UNIQUE Image Processing Software

The art of imaging
Have you ever looked at an X-ray image and thought that the human body is a work of art? Philips welcomes you to experience a master class in image processing with UNIQUE. We have turned modern image processing into an art form.

Examining an X-ray image is not unlike analyzing an old master, UNIQUE dissects even the thinnest layer of paint, showing what really lies beneath the surface - revealing its secrets.

As an experienced practitioner you want an X-ray image of the highest quality, showing diagnostically relevant information in one single image, displayed as you want it and where you want it. This is exactly what UNIQUE delivers.

UNIQUE is a sophisticated image processing technology. With over 100 years of imaging experience we have developed a solution that displays all diagnostically relevant information in one single image, giving you more confidence in diagnosing. UNIQUE can do even more for you: it displays images just the way you want to see them, optimized for your diagnosis.

But from Philips you can expect more than just an excellent image. We look at how you work in different departments, from trauma room to radiology, and we understand that flexibility and consistency are key. Therefore with UNIQUE, it does not matter which digital Philips X-ray modality the image is taken with, the parameters for all systems and detectors are the same, and can be viewed and evaluated from any suitable monitor, giving you flexibility and diagnostic confidence.

UNIQUE reduces the patient dose and the need for retakes. The result is a significant increase in workflow efficiency. Manual procedures, like applying wedge filters, multiple processing to display all requested areas of the image or adjusting contrast and brightness, become obsolete.

Now from the theory behind the technology, let’s go to explore the clinical benefits...
Art for children
UNIQUE in CR and DR

“You get more out of UNIQUE: more details, more soft tissue as well as good bone definition, bringing possibilities beyond what was achievable until now”

Dr. Wolf, Switzerland

Low dose pediatric abdomen, CR technique. Comparable image quality to DR.

Low dose pediatric abdomen, DR technique. Comparable image impression to CR.
University Hospital Bern, Switzerland
The University Hospital in Bern, Switzerland, is a leading hospital in the field of pediatric radiology with particular focus on dosage reduction for pediatric X-ray.

Dr. Wolf, Head of Pediatric Radiology, uses fully digital X-ray systems, which are integrated in the RIS and PACS. Both Digital Radiography (DR) and Computed Radiography (CR) systems were installed as part of a PACS implementation that made the operation of the department completely filmless within less than 3 months. When looking at CR solutions, Philips met two important criteria: Image stitching – an absolute must for the spinal and long extremity examinations that are so important for pediatric orthopedists – and the ability to display both CR and DR images in a consistent manner. This is a significant benefit for the radiologist, as it means a tremendous reduction of image adaptation that had to be otherwise done manually by the radiographer or the radiologist.

UNIQUE – Improving Diagnostic Confidence
UNIQUE harmonizes contrast levels, highlights faint details and adapts parameters to provide lots of detail and wide image dynamics, while still maintaining a natural, artefact-free appearance. Dr. Wolf comments, “you get more out of UNIQUE, you get more details, you get more soft tissue as well as good bone definition, bringing possibilities beyond what was achievable until now”. He cites the example of a contusion of a knee joint. The orthopedists were satisfied with images using the standard post-processing, but using UNIQUE, the skin contour, the subcutaneous fat and a finer bone structure are visible simultaneously from the same raw data. “It is the difference between a good and an excellent image, and gives radiologists the chance to achieve the full potential of the system, to get more information and improve diagnostic confidence, based on the specific clinical requirement and the anatomy of region being examined”, he says.

By applying the same criteria to both CR and DR images, UNIQUE also ensures that image consistency is high. “You get very convincing results from both systems with UNIQUE”, says Dr. Wolf.

Low-dose Research in Pediatrics
It might have been expected that the use of digital flat detectors, which often enables dose reduction when used in adult radiography, would offer an important opportunity for further reducing X-ray dose. But, as Dr. Wolf explains, they were already using films with a speed class of 800, and had reduced dose to a very low level. In fact, the dose levels were so low that it is only recently that digital technology has been able to offer sufficient sensitivity to make the change to digital beneficial. Watching the market, only the Philips DR technology met the department’s dose criteria.

Digitalization (PACS) combined with UNIQUE meant a ‘quantum leap’ in workflow improvement. It also offered substantial benefits for all parties: less scheduling work for the radiographer, greater diagnostic confidence for the radiologists and other specialists, a dose reduction through lower dosage and fewer retakes, shorter and less stressful examinations for the children, and finally more personal care dedicated to them from the time saved through improved workflow.
Novato Community Hospital, USA

The Novato Community Hospital, California switched to digital radiography. As the Radiology Director, Dr. Ralph Koenker oversaw the installation of CR readers across the hospital, from the emergency room and operating room area to the outpatients center and in the radiology department itself.

