2272538

COLOUR BALANCE DETECTION

The present application is divided out from the present applicants application no. 9111604.6 (S.N. 2245719) filed 30th May 1991 and entitled "Colour Image Production Control".

The present invention relates to a method of detecting the colour balance of an image, for example for use in a colour printing process.

A prior art system disclosed in GB-A-2046943 has made use of at least one colour panel on a colour film to effect a printing system automatic colour exposure correction due to the different inherent colour bias films of different film manufacturers. The colour panel used in the present invention according to its preferred aspects is distinctly different from the said prior art in that:

(i) the prior art serves to identify colour bias attributed only to the make of film by different manufacturers; whereas this said invented colour panel identifies an inherent colour bias attributed to both the make of film and the colour image within.

(ii) the prior art identifies film bias by relying on the machine processor to compare the measured spectral transmissivity of the colour panel on the emulsion film to that of a known standard value corresponding to known different film types; whereas the invented colour panel identifies a bias primarily by null field comparison tests via the basic colour changes affected by an additional presence or absence of a hue.

According to a first aspect of the present invention, there is provided a method of detecting the colour balance of an image comprising forming the image together with at least one colour panel, which colour panel is made up of at least one primary colour incorporating a visually identifiable marking marginally different in density to that of the original panel area, arranged such that a change in density or an additional presence or an absence of a colour

can be shown very sensitively by a null field comparison effect.

This aspect of the present invention helps overcome an operator's difficulties in identifying the hue correction needed for an incorrectly colour balanced projected image.

According to a second aspect of the invention, there is provided a method of producing a colour image using a machine with variable primary colour settings, including the step of detecting the colour balance of the image by a method in accordance with the first aspect of the invention, and adjusting the primary colour settings accordingly to produce a desired print.

In accordance with this aspect of the invention, an image is created alongside at least one density selected colour panel. The panel has at least one primary colour, and that one panel is combined with another primary colour forming another different basic colour. The resulting basic colour change of the or each panel due to the colour characteristics of the image produced is detected and analysed. The correct colour patch which is distinct from the preferred host panel corresponds to a desired print.

The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a diagram showing an example of the colour panels display design for detecting the additional presence or absence of a hue in a colour image.

In the ensuing description the invention applies generally to photographic films having blue-, green- and red-sensitive layers, as well as image production systems having the three primary colours as its primary elements. The primary colour refers to either or both the subtractive and the additive colour principle of colour production. The colour panel of the invention is generally suitable for use with any image producing system that relies on the human eyes as the densitometer for null comparison tests in assessing the quality of the colour image. This would also

include colour television images, and also off-set colour printed images.

Figure 1 shows the step-tablet form of displaying a series of colour panels. In this example, the colour panel is made up of one primary colour Magenta 1, and that one part of the panel has another primary colour Yellow 2, the resulting combination of hue panel 1 and hue panel 2 forming a visual Red hue panel 4. Magenta and yellow hues were selected as the host panels because it is common practice in photographic printing to make colour correction on a print with these two main colour keys, that is, magenta and/or yellow only. Also with the hue panel 4 which is a composite of two primary colours, a third primary colour (cyan) panel 3 is added to form a light grey panel 5. Density of each panel range from 0% onward with gradual marginal increment of the hue saturation in each panel. The colour arrangement is designed so that an additional presence or an absence of a hue at different density level can be shown with great sensitivity by the resulting basic colour changed on the panel/s, thus permitting rapid adjustment during the colour image production process. Ease of use of this visual calibration tablet relies mainly on the null field comparison test attributed to each hue visual effect on the colour panel/s. For example, referring to the "-" 0.05 Y panel, if the print has an absence of yellow by a 5% saturation value, the 0.05 panel (that is 5% saturation colour panel display) would have its original yellow appear as white panel 6, and the original red panel 4 outline becomes non-distinct white one half of the original panel 4 has the same colour and density field as its comparison field (the host panel 1); and the grey panel 5 would show a blue patch once its yellow element is removed. In addition, the other panels of higher saturation density would not have much "easy identification" visual changes, though the 0.10 saturation panel may show some effect but is not as distinctive as in 0.05 saturation panel.

A preferred method for producing these display colour panels is by off-set printing. Due to the overlapping of hue at the smaller panels, therefore, panel 5 has a higher density saturation than panel 4, panel 2, or panel 1; while panel 4 would also be of higher density saturation than panel 1 or panel 2. The panel(s) can be effected onto the negative during the exposure made of the image while using the camera. One example is by placing a finished artwork adjacent to the said off-set printed colour panel(s) and then copied both as a single assembly onto the film in the camera. Another example is to place an appropriate filter(s) diffuser within the camera device such that it is advantageously positioned directly in front of the emulsion film, whereby an exposure made of an object would simultaneously capture a colour identification panel, derived from the selected filter diffuser, on every frame of the film.

Human eyes are good visual tools for null comparison tests. Hence the said step-tablet colour panels when projected as a visual image would facilitate colour identification. The colour selected shall be changed appropriately to the colour production system, example, if its television images, then the additive primary colours are emphasis in the main colour panels display. The colour panel(s) if incorporated into a colour film, then a densitometer device for such identification could be built into a image reading system to take advantage of this colour panel design.

As described above and set out in the claims, the colour balance may be detected using a colour panel which has one part of its area at a marginally different density to the rest of the panel area. The difference in density may arise from the use of the same hue but a different saturation level to the host panel. Alternatively the difference may arise from the use of a different hue with the combined density due to the masking combined with the density of the host panel resulting in the increased

density. For example, if the panel is off-set printed, made up of ink dots, with a yellow hue then a masking area of cyan dots is used on a ground of yellow dots. The masking area appears visually as a green marking and this patch within the main colour panel has a higher density due to the increased number of ink dots.

CLAIMS

1. A method of detecting the colour balance of an image comprising forming the image together with at least one colour panel, which colour panel is made up of at least one primary colour and incorporating a visually identifiable marking marginally different in density to that of the original panel area, arranged such that a change in density or an additional presence or an absence of a colour can be shown very sensitively by a null field comparison effect.

2. A method as in claim 1, wherein one part of the said panel area is combined with another primary colour forming a different basic colour panel, arranged such that any additional presence or an absence of a hue can be shown very sensitively by the resulting basic colour change on the or each panel, thus permitting rapid adjustment during the colour image production process.

3. A method as in claim 1 or claim 2, including the display of more than one colour panel, each panel being distinct by its colour saturation, thus forming a step-tablet, effectively serving as an image colour and density calibrating tool.

4. A method of producing a colour image using a machine with variable primary colour settings, including the step of detecting the colour balance of the image by a method according to claim 2 or 3 and adjusting the primary colour settings accordingly to produce a desired print.

5. A method according to claim 4, in which in the step of detecting the colour balance, a hue step tablet comprising areas of gradual, varying intensities of the three primary colours, incorporating in each area visually identifiable markings of marginally different intensity to that of the rest of the respective area is formed alongside the biased image, and the colour settings of the machine are adjusted in accordance with the results of a null comparison test using the step tablet.

6. A hue step tablet for use in producing colour images substantially as described with respect to the accompanying drawings.

7. A colour panel suitable for use in detecting colour balance, the colour panel being made up of at least one primary colour and incorporating a visually identifiable marking marginally different in density to that of the original panel area, arranged such that a change in density or an additional presence or an absence of a colour can be shown very sensitively by a null field comparison effect.