Estimation of Optical Flow in Occluded and Appearance Region Using Flow Extrapolation

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The estimation of optical flow that is a method of estimation motion vector of each pixel in images is used widely, as analysis moving objects in temporal continuity images. There are gradient method and block matching method in optical flow estimation.

However, there is problems such that in the regions where an object is occluded by other objects or where an object appears from behind other objects, optical flows are not precisely estimated. The reason is abrupt intensity changes or motion discontinuity in gradient method and disappear correspondence point.

To solve these problem, following methods have been purposed.

(1) Mode that intersection points of constraint line.

(2) Clustering of constraint lines.

(3) Multiple optical flow estimation.

However, these above methods estimate flows that do not take into account motion continuity and that connect motions in the discontinuity regions, by assign flows in neighborhood points regions to flows in occluded and appearance regions.

Thus, in this paper, to estimate optical flow precisely, we first achieve region segmentation by using the object motion information. We then extract occluded regions and appearance regions. Finally, we assume that each flow (u, v) components are function in coordinates (x, y). Then, we extrapolate flows in those regions from belonging regions. We purpose for precisely estimating optical flow that take into account motion continuity in occluded and appearance regions that optical flows are not precisely estimated. We extrapolate flows in occluded and appearance regions along following process.

First, we extract feature that it occurred occlusion or appearance between different motion objects to extract the information;"Where are occluded and appearance in image".

step1. Estimation optical flows using that can extract occluded and appearance regions each pixels.

step2. Execution segmentation based on motion continuously from estimated flow information.

step3. Extraction occluded and appearance regions using flow information and segmentation information.

Next, it is necessary to decide "which region occluded and appearance regions that are extracted belong to" to extrapolate flows in occluded and appearance regions.

step4. Decision belonging regions that occluded and appearance regions using extracted occluded and appearance regions information and segmentation information.

step5. Extrapolation flows in occluded and appearance regions using flow belonging regions that occluded and appearance regions.

To estimate precisely flows in occluded and appearance region that are not precisely estimated, we suggested the method such that is introduced of 3-conditions and weight function to the method of using vote that is regarded robust against noise. Moreover, we suggested the method using the mentioned method such that, first, extraction occluded and appearance regions, next, decision belonging regions that occluded and appearance regions, finally, extrapolation flows from belonging regions. Moreover, we compared experiment of flow estimation precision in occluded and appearance regions against model image and model image added noise and real image, in the case of only using vote, in the case of vote that is introduced of 3-conditions and weight function and in the case of vote that is introduced of 3-conditions and weight function, moreover, and extrapolation.

From the experimental results, flow estimation precision is improved by using vote that is introduced of 3-conditions and weight function than using only vote. Then, flow estimation precision is improved by using vote that is introduced of 3-conditions and weight function , moreover, flow extrapolation than using vote that is introduced of 3-conditions and weight function. To put it concretely, mean of error decline 3.21907 by using only vote to 0.03432 by using flow extrapolate in model image that translation. And, mean of variance decline 1.60172 by using only vote to 0.07645 by using flow extrapolate in model image that translation. then, mean of error decline 3.21945 by using only vote to 0.68479 by using flow extrapolate in model image that rotation added noise PSNR=23.6[dB]. And, mean of variance decline 1.60172 by using only vote to 0.07645 by using flow extrapolate in model image that rotation added noise PSNR=23.6[dB]. Then, we apply flow extrapolation to real image. As the result, flow estimation precise is improved.

After this, flow estimation precision in Occluded and appearance regions depend on floe estimation precision in belonging regions, therefore, it is necessary to improve flow estimation precision in belonging regions. Thus, we investigate more precisely a method of flow estimation in belonging regions. then, there is real image which light change condition temporally. We investigate a method of flow estimation in real image which light change condition temporally. Moreover, we apply our method to observe doubtful

person using motion information in image that occurred occlusion. And, we apply our method to visual control robot in the situation of occlusion.