

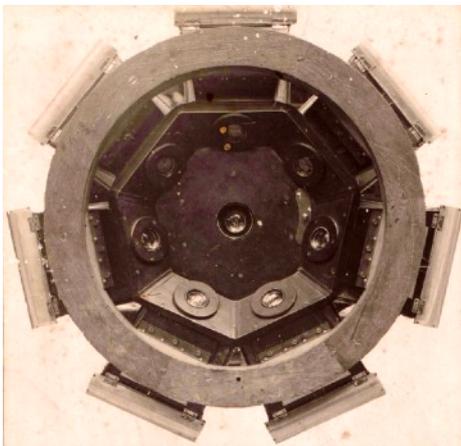
Why Panomera is different

Written and illustrated by **Vlado Damjanovski, B.E.(Electronics & TV)**

It may come as a surprise to some, but the idea of making 3D photographs has been around for over one hundred years. In the very early days of photography, shooting photographs with two cameras displaced at human eyes *interpupillary* distance, in order to simulate seeing the world with human eyes, made photography more interesting and almost three dimensional.



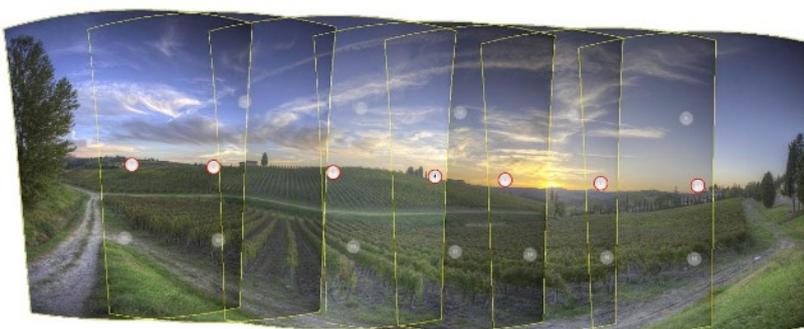
Creating 3D virtual reality in today's world is merely an evolution of this old idea.



Likewise, producing landscapes by *stitching* photographs together to make a wide panoramic view is a hundred year old idea. In the early days of film photography, *stitching* was done purely by optical and manual alignment of the finished photographs, typically next to each other, so that a wider landscape panorama could be achieved.

Once photography became digitised, various stitching software was developed to achieve a more skilful blending between multiple shots. Special calibrated panoramic tripods, with intelligent “panning” electronics, were created to allow multiple images of the panorama to be stitched as perfectly as possible. Aligning such cameras and tripods is an art in itself. When panning the camera to capture the panoramic view - a perfect optical axis centre needs to be found. Perfect levelling is also needed so that when you turn the camera 360° - you don't want the horizon to appear tilted.

Being a passionate photographer for many years (actually, more years than I've been in the CCTV industry!), I have used various stitching software to produce wide panoramic images. One such powerful software, which I was very fond of using, was *AutoPano*. I am sure readers involved in photography will be familiar with it, and it is still being used today.



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Although the difficulty when stitching software is to level the horizon, even more difficult is the need to equalise the exposure of the combined scene that spreads across multiple images next to each other. The reason for differences in the exposure of adjoining images is due to the light meter measurement. Exposures made without the sun in the field of view will be very different to the exposures made with the sun in the field of view. This means the brightness and contrast, as well as colour balance will be different. Putting different exposed images next to each other is not easy to blend. A good software, like *AutoPano* takes care of this.

It is amazing that with the advancement of smart phones, in which cameras are now an inherent part, panoramic images can easily be taken by just selecting the panorama mode and by sweeping across the landscape view from one side to the other. Something that was a complicated photographic process only a few years ago is now seamlessly integrated in the pocket smart phone.



In the CCTV industry attempts have been made, by a few different manufacturers, to produce panoramic live video surveillance. Enter IP CCTV.

Two decades ago, when analogue ruled, I remember designing CCTV systems with four monitors next to each other, showing four different camera next to each other. This created a panoramic view with four times the horizontal angle of each individual camera. Perhaps a primitive idea, but it worked. It gave the operators a better clarity of what they wanted to see than when the whole view was observed by just one wide-angle lens camera.

