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Study of Multiplexing Space and Focal Surfaces and Automultiscopic Displays for Image Processing

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Abstract – The ability to resolve spatial light variation is an integral part of any imaging system. For the purpose of differentiate between spatial variation on a plane perpendicular to the optical axis and variation along the optical axis inside a camera behind the main lens. The former quantity, transverse variation, is what all 2D sensors measure. Light variation along the optical axis can be described as the depth of field of an imaging system.

Keywords - Image, Quality, Pixel

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1. INTRODUCTION

A simple linear prediction is used in the lossless mode of the JPEG still compression standard and a nonlinear predictor in the newer JPEG-LS standard.2 despite their apparent simply prediction-based techniques are quite effective and used in state of the art compression methods. Another approach is to use context modeling followed by arithmetic coding.3 in context-based models, every distinctive pixel combination of the neighborhood is considered as its own coding context. The probability distribution of the pixel values is estimated for each context separately based on past samples. In grayscale images, however, the number of possible pixel combinations is huge and only a small neighborhood can be used. The number of contexts must therefore be reduced by context quantization. This approach, combined with predictive modeling, has been used in the context-based adaptive lossless image compression. The recent JPEG20006 compression is based on wavelet transform, and although this algorithm is aimed at loss compression, it also includes a lossless variant. The efficiency of the prediction scheme also depends on the type of image. For example, CALIC is efficient on photographic images but not so good on images that contain smaller amounts of color gradation see image, e.g., color palette images, web graphics, geographical maps, schemes, and diagrams. On the other hand, a method called the piecewise-constant model _PWC_7 has been optimized for this type of image. The algorithm is a two-pass method. In the first pass, it uses special classification to establish boundaries between constant color pieces in the image. In the second pass, the decisions are coded by a binary arithmetic coder. The method also takes advantage of uniform regions where the same context repeatedly appears. One approach for exploiting spatial correlations efficiently is to decompose the image into a set of binary layers, as demonstrated in Fig. 3, and then compress the layers by a binary image compression method such as JBIG.8 The advantage of this approach is that a much larger neighborhood can be applied in the context model than when operating on the grayscale values. The decompression process is reversed: the compressed file is decompressed into a set oflayers, which are then combined back into the grayscale image. Unfortunately, JBIG is not very efficient when applied to bit-plane separated layers, as it is on images that are binary by their origin. Typically, the bit layers especially less significant bits lack predictable structure to be compressed well. This is because the bit-plane separation destroys the gray-level correlations of the original image, making the compressor unable to exploit them when coding the bit planes separately. In fact, interlayer dependencies are stronger than spatial dependencies within the layers. Embedded image-domain adaptive compression of simple images EIDAC9 therefore uses a 3-D context model, where context pixels are selected not only from the current bit plane but also from the already processed layers. Another way to improve compression performance is to increase the size of the context template.

