

CLAIMS

1. An image collection device for light splitting and fusion, comprising:

a light splitter, a visible spectrum imaging module, a non-visible spectrum imaging module, a registration unit, a pre-processing synthesizing unit, and a fusion unit;

wherein the light splitter is configured to split incident light into a visible light and a non-visible light;

the visible spectrum imaging module is configured to perform photosensitive imaging according to the visible light split by the light splitter to form a first visible light image;

the non-visible spectrum imaging module is configured to perform photosensitive imaging according to the non-visible light split by the light splitter to form a first non-visible light image;

the registration unit is configured to perform position registration on the first visible light image and the first non-visible light image to obtain a target visible light image and a second non-visible light image;

the pre-processing synthesizing unit is configured to perform brightness adjustment on the second non-visible light image based on the target visible light image to obtain a target non-visible light image;

the fusion unit is configured to perform image fusion on the target visible light image and the target non-visible light image to obtain a fused image,

wherein a brightness of the second non-visible light image is changed to reduce a difference in brightness of the two images to be fused.

2. The image collection device according to claim 1, wherein, the pre-processing synthesizing unit is specifically configured to:

perform color space conversion on the target visible light image to obtain a brightness component of the target visible light image;

calculate a first mean value and a first variance of the brightness component, and a second mean value and a second variance of a brightness component of the second non-visible light image, respectively;

perform global mapping processing on the brightness component of the second non-visible light image based on the first mean value, the first variance, the second mean value, and the second variance;

convolve the target visible light image and the second non-visible light image respectively by using a preset sobel edge detection operator to obtain a first texture image corresponding to the target visible light image and a second texture image corresponding to the second non-visible light image;

perform brightness adjustment on the second non-visible light image to determine the target non-visible light image by using a brightness component obtained after the global mapping processing, the brightness component of the target visible light image, the first texture image, and the second texture image.

3. The image collection device according to claim 2, wherein, a formula used by the pre-processing synthesizing unit to perform global mapping processing on the brightness component of the second non-visible light image is:

$$y'_N = \frac{\sigma_D}{\sigma_N}(y_N - \mu_N) + \mu_D$$

wherein, y'_N represents the brightness component obtained after the global mapping processing, y_N represents the brightness component of the second non-visible light image, μ_D represents the first mean value, μ_N represents the second mean value, and σ_D represents the first variance, σ_N represents the second variances;

the preset sobel edge detection operator used by the pre-processing synthesizing unit is:

$$sobel_{horizontal} = \begin{bmatrix} -1 & -2 & -1 \\ 0 & 0 & 0 \\ 1 & 2 & 1 \end{bmatrix}, sobel_{vertical} = \begin{bmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{bmatrix}$$

a formula used by the pre-processing synthesizing unit to perform brightness adjustment on the second non-visible light image is:

$$y_{AP} = \frac{y'_N * t_N + y_D * t_D}{t_N + t_D}$$

wherein, y_{AP} represents the target non-visible light image, y'_N represents the brightness component obtained after the global mapping processing, y_D represents the brightness component of the target visible light image, t_N represents the second texture image, and t_D represents the first texture image.

4. The image collection device according to any one of claims 1-3, wherein, the fusion unit is specifically configured to:

perform weighting processing on the target visible light image and the target non-visible light image according to a corresponding first type of weight value to obtain a fused image.

5. The image collection device according to any one of claims 1-3, wherein, the fusion unit is specifically configured to:

perform frequency division fusion on the target visible light image and the target non-visible light image to obtain a fused image.

6. The image collection device according to claim 5, wherein, the process of performing frequency division fusion on the target visible light image and the target non-visible light image by the fusion unit comprises:

performing color space conversion on the target visible light image to obtain a brightness component and a color component of the target visible light image;

performing low-pass filtering on the brightness component to obtain low frequency information of the target visible light image;

performing high-pass filtering on the target non-visible light image to obtain high frequency information of the target non-visible light image;

performing weighting processing on the low frequency information and the high frequency information according to a corresponding second type of weight value to obtain a brightness component corresponding to a fused image to be formed;

combining the brightness component corresponding to the fused image to be formed and the color component of the target visible light image to obtain the fused image.

7. The image collection device according to claim 6, wherein, a formula used by the

fusion unit to perform weighting processing on the low frequency information and the high frequency information according to the corresponding second type of weight value is:

$$y_{Fus} = w*y_{low} + (1-w)*y_{AP} + K*y_{high}$$

wherein, y_{Fus} represents the brightness component corresponding to the fused image to be formed, y_{AP} represents the target non-visible light image, y_{low} represents the low frequency information, y_{high} represents the high frequency information, w represents the second type of weight value corresponding to the low frequency information, K represents the second type of weight value corresponding to the high frequency information.

8. The image collection device according to claim 7, wherein, w is determined according to a brightness difference between the brightness components of the target non-visible light image and the target visible light image, wherein

$$w = \frac{abs(y_{AP} - y_D)}{\max(abs(y_{AP} - y_D))}$$

wherein, y_{AP} represents the target non-visible light image, y_D represents the brightness component of the target visible light image, $abs(y_{AP} - y_D)$ represents an absolute value of $(y_{AP} - y_D)$, $\max(abs(y_{AP} - y_D))$ represented a maximum value of $abs(y_{AP} - y_D)$.

9. The image collection device according to any one of claims 1-3, wherein, the visible spectrum imaging module is placed at 90° with respect to the non-visible spectrum imaging module, and a reflective surface of the light splitter is at 45° with respect to the incident light.

10. The image collection device according to any one of claims 1-3, wherein, the image collection device further comprises an illumination module;

wherein the illumination module is configured to perform infrared illumination on the non-visible spectrum imaging module.

11. The image collection device according to claim 10, wherein, the non-visible spectrum imaging module is further configured to send a illumination signal to the

illumination module when detecting that the first non-visible light image formed itself meets a predetermined illumination condition;

the illumination module is specifically configured to perform infrared illumination on the non-visible spectrum imaging module after receiving the illumination signal.

12. The image collection device according to claim 11, wherein, the predetermined illumination condition is:

a signal to noise ratio of the first non-visible light image being lower than a predetermined threshold;

or,

a gain level during an automatic exposure processing when the first non-visible light image is imaged being lower than a predetermined level.

13. An electronic device, comprising a housing, a processor, a memory, a circuit board, a power supply circuit, a light splitter, a visible spectrum imaging module, and a non-visible spectrum imaging module, wherein the circuit board and the light splitter are disposed within a space enclosed by the housing, the processor, the memory, the visible spectrum imaging module and the non-visible spectrum imaging module are disposed on the circuit board;

the power supply circuit is configured to supply power to each circuit or component;

the light splitter is configured to split incident light into a visible light and a non-visible light;

the visible spectrum imaging module is configured to perform photosensitive imaging according to the visible light split by the light splitter to form a first visible light image;

the non-visible spectrum imaging module is configured to perform photosensitive imaging according to the non-visible light split by the light splitter to form a first non-visible light image;

the memory is configured to store executable program codes;

the processor performs the following steps by running executable program codes stored in the memory:

performing position registration on the first visible light image and the first non-visible light image to obtain a target visible light image and a second non-visible light image;

performing brightness adjustment on the second non-visible light image based on the target visible light image, to obtain a target non-visible light image;

performing image fusion on the target visible light image and the target non-visible light image to obtain a fused image,

wherein a brightness of the second non-visible light image is changed to reduce a difference in brightness of the two images to be fused.