Today, in the digital realm, it is possible to stitch the streams of multiple cameras on one viewing client screen. This was not possible a few years ago because concurrent decoding of multiple H.264 camera streams was a very intensive number crunching exercise. CPUs, whether they were Intel dual-core, quad-core, or i7, were not able to perform such smooth operations. Yet, with the introduction of powerful graphic processors (most of which were developed for the gaming industry), times have changed and we can now decode multiple HD video streams in real time.

So, as a result, several CCTV manufacturers have designed their own 'panoramic' cameras which are now on the market. A number of sensors (4, 6 or 8) are arranged in a circular shape, each one covering a section of the wider panoramic view. The lenses are chosen so that they all have the same focal length and they all cover the same angled section to make a total of 360 degrees, or less. These designs are nothing new other than being based on the 100-years old 'stitching' technology.



Panomera® is different and a more advanced concept.

Dallmeier came out with their Panomera® patented concept in 2011, and immediately won an IFSEC innovation award.

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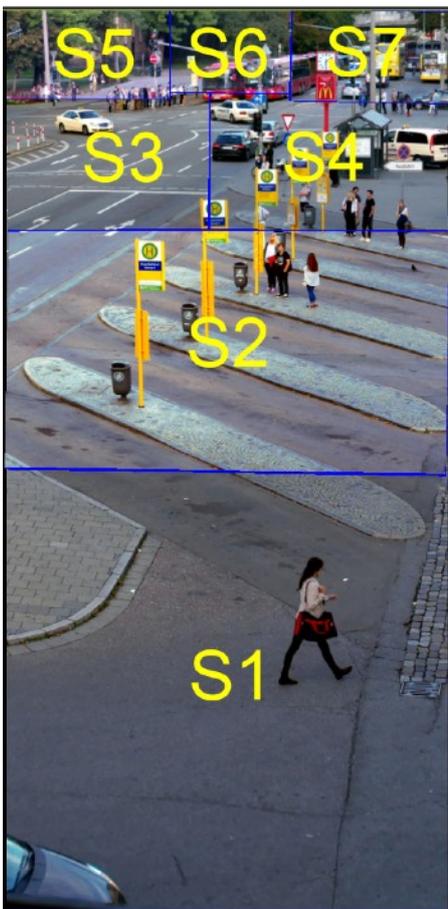
Those who believe that the general 'panoramic' cameras, now on the market, are the same as Panomera®, are mistaken.

One of the key differences between the two types of camera is in Dallmeier's use of multiple focal lengths of lenses on multiple sensors (cameras). For example, instead of arranging the video streams next to each other, in only a horizontal direction, Dallmeier includes longer focal length lenses to capture further distances in the vertical direction also.



Subsequently, this makes the mosaic of sensors very flexible, matching the desired coverage, rather than the other way around. With the Panomera® it is possible to have very wide (horizontal) panoramic coverage, when used in stadiums, as well as very tall coverage from people standing under the camera at 10 metres away up to 200 meters distance. This, of course, is very convenient for motorways, airport runways, train lines, harbours and streets. Optimal coverage is achieved by having shorter focal lengths (wider angle) for viewing closer objects and longer focal lengths (narrower angle) for viewing objects in the distance.

The end result is having multiple focusing points which progressively go further and further in the distance, producing the, so-called, 'Panomera® effect'. There are multiple focusing points, as well as a combination of focal lengths for various distances which results in a much larger depth-of field. This is not possible with just a one focal length lens.



