4 Conclusions

4.1 The main results

We have presented vectorization system, which uses locally adaptive binarization algorithm. Efficient implementation of distance transform based thinning algorithm for large binary images was also proposed. The developed algorithm can be used in multiprocessor parallel machines as well as in single-processor computers. The developed system was applied for feature-based filtration of binary images as a part of context-based image compression.

In the second part of the thesis, we introduced a new paradigm of bounding corridor in the state space. Using the iterative reduced search approach in the corridor we introduced fast algorithm for the *min*-ε *problem*, and also for the *min*-# *problem* with joint use of error measures L_2 and L_∞. Furthermore, we extended the idea to the case of closed contours. Finally, we generalized the iterative reduced search approach to the case of multiple-object *min*-ε *problem* for vector data reduction.

4.2 Main conclusions

To bridge the gap between slow optimal and fast heuristic algorithms for *min*-ε *problem*, we introduced paradigm of bounding corridor and iterative reduced search approach. We have released condition of solution optimality to reduce the time complexity of the original full search algorithm. With the proposed iterative reduced search algorithm we have again approached to the 100% optimality very closely. The paradigm was used for solving other approximation problems, including *min*-# *problem* for open curves, *min*-ε and *min*-# approximation of closed contours, *min*-ε approximation of multiple objects.

4.3 Open problems

Although in practice, we can achieve optimal result with iterative reduced search the problem of optimality of the solutions in general case is still open. The analogous

problem concerns the optimality of solutions obtained with analysis of the state space for closed contours with multi-run cyclical DP search.

4.4 Topics for the future research

The future research area includes the following tasks in digital cartography. Using the developed fast algorithms for polygonal approximation we can perform better context modeling of input vector data for lossless compression of vector maps using Minimum Description Length (MDL) approach.

Other important area of research in digital cartography is map simplification with preserving of topology. Currently the topology-preserving approximation is performed with non-optimal heuristic algorithms. With the proposed approach quality of polygonal approximation solution can be improved by the same time cost.