20% efficiency improvement by going digital

One of the key problems which digitilization was able to solve was a bottleneck in the department’s workflow. Radiology personnel often congregated around one particular station for patient examination, cassette labeling and processing. With the Philips solution, the workflow could be better distributed by physically separating these functions. Evaluating the implementation Dr. Koenker explains that “going digital has improved our efficiency by about 20% compared with reading regular X-ray images. With that, the physician’s diagnostic accuracy has also increased, as visualizing lesions is easier on digital images when they are correctly post-processed.”

UNIQUE in the ICU environment

A major contributing factor in increasing the department’s efficiency was the utilization of UNIQUE. The most common X-ray examinations that are done in a hospital are portable chest X-rays. Here images often have a wide range of exposure between the top and the bottom of the lungs.

Dr. Koenker explains that UNIQUE equalizes that exposure difference in a very effective way: “I think that one of the big advantages of UNIQUE is that it allows us to see abnormalities in the lung on portable X-rays with greater conspicuity. We can see lesions in the lung apex as well as lesions which may be hiding behind the shadow of the heart and that is where we found our clinically most significant improvements.”

Another area where the benefits of UNIQUE became obvious was on the very periphery of the lungs where all the rib shadows overlie. Again it is easier to see through the rib shadows and detect pleural-based nodules, improving diagnostic relevance.

Dr. Koenker also cites the visibility of catheters and tubes in the ICU setting as another area where UNIQUE brought significant advantages. Here it is vital to show the position of catheters and tubes accurately while still being able to see the lungs as well. This can particularly be a problem with nasal gastric tubes. The tube is in the stomach, which is at the bottom of the image and the most underexposed part. Dr. Koenker explains: “This was difficult to see in the days of film and even with standard processed CR. But today we are able much more readily to see the course of NG tubes and the location of pace maker wires or other monitoring than before, making UNIQUE the next step in the evolution of image processing.”
“UNIQUE had a major impact on our diagnostic results”

Dr. Koenker, USA
Elkerliek Hospital, The Netherlands
The Radiology Department of Elkerliek Hospital, in the Netherlands, underwent a radical metamorphosis. This involved a PACS installation and the digitalization of radiology and nuclear medicine modalities in both the hospital at the Helmond site, and the outpatient clinic in nearby Deurne.

Digitalization
Primarily, going digital means becoming more efficient. Mr. J.A.M. Op't Hoog, Head of Radiology, is pleased that the logistical drawbacks associated with working with film are now a thing of the past. “The workload in our departments in Helmond and Deurne is permanently increasing. Thanks to this new way of working we can now keep up with this increase.” Neurologist Dr. P.P.A. Lenssen also comments on the advantage of being able to manipulate images on screen. “From the images on the screen, which are already fairly large, you can enlarge parts or change the contrast and so spotlight precisely the part you’re interested in.” Dr. Lenssen also values the ease with which a patient can watch the screen while discussing his or her complaint. “They only need to turn in their chair to see the screen. No more running over to a light box. It is faster, easier and clearer.”

UNIQUE and PACS
At the core of any diagnosis is the image. Without optimal image quality no other process improvement will truly work. Therefore high and consistent image quality throughout the entire image chain is key in a fully digital PACS environment. This is especially true for the replacement of conventional X-ray film with CR and DR. Only by combining PACS with UNIQUE was the hospital able to take full advantage of the digitalization benefits on all levels.

The hospital had already chosen UNIQUE processing when acquiring the Philips Digital Diagnost in the past, and now added the same for the Philips CR system. By providing superb image quality and all the diagnostically relevant information in a single image, UNIQUE offers the required information in exactly the desired format, no matter where the data is accessed.

In the end, UNIQUE helps to increase diagnostic confidence and overall throughput. It also helps to reduce the number of retakes and the X-ray dose for the patient. Without proper radiography digitalization and effective post-processing tools the overall efficiency of the PACS project could be seriously jeopardized. “The result is an impressively good and constant image quality in the CR images; a huge leap forwards”, says radiologist Dr. B.R. De Witte. “Both image contrast and sharpness can be adjusted down to the finest detail by the user with the help of the parameters.”
“It is only with UNIQUE that the radiologists have been able to make use of the much-vaunted large dynamic range of digital imaging technology. As far as I’m concerned, UNIQUE is the crowning glory of our digitalization project.”

Dr. De Witte, The Netherlands
We have now seen the results, but how does UNIQUE actually bring the invisible to light? UNIQUE, which stands for Unified Image Quality Enhancement, is a multi-resolution algorithm. Every X-ray image consists of structures with different resolutions, ranging from low-resolution soft tissue, to high resolution of the bones’ trabecular structures. To optimize all areas of an image, UNIQUE uses three steps: First the original image is split into multiple sub-images. Each sub-image represents a particular structure size. In the next step, each sub-image is processed in a way optimized for its respective structure size. In the last step, UNIQUE re-combines the processed sub-images into one single image.

The result is an image with unsurpassed image quality, containing all diagnostically relevant information. It offers constant image impression across all digital modalities, independent of modality type or detector.

Thank you for joining our master class of imaging!
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