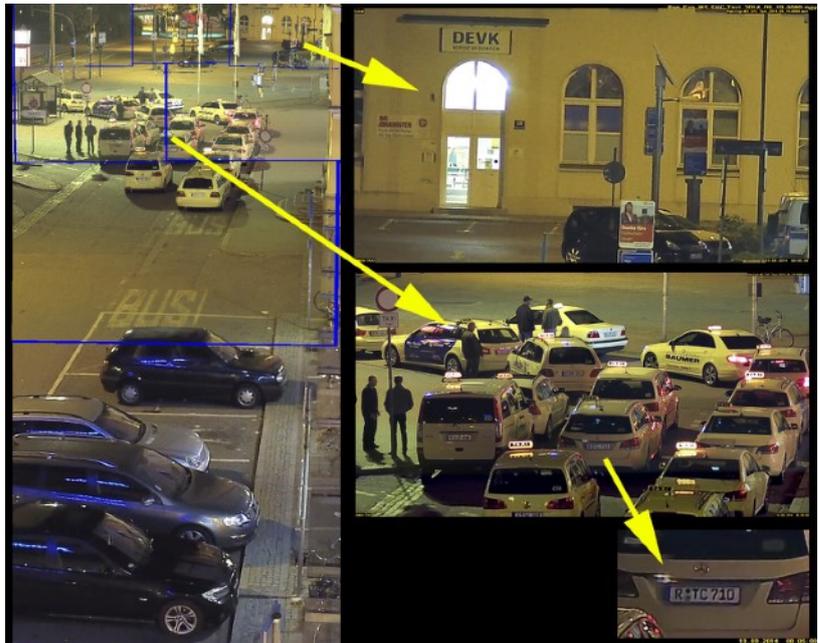
Those of you lucky enough to have already seen a Panomera® demonstration, can witness to the possibility of obtaining minute details by zooming in to any distance. This is the closest thing to an American *CSI* fictional TV series, where impossible things are made to appear possible. Panomera® makes impossibly low resolution images possible.

Furthermore, the dynamic range appears much larger due to each camera sensor adjusting its own exposure to its own field of view. When combined they create a total dynamic range much wider than if one sensor is used.

To have such a mix of sensors and views in the one display is not an easy task. One would say it is an impossible task to blend the sensor crossing areas with matching colours. This is more difficult when one understands the *parallax error*, which is an inherent part of all multi-sensor systems.

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Yet, Dallmeier's Panomera® minimises *parallax error* brilliantly. This is the second point of difference between it and other panoramic cameras. Dallmeier utilises their dedicated viewing client *SVC*, which is optimised for *NVidia* graphics processors. Not only can *SVC* decode multi-sensor Panomera® images seamlessly from one camera, but also multiple Panomera® cameras concurrently. An operator can easily cover views of 180°, or even 360°, obtained from a few



Panomera® cameras. The details gained from such a system is unprecedented, with equal colour balance from all sensors and all on one live camera signal. Anything visible in the entire area around the Panomera®, up to a few hundred metres, can be seen and analysed in detail during the live view or even playback. If one has missed an important incident in the top left hand corner of a stadium, or car-park, it is very easy to pinpoint the area, play it back, zoom-in and watch the incident unfold.

An operator never misses an incident regardless of where, in the field of view, it occurs. In fact, multiple operators can see different areas of the same vast coverage, concurrently, without affecting each other due to Panomera® multi-casting streams.

Panomera® sees everything, at any distance, with exceptional clarity. This is not possible with any other panoramic or PTZ camera.

A third point of difference between the Panomera® and other multi-sensor panoramic cameras, and one I find very impressive, is the *Auto-calibration* tool. Previously, adjustments such as installation height, camera tilt and an object's distance had their own optimal parameters in order to obtain a seamless blended image. This would have taken at least two hours to adjust manually, by a trained imaging specialist eye. Dallmeier has produced a clever *Auto-calibration* tool which does the same job effortlessly in just a minute, without a need for installers intervention.

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So, next time when you have the opportunity to see a Panomera® camera and assume that it is the same as any other panoramic camera, think again.

You might know of the Toyota Hybrid Prius car, a wonderful piece of engineering with electric motors and environmental sense and you may believe it to be like all other electric cars; even the latest Tesla Model S. That is, until you sit in one and drive it. Yes, they are both classed as electric cars, but they are not the same. I have test driven both and I can tell you - there is no comparison.



Similarly, hands-on experience with Panomera® far outweighs here-say and suggestions from friends and colleagues. It is hard to be convinced as when you see a product, first-hand, yourself. I encourage you to ask your local supplier to arrange a demonstration so that you can fully appreciate the actual Panomera® technology.

This is where I can truly vouch that the picture is worth a thousand words.

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