

PHOTOGRAPHY METHODS AND SYSTEMS

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] The present application claims the benefit, under 35 U.S.C. §119(e), of the following U.S. Provisional Applications:

[0002] Ser. No. 60/490,317, filed Jul. 25, 2003, entitled "Methods and Systems for LED-Based Lighting of Imaging Applications;" and U.S. Provisional Application filed Jul. 15, 2004, entitled "LED Package Methods and Systems," naming inventors Mueller et al.

BACKGROUND

[0003] 1. Field of the Invention

[0004] The present disclosure relates to the use and control of LED-based lighting systems for imaging applications including, but not limited to, photography, video and film.

[0005] 2. Description of the Related Art

[0006] For situations where natural lighting is insufficient, photographers may use strobe lights, tungsten lighting or even fluorescent lighting to light their subjects. Tungsten lighting generates considerable heat, which can cause problems with some subjects. Fluorescent lighting is cooler and more efficient but there are issues with flicker and color temperature control. Strobe or flash lighting gives an intense burst of light flooding the subject with light to insure good image capture. Traditional analog film can use high output flashes because the entire film is exposed at once. However, most digital cameras require constant illumination, so strobes or flashes do not work as well, especially for high-resolution formats. Since digital photography sensitivity has not yet reached the sensitivity of film to light, the photographer may need more illumination than for normal film. Thus, the lighting level required can be high.

[0007] Lighting plays a strong role in the perception of an image. In color imagery, if a pale subject is adjacent to a complementary background, the saturation appears higher. Thus, control of the lighting color can dramatically affect the photographic image. Pastel colors bring a sense of calm, softness bringing a sense of relaxation and are soothing. Saturated colors, on the other hand, are vibrant and emotional.

[0008] Lighting quality is also a function of the lit surfaces, which can vary from matte surfaces (Lambertian) to glossy (specular), surface properties that include texture, color, and the effects of mirrors (reflectivity), glass (transparency) and translucent surfaces. Common challenges include lighting of skin and cosmetics, transparent objects, and others.

[0009] Studio photography can involve substantial setup and control for taking pictures to insure that the illumination is at the appropriate level and the scene is set. Artificial lighting is critical, since natural sources of light are not typically available or controllable. Lighting for studio photography is critical and can change the mood and tone of an image dramatically.

[0010] A great advantage to digital photography and filming over analog technology is that correct color images can

be achieved even under very odd lighting conditions, without the need for filters. Digital cameras typically offer several White Balance options including Auto, Daylight, Cloudy, Incandescent, Fluorescent, Flash and others. Although it may be tempting for a user to simply set the digital camera on "Auto White Balance" and edit it in post-production, it may be preferred that the image be captured correctly in the first place to eliminate post-production issues. Auto balance features generally work well, but again, under low light conditions the exposure compensation may need to be increased to produce an image that is sufficiently bright. The "daylight" setting is good for warm light, typically outdoors or indoors if enough external light is available; however, such settings don't work for all environments.

[0011] In digital photography, post-production can often take as much time or more than the set-up and production of the actual image. Post-production color balancing and color adjustments are often required as well as editing of the image itself. Post-production time also requires skilled labor and can be very expensive. A need exists for lighting systems that improve the quality of photographic images, including images captured through digital photography.

SUMMARY

[0012] Conventionally, LED light sources have not been considered for imaging applications due to their low light output. LED lighting control gives the ability to select color and give the final output without retouching or involving post-production. LEDs have improved to the point where they can provide an alternative to existing lighting technologies, including the area of imaging, such as for photography applications.

[0013] Given the nature and advantages of digital photography and filming there are numerous features that solid state illumination systems can bring to image capture. The embodiments disclosed herein show how such LED systems, especially intelligent LED systems, can be used for photographic and cinematography applications and provide many benefits. Controlled LED illumination allows easy customization of these features to create a particular mood and can be used to create light of desired saturation and hue.

[0014] Methods and systems are provided herein for LED modules that include an LED die integrated in an LED package with a submount that includes an electronic component for controlling the light emitted by the LED die. The electronic component integrated in the submount may include drive hardware, a network interface, memory, a processor, a switch-mode power supply, a power facility, or another type of electronic component.

[0015] In various aspects, the electronic component may include a photosensor.

[0016] In one aspect, there is disclosed herein a lighting system including an LED lighting unit, and a camera, wherein the lighting unit lights a subject of the camera based on at least one of a desired lighting condition for the subject and a feature of the subject. In another aspect, there is disclosed herein a method for illuminating a subject of a photographic image including directing a camera at a subject and lighting the subject with an LED lighting unit based on at least one of a desired lighting condition for the subject and