2. REVIEW OF LITERATURE

Aerial photography is the oldest and most widely used method of remote sensing. Cameras mounted in light aircraft flying between 200 and 15,000 m capture a large quantity of detailed information. Aerial photos provide an instant visual inventory of a portion of the earth's surface and can be used to create detailed maps. Aerial photographs commonly are taken by commercial aerial photography firms which own and operate specially modified aircraft equipped with large format (23 cm x 23 cm) mapping quality cameras. Aerial photos can also be taken using small format cameras (35 mm and 70 mm), hand-held or mounted in unmodified light aircraft. Camera and platform configurations can be grouped in terms of oblique and vertical. Oblique aerial photography is taken at an angle to the ground. The resulting images give a view as if the observer is looking out an airplane window. These images are easier to interpret than vertical photographs, but it is difficult to locate and measure features on them for map-ping purposes. Vertical aerial photography is taken with the camera pointed straight down. The resulting images depict ground features in plan form and are easily compared with maps. Vertical aerial photos are always highly desirable, but are particularly use-full for resource surveys in areas where no maps are available. Aerial photos depict features such as field patterns and vegetation which are often omitted on maps. Comparison of old and new aerial photos can also capture changes within an area over time. Vertical aerial photos contain subtle displacements due to relief, tip and tilt of the aircraft and lens distortion. Vertical images may be taken with overlap, typically about 60 percent along the flight line and at least 20 percent between lines. Overlapping images can be viewed with a stereoscope to create a three-dimensional view, called a stereo model. Commercial aerial survey firms use light single or twin engine aircraft equipped with large-format mapping cameras. Large-format cameras, such as the Wild RC-10, use 23 cm x 23 cm film which is available in rolls. Eastman Kodak, Inc., among others, manufactures several varieties of sheet film specifically intended for use in aerial photography. Negative film is used where prints are the desired product, while positive film is used where transparencies are desired. Print film allows for detailed enlargements to be made, such as large wall-sized prints. In addition, print film is useful when multiple prints are to be distributed and used in the field. Small-format cameras carried in chartered aircraft are an inexpensive alternative to large-format aerial photography. A 35mm or 70mm camera, light aircraft and pilot are required, along with some means to process the film. Because there are inexpensive commercial processing labs in most parts of the world, 35mm systems are especially convenient. Oblique photographs can be taken with a hand-held camera in any light aircraft; vertical photographs require some form of special mount, pointed through a belly port or extended out a door or window. Small-format aerial photography has several drawbacks. Light unpressurized aircraft are typically limited to altitudes below 4000 m. As film size is small, sacrifices must be made in resolution or area covered per frame. Because of distortions in the camera system, small-format photography cannot be used if precise mapping is required. In addition, present-station-quality wall-size prints cannot be made from small negatives. Nonetheless, small-format photography can be very useful for reconnaissance surveys and can also be used as point samples. Normal color photographs are produced from a composite of three film layers with intervening filters that act to isolate, in effect, red, green, and blue wavelengths separately to the different film layers. With color infrared film, these wave-lengths are shifted to the longer wavelengths to produce a composite that has isolated reflectance's from the green, red and near-infrared wavelength regions. However, because the human eye cannot see infrared, a false color composite is produced by making the green wavelengths appear blue, the red wavelengths appear green, and the infrared wavelengths appear red. As an alternative to the use of color film, it is also possible to group several cameras on a single aircraft mount, each with black and white film and a filter designed to isolate a specific wavelength range. The advantage of this arrangement is that the bands are independently accessible and can be photographically enhanced. If a color composite is desired, it is possible to create it from the individual bands at a later time. Clearly, photographs are not in a format that can immediately be used in digital analysis. It is possible to scan photographs with a scanner and thereby create multispectral datasets either by scanning individual band images, or by scanning a color image and separating the bands. However, the geometry of aerial photographs (which have a central perspective projection and differential parallax) is such that they are difficult to use directly. More typically they require processing by special photogrammetric software to rectify the images and remove differential parallax effects.

3. MULTIPLEXING SPACE AND FOCAL SURFACES

The ability to resolve spatial light variation is an integral part of any imaging system. For the purpose of differentiate between spatial variation on a plane perpendicular to the optical axis and variation along the optical axis inside a camera behind the main lens. The former quantity, transverse variation, is what all 2D sensors measure. Light variation along the optical axis can be described as the depth of field of an imaging system. Although exotic camera systems can resolve structures in the order of 100 nm, the resolution of standard photographs is usually limited by the physical layout and size of the photosensitive elements, the optical resolution of employed optical elements, and the diffraction limit. Attempts to break these limits are referred to as super-resolution imaging. Giga pixel imaging is another field that, similar to super-resolution, aims at capturing very high-resolution imagery. The main difference is that Giga pixel imaging approaches generally do not try to beat the limits of sensor resolution, but rather stitch a Giga pixel panoramic image together from a set of megapixel images. Depth of field (DOF), that is a depth-dependent (de)focus of a pictured scene, plays an important role in photography. While it is sometimes used as a photographic effect, for instance in portraits, ideally a photographer should be able to refocus or completely remove all defocus as a post processing step. Removing DOF blur from images is difficult, because the point spread function (PSF) is depth-dependent, resulting in a spatially-varying blur kernel. Furthermore, the PSF shape corresponds to that of the camera aperture, which is usually circular; due to the low Fourier magnitudes of these kinds of PSFs, high spatial frequencies are irreversibly out in the image capture. The removal of DOF blur is therefore a deconvolution with an unknown, spatial-varying kernel that is not invertible. Applying natural image priors can improve reconstructions, but does not change the ill-posedness of the problem. In order to overcome the difficulties of defocus deblurring, the computational photography community has come up with two different approaches: optically changing the PSF to be depth-independent, resulting in a more tractable shift-invariant deconvolution, and modifying the PSF to be invertible. Point spread functions can be modified with Focal Sweeps, that is moving the object or sensor during the exposure time, or by exploiting the wavelength-dependency of the PSF. Alternatively, the apertures of the imaging system can be coded with cubic phase. All of these approaches optically modify the PSF of the optical system for an extended DOF. The captured images usually need to be post-processed, for instance by applying a shift-invariant deconvolution. An analysis of quality criteria of attenuation-based aperture masks for defocusdeblurring. this analysis was extended to also consider PSF invertibility. Focal Stacks are image sequences, where the focal plane for each photograph in the stack. A single, focused image can be composited by selecting the best-focused match in the stack for each image region. The optimal choice of parameters, including focus and aperture, for the images in a focal stack are well established. Capturing a focal stack with a large-scale high-resolution camera was implemented. Multiplex a focal stack into a single sensor image in a similar fashion as colour arrays multiplex different colour channels into a RAW camera image. However, to the knowledge of the author, this camera has not yet been built. split the aperture of a camera using circular mirrors and multiplex the result into different regions of a single photograph. In principle, this approach captures multiple frames with varying aperture settings at a reduced spatial resolution in a single snapshot. Other applications for exible focus imaging include 3D shape reconstruction with shape. We introduce dynamically coded apertures to extend the capabilities of projection displays. Inspired by coded apertures in computational photography we show how the depth of field of display devices can be significantly extended while preserving a high light transmission.

