

Mathematical methods of advanced image processing in real time

For many years many researchers have worked on image processing algorithms. Some of those works can be found in [1]. Implementing algorithms used for processing video stream add new features for vehicles designed as UAV. Machine equipped with an “electronic eye” can easily find and follow the target without any human intervention. With large enough knowledge base containing known objects the designed machine could be able to move autonomously in a completely new environment. Implementing algorithm with those abilities will be a huge step to create robots or vehicles which will be able to carry on their mission without any outside help.

The problem that is to be solved is to recognize object on a two-dimensional image. Human brain has no problem with such a task. When we see some scene we have no problem to identify objects, estimate its position in scene. But this is very complex and challenging problem for pattern recognition algorithm. One of the basic problems is a huge number of mathematical operations which are to be made. This problem can be solved by using FPGA. Creating on-chip system with implemented pattern recognition algorithm is perfect for UAVs like helicopter. Such a device has small weight and size. Those features are very important because a small size helicopter has low lifting capacity.

Research on pattern recognition algorithms is one of the most important areas of computer vision. Dynamic expansion of this area of science could be observed during last decade. Many of developed algorithms allow to identify only restricted class of objects [3], [4]. Such algorithms work fine but only with implemented classes of objects. If an algorithm should recognize some new object, it is necessary to add a new class. Another method is correlation. This method correlates pixels from proceeded image with pixels from image template. However using correlation slows the algorithm because it takes all image and pattern into consideration. A solution that seems to be very reasonable is to find characteristic points in the image and search an object interesting for us using those points. Methods how to find those key points can be found in [2], [3], [4], [5], [6]. When key points have been found they are used for classification of image pattern. Methods of classification can be found in [2], [7].

References

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