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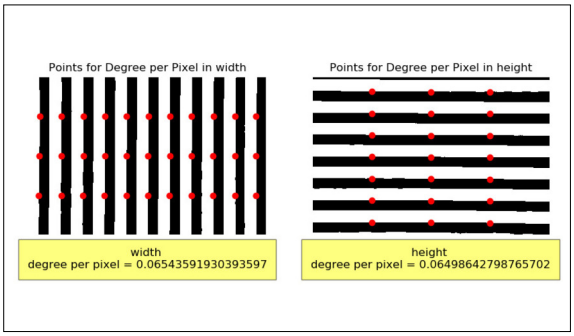
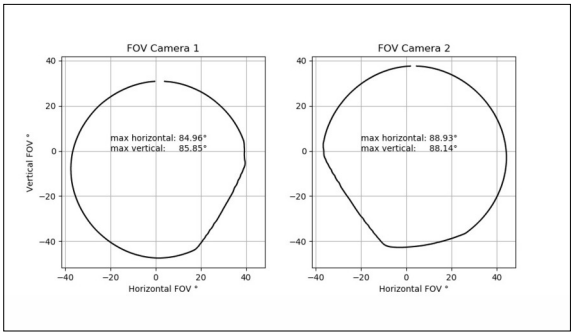
Subject Area	Digital Image Processing

Test-device for VR-Headsets

test-device
Own presentment



degree per pixel measurement
Own presentment



field of view measurement
Own presentment

Introduction: VRMotion GmbH and HSR engineers developed a Virtual Reallity (VR) Motion-simulator. It is mainly used for flight-simulation.
The conventional simulators are without VR technology and have many official requirements, regarding for example, the Field of View (FOV) and resolution.
Now the question is, if these official requirements are adaptable to flight-simulators with VR technology. This mainly concerns the specifications of the VR-Headsets.
As there is no existing test-device for this matter, the goal of this work is to develop and implement such a device.

Approach: To measure the parameters, the VR-headsets displays will be filmed. The recorded images will then be processed, so that the measurements can be taken.
In order to measure as many parameters as possible, it was decided to use four cameras. Two with a big FOV, one to film individual pixels of the display and one to film with a high frame rate.
Afterwards two heads were constructed to mount the cameras and VR-Headsets.
To control the test-device, a software was implemented in Python. It consists of several parts. The first one is to control the VR-Headsets displays. Another is to record the images with the chosen camera. Followed by the part that processes the images and takes the measurements. The software also consists of a graphical user interface (GUI), with which the user can interact and display the results.

Conclusion: A test-device was developed to measure parameters of the VR-Headsets.
Four cameras were ordered, which cover a wide area of measurements. Two can record the whole display and can be used for 3D-perception and one can record individual pixels. The last one has a very high frame rate.
Two heads were constructed to mount the cameras and the VR-Headsets. Most of the parts were 3D printed, the rest were built out of wood.
Multiple tests were implemented. More specifically, one to measure if the resolution of the headset is exact, by first displaying 10x10 pixels to measure if they are displayed correctly and then measuring the seen pixel count on the screen. Another test measures the FOV per eye. The last test measures the degrees per pixel in two different approaches.
The implementations yielded the desired results.
For the future, more tests can be implemented with the use of this test-device.