# White Paper : Dual CV

In this paper we have used TWO camera systems for calculating Camera Vector (CV) and describe the benefits and differences as compared with the ONE camera systems. We are not explaining in detail about the calculation of the traditional CV and its operations here. One can refer to the "White Paper –CV attached as an appendix".

Overview

In addition to the conventional camera (single camera system), the other one is fixed at 1m away from the second camera and the two are synchronized and shooting is performed simultaneously. In other words, we can also say that in one frame of image the two cameras images can be fit.

We have synchronized the two camera system in this case and can also evaluate results even the two camera system are not synchronized.

Synchronous Capture

All-around video
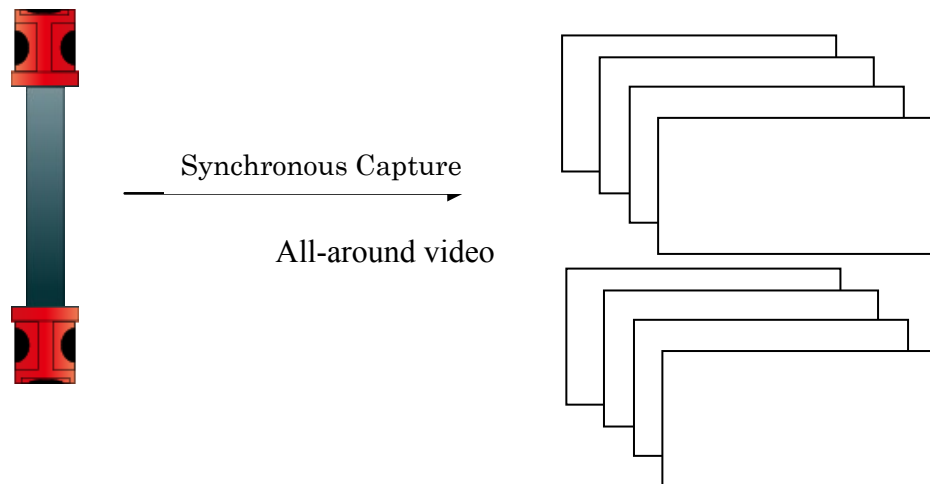
Feature Point Tracking

In the general case, the camera system is required to capture the sequence of images / video image and a conventional CV method is used to determine the relative posture and positions of the camera.

In the traditional CV operations, the relative value's of the camera position is calculated or derived and the scale is all relative. The relative scale can be assigned an absolute scale by fusing actual geo graphical coordinates with the camera vector coordinates and the hence gains an absolute scale. The measured values are used for calibration and these results in the change of scale and hence cause some errors which are inevitable.

In the Dual systems, there is a distance between the cameras's which is well known and this phenomenon always helps to provide an absolute scale continuously. Hence, it has a nice feature which helps to avoid any discrepancy in the scale.

The concept "stereo vision" is misleading in this case and this is only because we are using two cameras. But in this it does not have a parallax distance measurement method using the two cameras.

In the early 20's, use of multiple cameras in an array of cameras and two time-spaces were prominent. But we computer the CV in such case and found the improvement in the accuracy of Dual system.

An extension of this idea is well arranged by multiple cameras, one or even two cameras rather than using multiple cameras. As a result always better than using a single camera. In addition, the stereo system that features no two cameras need not be synchronized.

However, we do not have to bother about the synchronization between the cameras. This is because the distance is known as synchronous and the second camera also helps in tracking the feature and compute camera vector.

As a result, the feature points are selected carefully and easily than before. This is because you can narrow your search of further tracking images. Using this phenomenon, we were able to reduce the calculation time without any compromise in the accuracy.

CV operation

When calculating the CV value for long distance in order to complete the process within time, it is always recommended to process a certain interval/ batch of data at one time i.e separated by interval because it is required to consolidate the results of their calculation.

In this case, each calculation period is too short and is generally accurate enough for the parallax angle feature point. The longer computation time is too long and therefore it is necessary to select the optimal interval length for processing.

In the conventional CV operation the relative value is calculated by using the path of the camera travelled but it was difficult to select the optimal interval length. Therefore, the process is unnecessarily long and hereby reduces the accuracy in case of long length interval.

On the other hand in the case of Dual camera systems, because it is known that the distance between two cameras can be determined the exact distance between each frame. Therefore, an optimal interval length can be selected in the sequential way which results in the no loss of accuracy.

Since we know the exact distance between each frame, therefore we not get a cumulative scale error in the direction of the camera and hence CV value will have more improved accuracy.

Amount of data

Only one factor which affects the Dual System is the data size. In contrast, we can have a smaller number of pixels of a second camera, a higher compression reduce image quality, and possible countermeasures for this.

Improved CPU performance in recent years, possible to store large-capacity storage, and given the speed of data transfer rate are also in other words the evolution which fits into the current era.

上部カメラ

対象物

・Sphere represents a panorama movie.
・CV and the camera (= center of the sphere) of
Location (x, y, z)
→: Angular /rotation information($\theta_x, \theta_y, \theta_z$)

Upper Cam

Downer Cam

Object