).

The goal of this assignment is to use this mechanism to visually represent the events that are generated by the system.

The events can, for example, be plotted on a timeline to give the user a clear overview of what is happening in the system.

There can be multiple phases to this assignment.

create graphical-representation in javascript, using the existing NMS-API and js-libraries such as <http://www.chartjs.org/> or <https://d3js.org/>

extend the NMS-API so that events are exposed over a websocket-connection (instead of plain http). NMS is developed in java, using JMS (https://en.wikipedia.org/wiki/Java_Message_Service) as back-end for the events.

update the graphical-representation to use the newly created websocket-connection to the NMS-server (optional).

Extend the existing API so that the complete functionality of the server is made available over a websocket-connection, instead of http-rest.

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Internship: Software Developer .NET (1700976)

Description

'Capacity planning' at Barco NV

Application

Short term and long term capacity planning in production is done via a cumbersome way as our ERP package is not set up to support this ('endless capacity planning'). A tool is needed where existing data (production orders, people availability) is linked to extra input in order to calculate and visualize short and long term capacity needs.

Internship description

The goal is to create a web application that replaces the use of different excels files and other tools used now. At Barco there are already different web applications that work via the system of 'areas' within MVC and all are part of 1 basic application. The new web-application would be a part of that via a new 'area'.

First step will be to integrate the different data sources via either importing of export files out of or direct links with SAP (product & process data) & our HR tool (operator availability).

Interactive input pages will be needed to allocate process times to process steps, people to different process steps and yields. The existing database used for competence follow up (which contains already the process steps) will be extended to support this.

Interactive visualization will be needed to support different levels of reporting – short term line responsible & supervisor support at process level & longer term management overview at plant level (eg cumulative overview of direct reports, interims & limited contracted operators)

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