5

Benchmarking

William W.-Y. Hsu
Department of Computer Science and Engineering
Department of Environmental Biology and Fisheries Science
National Taiwan Ocean University

CONTENTS

5.1 Introduction 33
5.2 Lab Procedures 33
5.2.1 Super π (SuperPI) 34
5.2.2 Novabench 34
5.2.3 CPU-Z 35
5.2.4 HWMonitor 36
5.2.5 GPU-Z 38
5.2.6 Geeks3D FurMark 39
5.2.7 UserBenchmark 40
5.3 Lab Questions 43
5.4 Lab Report 43

\nobreak

5.1 Introduction

There are many tools that promise to optimize or speed up your Windows computer, but how can you make sure the software did what it promised? Confirmation bias can make it very, very hard to simply "eyeball" your computer's speed because you'll usually want to confirm that your efforts made an impact. This can be a problem as your computer ages. If you have no objective way of knowing how fast your computer is you won't be able to figure out which optimizations work and which don't.

That is where free benchmark testing software comes in. Downloading a free benchmark will give you a firm, objective way of judging the perform of your computer. As you make adjustments to your computer you can see just how much, or how little, your computer's performance has changed.

Reference: http://www.makeuseof.com/tag/5-free-benchmark-programs/

5.2 Lab Procedures

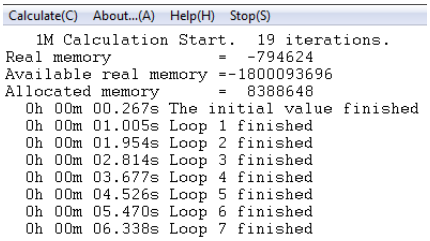
\nobreak

5.2.1 Super π (SuperPI)

While your computer may pack more computing power than the rocket which sent men to the moon, it is still possible to choke a computer processor using simple math, and that is what the SuperPi free benchmark testing software does. SuperPi is capable of calculating Pi up to 32 million digits after the decimal point. This complex math significantly tasks your computer's processor, and SuperPi keeps track of how quickly it takes for your computer to complete the calculation.

SuperPi is focused on your processor's speed, not the speed of other components, so it only useful when judging changes to your computer's processors. For example, overclockers consider SuperPi to be one of the best free benchmarks around because it provides a processor-focused test which can help them judge how much extra performance their overclocking has gained them.

SuperPi can be obtained from `http://www.superpi.net/Download/`.

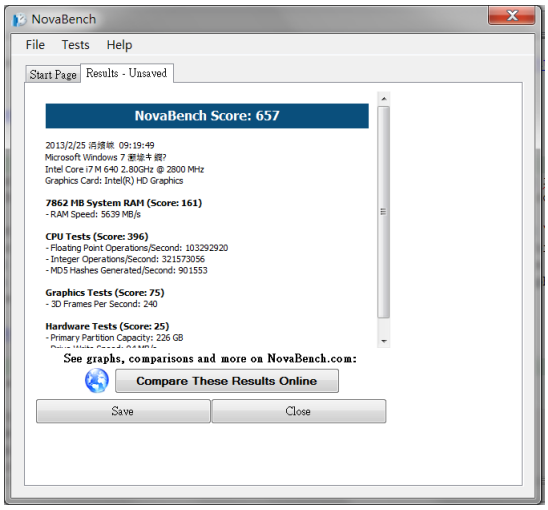


5.2.2 Novabench

Novabench is a free benchmark testing software suite. Unlike many benchmark suites, Novabench isn't a trial version or an older version released for free. The free version is the only version available, and it gauges multiple aspects of your computer's performance.

The Novabench benchmark tests **processing speed**, **2D graphics performance** and **hard drive read/write performance**, making this a very well-rounded benchmark. It is particularly well suited for computers which are meant for a home office, as the hard drive read/write speed benchmark can help you find out if your productivity is being hurt by a hard drive which takes a long time to spin up and transfer data. Novabench also has a basic multimedia and graphics benchmark. It is less intensive than a dedicated graphics benchmark, like 3DMark06, but can give you a general idea of your computer's graphics performance.

Novabench can be obtained from `http://novabench.com/download.php`.

