在高新技术不断发展的当下，实现完全的自动化是未来工业制造的发展方向。智能检测作为自动化的关键环节，对机器运作的实时性要求是一个硬性需求。本文基于手机屏幕的缺陷的自动化检测，主要研究了图像处理过程中的程序优化方法，提高运行速度以满足实时性的要求。

本文先介绍了手机屏幕缺陷检测系统在生产线上的工作流程，根据实际的需求采用了多线程并行的程序设计方法来进行优化。为了解决CPU计算能力的瓶颈，利用了GPU的高并发计算提高部分图像处理函数的性能。

多线程并行的方案中，根据程序的工作流程设计了两种线程类型，说明了如何分配线程，并利用了OpenMP对一些循环程序进行了并行化处理。对GPU计算的利用主要是在CUDA架构下，借助了OpenCV的CUDA模块来实现，针对检测算法中的特定函数进行移植；并在移植过程中设计了易扩展和维护的程序框架。

最后，本文对并行化后的程序进行了多方面的测试和分析，总结了毕设的工作成果，也提出了在GPU的利用方面存在的不足，指明了后续研究的方向。

In the continuous development of high-tech, to achieve full automation is the future direction of industrial manufacturing. Intelligent detection as a key link in the automation, the real-time capability of the operation of the machine is a rigid demand. Based on the automatic detection of defects in mobile phone screen, this paper mainly studies the program optimization method in the image processing process, and improves the running speed to meet the real-time capability.

This paper introduces the workflow of the mobile phone screen defect detection system in the production line, according to the actual needs of the use of multi-threaded parallel programming method to optimize. In order to solve the bottleneck of CPU computing power, the use of GPU high concurrent computing to improve the performance of some image processing functions.

Multi-threaded parallel program, according to the program's workflow design of the two types of threads, explains how to allocate threads, and the use of OpenMP to implement parallel processing for loop code. The use of GPU computing is based on the CUDA architecture, with the help of OpenCV CUDA module to run the specific functions of detection algorithm.And also designed a program framework that is easy to expand and maintain during the work.

Finally, this paper has carried on the multidimensional test and the analysis to the parallel procedure, has summarized the work result, also put forward the insufficiency in the utilization of the GPU, pointed out the follow-up research direction.