

CLAIMS

1. A method for estimating the movement between two images (I_1, I_2) implemented by an electronic processing device (10), said images being captured using an image capture device (2), said method comprising the steps of:

- collecting data defining each of the two images;
- determining an initialization displacement vector characterizing a displacement between said two images; and

- implementing, based on the initialization displacement vector, an iterative algorithm delivering at each iteration an updated displacement vector according to an error function to be minimized between one of the two images and the transform of the other image by a displacement defined by the updated displacement vector,

- said method being characterized in that it comprises the steps of:

- collecting information defining the movement of the image capture device between the two images;

- collecting the value of capture parameter(s) of the image capture device used for capturing the two images chosen from an angular opening, a zoom factor and the resolution of the images; and

- determining the initialization displacement vector by projecting, in the image plane of the image capture device, the displacement between the two images calculated depending on the collected information defining the movement of the image capture device between the two images and depending on the value of each capture parameter.

2. The method for estimating the movement between two images (I_1, I_2) according to claim 1, wherein the information defining the movement of the image capture device between the two images is provided by a movement determination device attached to the image capture device.

3. The method for estimating the movement between two images (I_1, I_2) according to claim 1, wherein the initialization displacement vector is taken as equal to

$$X_0^{opt} = (a_1^{opt}, a_2^{opt}, a_3^{opt}, a_4^{opt}, a_5^{opt}, a_6^{opt})^T, \text{ where}$$

$$\begin{cases}
 a_1^{opt} = \frac{\left(\frac{W-1}{2} \left(1 + \frac{\tan(\psi)}{\tan\left(\frac{\alpha_\psi}{2}\right)} - s \times \cos(\varphi) \right) + \frac{H-1}{2} s \times \sin(\varphi) \right)}{2^{L-1}} \\
 a_2^{opt} = s \times \cos(\varphi) - 1 \\
 a_3^{opt} = -s \times \sin(\varphi) \\
 a_4^{opt} = \frac{\left(\tan(\theta) \times \sqrt{\frac{(H-1)^2}{4 \tan\left(\frac{\alpha_\theta}{2}\right)^2} + \frac{(W-1)^2}{4} \frac{\tan(\psi)^2}{\tan\left(\frac{\alpha_\psi}{2}\right)^2}} - \frac{W-1}{2} s \times \sin(\varphi) + \frac{H-1}{2} (1 - s \times \cos(\varphi)) \right)}{2^{L-1}} \\
 a_5^{opt} = s \times \sin(\varphi) \\
 a_6^{opt} = s \times \cos(\varphi) - 1
 \end{cases}$$

where L is the number of levels of a successive image resolution reduction pyramid in the case of a multi-resolution the movement estimation method or is equal to 1 otherwise; (ψ , θ , φ ,) are the Euler angles indicated by the collected information, further representing the rotation of the camera about its line of sight, the images having pixels in width and pixels in height, where s is the zoom factor ; α_ψ is the angular aperture (or opening) in azimuth of the camera and α_θ is the aperture (or opening) in elevation of the camera.

4. A computer program comprising software instructions which, when executed by a computer, implement a method according to any of the preceding claims.

5. An electronic device for estimating the movement between two images (I_1 , I_2) comprising an input for collecting data defining each of the two images and being adapted to determine an initialization displacement vector characterizing a displacement between said two images and for implementing, based on the initialization displacement vector, an iterative algorithm delivering at each iteration an updated displacement vector depending on an error function to be minimized between one of the two images and the transform of the other image by a displacement defined by the updated displacement vector,

- said device being characterized in that it is adapted to collect information defining the movement of the image capture device between the two images, to collect the value of capture parameter(s) of an image capture device used for capturing the two images chosen from an angular opening, a zoom factor and the resolution of the images, and for determining the initialization displacement vector by projecting into the image plane of the image capture device the displacement between the two images calculated, depending on the collected information defining the movement of the image capture device between the two images and depending on the value of each capture parameter.

6. The electronic device for estimating the movement between two images (I_1 , I_2) according to claim 5, adapted to take the initialization displacement vector as equal to $X_0^{opt} = (a_1^{opt}, a_2^{opt}, a_3^{opt}, a_4^{opt}, a_5^{opt}, a_6^{opt})^T$, where

$$5 \quad \begin{cases} a_1^{opt} = \frac{\left(\frac{W-1}{2} \left(1 + \frac{\tan(\psi)}{\tan\left(\frac{\alpha_\psi}{2}\right)} - s \times \cos(\varphi) \right) + \frac{H-1}{2} s \times \sin(\varphi) \right)}{2^{L-1}} \\ a_2^{opt} = s \times \cos(\varphi) - 1 \\ a_3^{opt} = -s \times \sin(\varphi) \\ a_4^{opt} = \frac{\left(\tan(\theta) \times \sqrt{\frac{(H-1)^2}{4 \tan\left(\frac{\alpha_\theta}{2}\right)^2} + \frac{(W-1)^2}{4} \frac{\tan(\psi)^2}{\tan\left(\frac{\alpha_\psi}{2}\right)^2}} - \frac{W-1}{2} s \times \sin(\varphi) + \frac{H-1}{2} (1 - s \times \cos(\varphi)) \right)}{2^{L-1}} \\ a_5^{opt} = s \times \sin(\varphi) \\ a_6^{opt} = s \times \cos(\varphi) - 1 \end{cases}$$

where L is the number of levels of a successive image resolution reduction pyramid in the case of a multi-resolution the movement estimation method or is equal to 1 otherwise; (ψ , θ , φ ,) are the Euler angles indicated by the collected information, φ further representing the rotation of the camera about its line of sight, the images having W pixels in width and H pixels in height, where s is the zoom factor ; α_ψ is the angular aperture (or opening) in azimuth of the camera and α_θ is the aperture (or opening) in elevation of the camera.