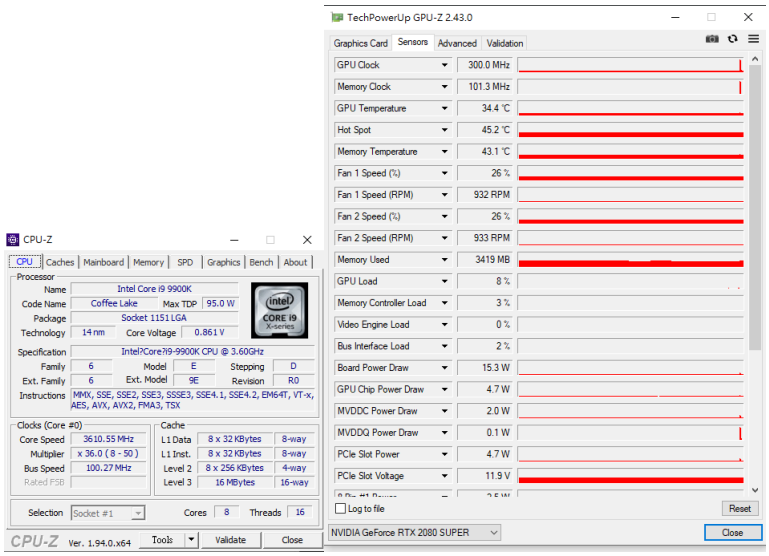


5.2.3 CPU-Z

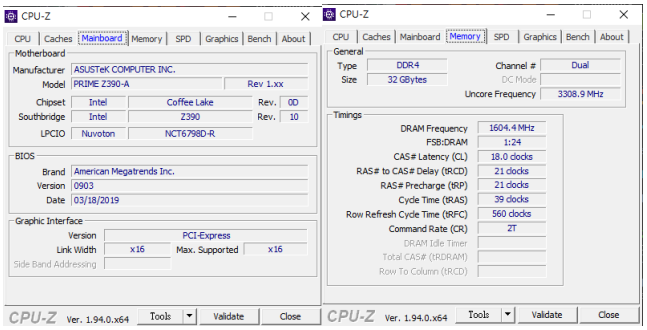
CPU-Z is a freeware that gathers information on some of the main devices of your system :

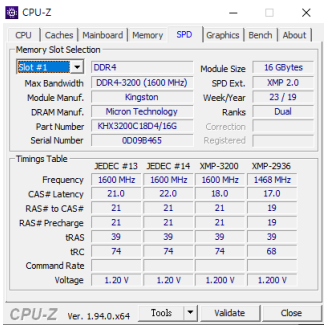
- Processor name and number, codename, process, package, cache levels.
- Mainboard and chipset.
- Memory type, size, timings, and module specifications (SPD).
- Real time measurement of each core's internal frequency, memory frequency.

It is able to identify the parameters of your CPU, such as the processor name, the technology used and packaging, core voltage, supported instruction sets, core speed and core numbers, and cache sizes.



Moreover, it can be used to identify the mainboard information and the BIOS brand. You can also check for the number of memory slots and how much memory is installed. The SPD information can also show you the vender information of your system memory.





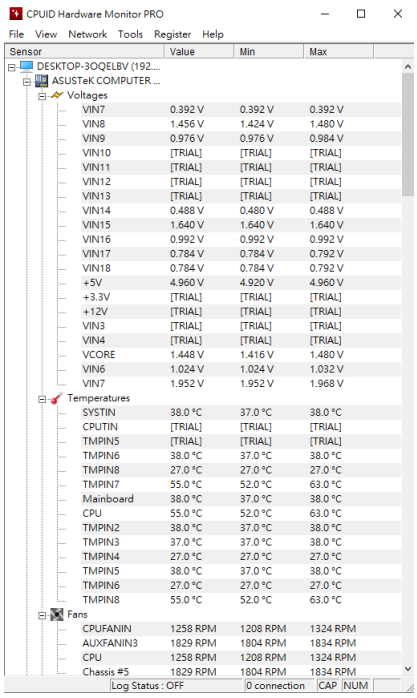
CPU-Z can be obtained from `https://www.cpuid.com/softwares/cpu-z.html`.

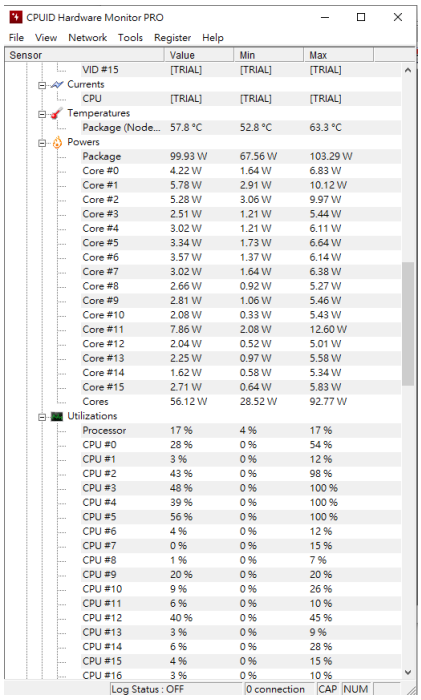
5.2.4 HWMonitor

HWMonitor is a hardware monitoring program that reads PC systems main health sensors: voltages, temperatures, fans speed.

