

Chapter 2

Interaction of Lower and Higher Vision Applications

Abstract In this chapter, an interaction between the lower vision application performance and the higher vision application performance is explained.

Keywords Low level vision operations • High level vision operations • Interaction • Positive feedback • Negative feedback

Figure 2.1 illustrates the interaction between lower and higher vision applications at the symbolic level. Although lower vision operations do not change the spatial size of data, they can change the color map or switch color image to gray image, which should downsize the total quantity of data.

After image acquisition, the data is entered into the image matrix. After the performance of any image processing operation (low-vision application), data remains organized in the matrix form. After lower processing, the image matrix is subjected to image analysis (high-vision application). A high-vision application yields information, which could take the form of complex data, structured data, char data or some other complex data.

There is interaction between lower and higher vision applications. Information obtained by higher vision applications can be used to narrow the area of search in the case of tracking operations. This is an example of positive feedback.

However, if a lower vision application operates badly, due to e.g. illumination variations, and produces e.g. bad segmentation, the tracker will perform worse than if segmentation was properly made. This may result in the detection of greater or smaller number of targets that there are in reality, or lead to wrong identification of targets and confusion of noise with targets.

This concept can be reduced to 1D case, for example, if electrical voltage over time is analyzed or if vibration signal of turning machine [53] is used as a diagnostic tool. In such a case, data processing results can impact reliability of the data analysis, which is higher level. In the data analysis, someone reaches the conclusions about the input data set. This conclusion can be a state, a word, a number, or anything else with smaller amount of data than the input data set. For example, we can reach the conclusions about monotonicity of the function by examining time change of the function.

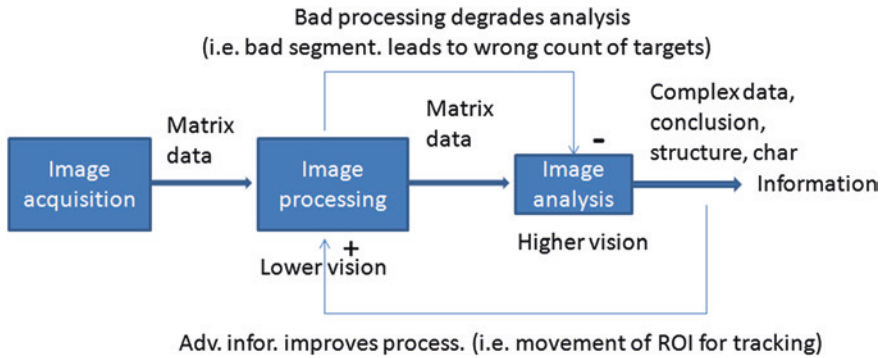


Fig. 2.1 Negative and positive influence to lower and higher vision

Generally speaking, there are a negative and a positive influence of the lower data (image) processing to the performance of the higher level applications. If the low level application (algorithm or function) operates within desired parameters, than such low level application will influence the performance of the higher level application in positive manner.

It has to be noted that higher level application can send a feedback to lower level application. The higher vision application can influence the performance of the lower level application by a positive or a negative feedback. If the higher level application operates outside desired parameters, than the negative feedback can “disorient” the lower level application. However, if the higher level application operates within the desired parameters, than the information from the higher level can improve the performance of the low level application, for example, by reducing the data set that should be taken into account by the lower level application, and, hence, increase the execution speed. This is of vital importance in on-line applications.

Such interaction between lower and higher level applications is important in any application, including applications based on the multiresolution approach.

Multiresolution Approach to Processing Images for
Different Applications

Interaction of Lower Processing with Higher Vision

Vujović, I.

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