Project Description

Cuda-based Acceleration for Object Detection Algorithm

Team Member:

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Brief Description Of the Project

This Project aims at getting GPU-based image processing acceleration algorithm. The algorithm used for object detection is based on NVIDIA CUDA library.

Project Background:

Typically, in the assembly line, we need human to recognize the flaws on the material. By using image detection, hundreds of such work can be done automatically by the machine. For this project, we’ve already had the algorithm on CPU. The problem left is to conduct a high speed detection algorithm on GPU.

Detailed Description:

a) Platform:

The project is based on NVIDIA CUDA platform. Specifically, using the NVIDIA Performance Primitives(NPP) library to reach the goal.

b) Programming language

For now, we’re pursuing to use two methods to achieve the algorithm. One is using C++/OpenCV, the other one is Python/OpenCV.

c) Function to be implemented

1) Two kinds of usable parallelism methods of the existing algorithm.

2) Non-uniformity correction of the images

3) Detect the flaws(object) in the image

d) Expectation

1) A usable code, with minor bugs in single image processing.

2) The computation time for single image is less than 50ms on GPU platform. (Typically, the time cost of this project on CPU is around 300ms and the speedup of such problem is 10x – 30x on professional GPU platform. Here, 50ms can meet the requirement but 20-30ms would be better)

3) Experiments and comparison of different methods, the best situation is that we can find the principles and reasons behind differences.

Project Organization

a)Two parts of the whole program --------- This part will be finished by both teams. Weiping Hua will give essential help on the image processing algorithm.

1) Non-uniformity correction of the images

2) Object detection of the flaws

b) Two different methods -------- Divide into two teams to do with different methods.

1) OpenCV\_GPU-module -------- By Team1 (Jiaxin Li and Weiping Hua)

2) CUDA\_NPP-library -------- By Team2 (Sen Zhang and Siyu Huang)

c) Experiments and comparison -------- These part will be finished together.

1) Performance comparison

2) Exploring the reasons behind the differences

3) Compatibility and Robust

Estimated timeline

10.22 – Learning and Studying on the background of CUDA/GPU

10.29 – Understanding the existing CPU algorithm code

11.22 – Conducting GPU-based algorithm code

11.29 – Experiment and comparison

12.3/12.6 – Presentation

12.13 – Project report