HWMonitor keeps track of your computer's vital statistics, including the temperature of various components and the current incoming voltages. With this information, you can ensure that your machine is not in danger of overheating or any other type of mechanical failure.

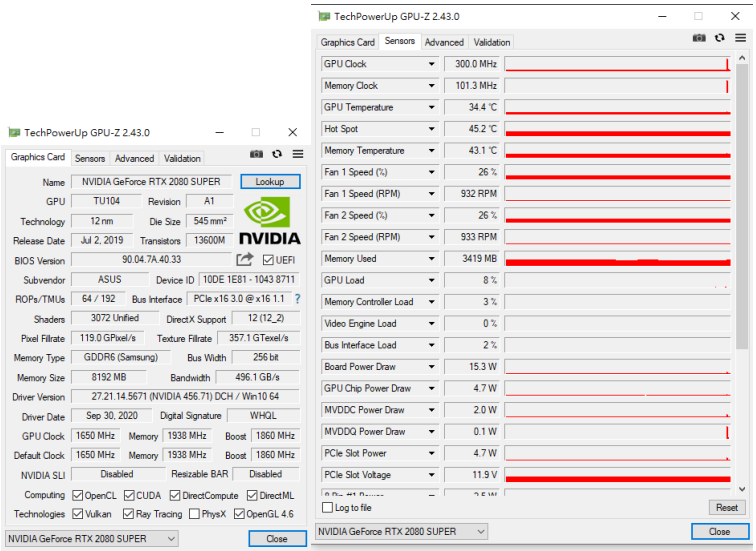
It has straightforward presentation: All of the data that this program records is presented in one clear chart. And in addition to the current readings for all of your systems, you can also see the recommended maximums and minimums for each category to give you a frame of reference. It also includes Real-time updates: This program updates all of the data readings it displays in real time. That means you can just glance over now and then to see how your computer's doing rather than having to switch over to the program and refresh the feed.





5.2.5 GPU-Z

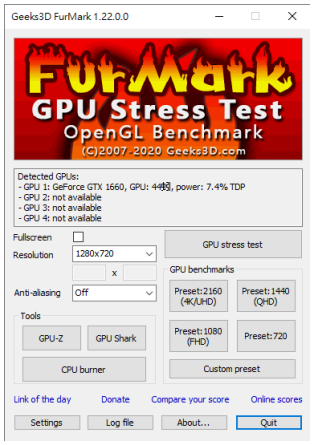
GPUZ can list all the internal factors of your GPU (like the CPUZ software, which lists the details of your CPU). It also monitors the current status of or GPU, including the power usage, fan speed, memory usage, and temperature.



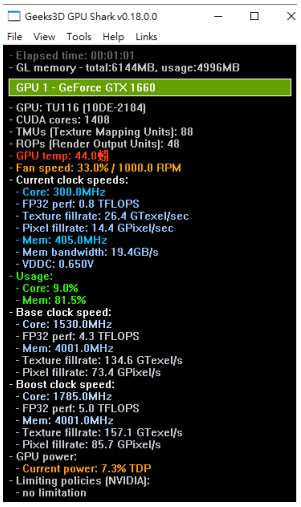
GPUZ can be downloaded from `https://www.techpowerup.com/download/techpowerup-gpu-z/`.

