Research and implementation of target tracking algorithm in compression domain on miniaturized DSP platform

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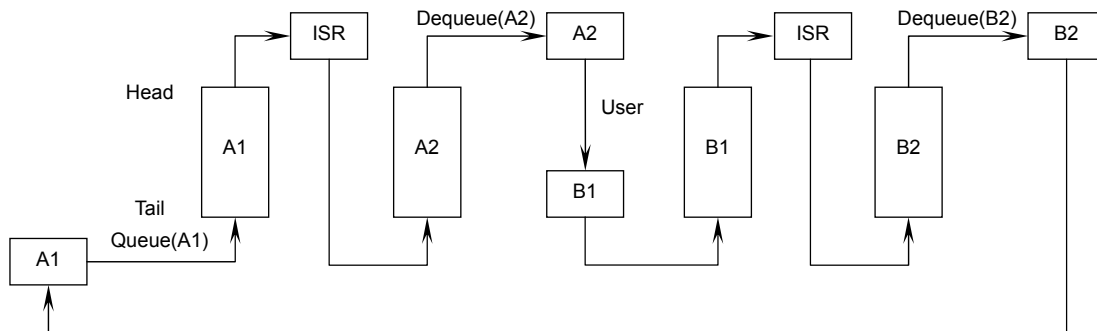
Image buffers management.

Abstract: Target tracking is the key technology of many computer vision systems, and has important application value in a range of military and civil fields such as weapon guidance, intelligent transportation system, medical image system, virtual reality and so on. The essence of target tracking is to determine the position of the target in successive frames of a video. Classic ideas of target tracking in videos are based on the surface model representing the target object, which translates the tracking problem into the problem of maximizing the similarity coefficient between the model and the candidate distribution. This kind of method is often with large computation complexity, and as for the platform with limited resources, the robustness, accuracy and real-time performance are difficult to achieve a good balance. On the other side, tracking method based on decision model is the research hot spot in the field of target tracking. It treats the target localization as a binary classification problem, by designing classifiers to distinguish the target from the background effectively to achieve the aim of target tracking. This method is often able to achieve a higher frame rate, but in embedded system, relative research and applications are still very imperfect. Target tracking algorithms based on compress sensing in compression domain fuses these two types of target tracking methods, and often have low computational complexity, high accuracy and stability. However, there are still some problems to be solved in some applications. The target tracking algorithm in compression domain based on compression perception is studied, and in order to meet the specific application requirements, the shortcomings of original algorithm are improved. At the same time, based on the design idea and demand of miniaturized target position detector, a real-time image processing platform with TMS320DM6437 digital signal processor as the core is designed and implemented, and the algorithm is implemented and optimized on the DSP platform. The simulation and experiment results show that after the combination of Kalman filter, LBP feature and adding adaptive learning rate update strategy, the stability of the algorithm is improved. For the implementation in DSP, after a series of optimizing measures, as for an image with resolution of 960 × 960, taking the target window of 80 × 80 into account, the computation speed can be up to 25 f/s, which can meet the requirement of real-time tracking. The embedded tracking system can track the selected moving objects continuously and stably, and can meet the target localization and tracking requirements under specific applications, which has a real practical value. Morevoer, the method in this paper has a certain reference value for the research and applications of this kind of target tracking method in the embedded platform.