3.1 Class of topological algorithms

In 1996, Bertrand and Couprie [11] introduced connectivity numbers for grayscale image. These numbers describe locally (in a neighborhood of 3x3) the topology of a point. According to this description any point can be characterized following its topology. They also introduced some elementary operations able to modify gray level of a point without modifying image topology. These elementary operations of point characterization present a fundamental link between large class of topological operators including, mainly, skeletonization and crest restoring algorithms [12]. This class can also be extended, under condition, to homotopic kernel and leveling kernel transformation [13], topological watershed algorithm [14] and topological smoothing algorithm [5] which is the subject of this article. All mentioned algorithms get also many algorithmic structure similarities. In fact associated characterizations procedures evolve until stability which induce common recursion between different algorithms. The grey level of any point can also be lowered or enhanced more than once. Finally, all mentioned algorithms get a pixel’s array as input and output data structure. It is important to mention that, to date, this class has not been efficiently parallelized like other classes as connected filter of morphological operator which recently has been parallelized in Wilkinson’s work [15]. Parallelization strategy proposed by Seinstra [30] for local operators and point to point operators can also be cited as example. For global operators, Meijster strategy [16] shows also consistence. Hence the need of a common parallelization strategy for topological operators that offers an adapted algorithm structure design space. Chosen algorithm structure patterns that will be used in the design must be suitable for SMP machines.

In reality, although the cost of communication (Memory-processor and inter-processors) is high enough, shared memory architectures meet our needs for different reasons: (i) These architectures have the advantage of

![Fig.2: SDM strategy classification](image-url)