5.2.6 Geeks3D FurMark

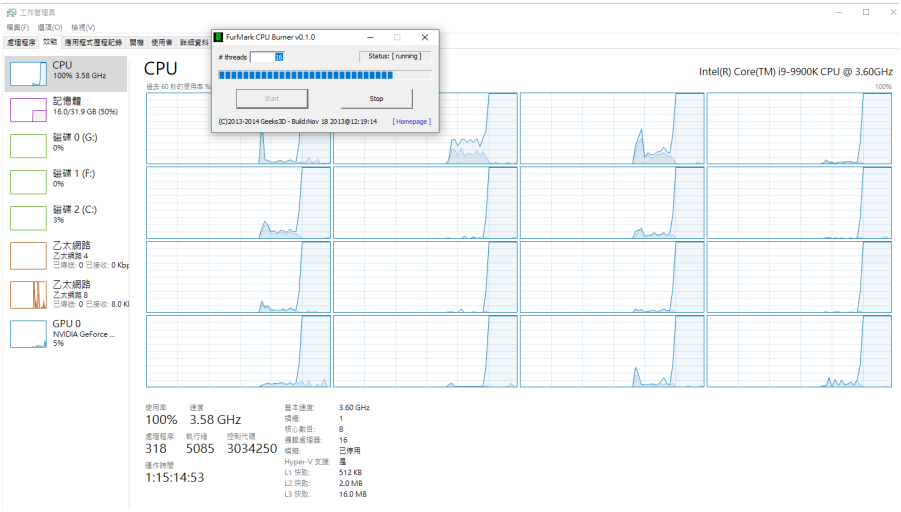
It is a VGA stress test and GPU burn-in test as well as an OpenGL Benchmark. It is a lightweight but very intensive graphics card / GPU stress test on Windows platform. It' s a quick OpenGL benchmark as well. It is simple to use and is free. FurMark is a popular VGA stress test (graphics card burn-in test) as well as an OpenGL benchmark.



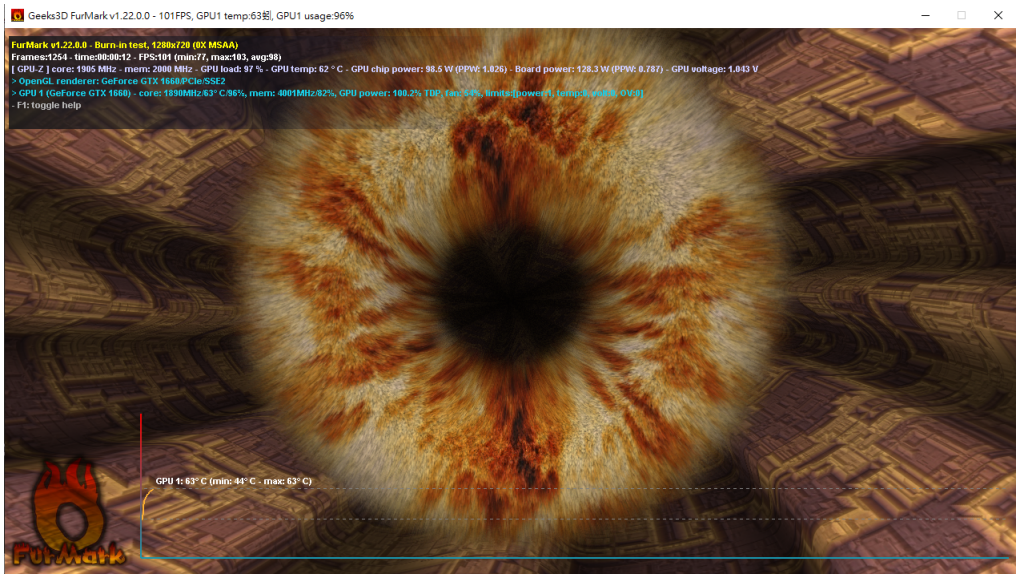
GPU Shark will get all the parameters your graphics card is capable of. The most important features are the `core speed`, `texel rates`, `memory speed`, `memory bandwidth`, and the `TFLOPS`. You can also use this software to monitor the power usage of your GPU.



The *CPU Burn* test will try to eat up all your CPU resource as shown in the next image.



Finally, it is the *GPU stress test*. The stress test puts 100% loading onto your GPU (please use at your own risk and ensure proper cooling). You can use this to test if your system is able to supply enough power to the GPU (if not, your system will become unstable), and to monitor the internal temperature to see if you have proper cooling (to protect your GPU).



FurMark can be downloaded from `https://geeks3d.com/furmark/downloads/`.