4. AUTOMULTISCOPIC DISPLAYS

Automultiscopic or auto stereoscopic displays present three-dimensional imagery to a viewer without the need for special glasses. These types can be categorized as parallax-based, volumetric, and holographic displays. The most popular approaches to glasses-free 3D display are parallax-based systems: Parallax Barriers. Parallax barrier approaches place light blocking elements, such as slits or pinholes, at a slight distance in front of a standard 2D screen. While reducing light efficiency and spatial resolution, this is a simple, yet effective approach to optically create distinct viewing zones. More recently, introduced dual-stack LCDs to achieve programmable parallax barriers.follow a similar principle, but enhance the spatial resolution of dual stacked LCDs using time-shifted pinholes. Introduce content-adaptive parallax barriers, optimizing dual-layer displays with temporally-varying attenuation found with non-negative matrix factorization. This approach generalizes parallax-barrier systems and improves light efficiency compared to prior approaches. One of the main advantages of LCD-based parallax barrier displays is the ability to dynamically switch between a high-resolution 2D mode and a lower-resolution 3D mode by switching one of the displays on. Integral imaging methods use an array of lenslets on a 2D screen to synthesize parallax, thereby maximizing the light transmission of the display. While this approach makes it more difficult to switch between 2D and 3D display modes, recent lenticular designs have been show to achieve this effect. The loss in spatial resolution is equivalent to the size of the employed lenslets and comparable to that of parallax barrier systems. Analyze this resolution and discuss anti-aliasing for both parallax barrier and integral imaging architectures, A Volumetric Display as permitting \the generation, absorption, or scattering of visible radiation from a set of localized and speciffed regions within a physical volume". Many volumetric displays exploit high-speed projection synchronized with mechanically-rotated screens. Such swept volume displays were proposed as early as and have been continuously improved. While requiring similar mechanical motion, instead achieve light display, preserving accurate perspective and occlusion cues, by introducing an anisotropic screen and user tracking. Related designs include the exploiting a spinning cylindrical parallax barrier and LED arrays, and the work of, utilizing a spinning LCD panel with a directional privacy. Several designs have eliminated moving parts using electronic projector arrays and beam-splitters Others consider projection onto transparent substrates, including water drops passive optical scatterers and dust particles Multi-Layer

Automultiscopic Displays with three or more attenuating layers were considered for 3D display by Loukianitsa and The employed optimization uses neural networks. In closely-related works, proposes optimizing the properties of layered LCDs with tomographic methods. As described multi-layer LCDs exhibit decreased brightness, and colour crosstalk, with additional layers exacerbating problems. Similar limitations are expected with other spatial light modulators Holographic Displays store wave front information in microscopic scales on a holographic emulsion that is somewhat similar to photographic. Holograms, when illuminated, can synthesize the recorded wave front in great detail with directional variation and high colour accuracy. Unfortunately, holographic recording technology can so far only produce static images with a high visual quality.

CONCLUSION

We have studied the efficiency of highly optimized binary-oriented compression algorithms to examine if it is possible to utilize their high performance, as presented for maps, for grayscale and palette images. We consider a set of binary layer separation schemes. We also consider two schemes for context modeling: one existing and one novel (NCT). The experiments show that statistical context modeling and arithmetic coding cannot outperform the best grayscale-oriented compressors. On the other hand, when applied to artificial palette-like imagery, the optimization of the model results in a compression performance, which is close to the best existing algorithms, and further improvement, is possible. We have proposed a novel filter for reconstruction of map images in the presence of noise.

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