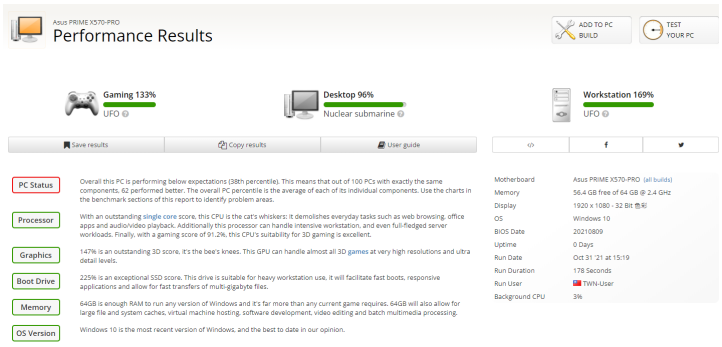
5.2.7 UserBenchmark

UserBenchmark is a free all-in-one benchmarking application. Benchmark your CPU, GPU, SSD, HDD and USB Drives then compare results with other users and see which parts you can upgrade together with the expected performance improvements. *CPU benchmarks bias toward Intel.* (See Google results, `https://www.ptt.cc/bbs/PC_Shopping/M.1564077327.A.E48.html`)

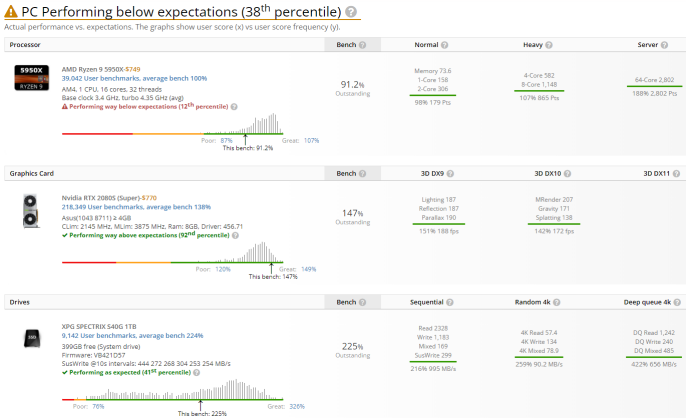
How it works:

- Download and run UserBenchMark.
- CPU tests include: integer, floating and string.
- GPU tests include: six 3D game simulations.
- Drive tests include: read, write, sustained write and mixed IO.
- RAM tests include: single/multi core bandwidth and latency.
- SkillBench (space shooter) tests user input accuracy.
- Reports are generated and presented on userbenchmark.com
- Identify the strongest components in your PC.
- See speed test results from other users.
- Compare your components to the current market leaders.
- Compare your in-game FPS to other users with your hardware.

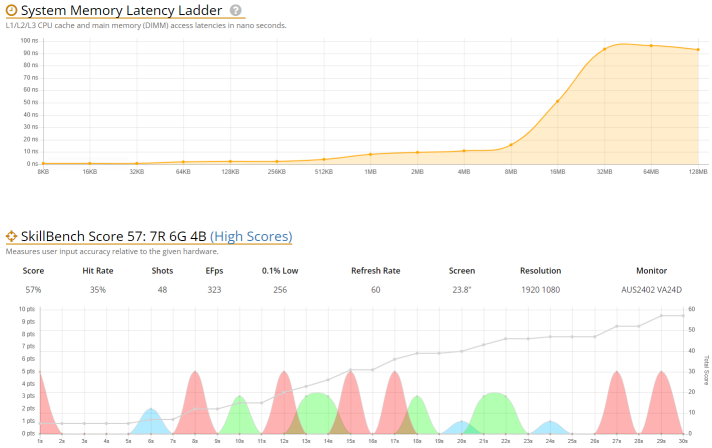
Run the benchmark to obtain the first results, which evaluates the suitability of your PC for different environnemts: Gaming, desktop, and workstation.



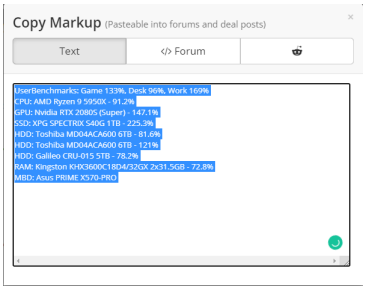
The following results shows the percentile ranking of components.



Play the game to measure results using real application.



The program can generate a simple report of your PC ranking.



5.3 Lab Questions

Finish the attached form and turn it to the TA. Repeat 3 times for all experiments.

- For Super PI, compute PI to 32 million digits. Record the time results for 24 iterations.
- For Novabench, record the results acquired from the program.
- For CPUZ, record the following parameters of your system:
  - CPU Name, technology used (nano meter), core speed, number of cores.
  - The cache of your CPU.
  - The mainboard vender of your system and the chipset.
  - The amount of memory installed and the core frequency of your memory chips. What does the `Channel #` mean?
  - For each of the memory banks, record the vender, bandwidth, and the size of the module.
  - Benchmark the performance of this (or your) CPU against the best CPU currently in our department: `Intel core i9-7980XE CPU 2.6GHz 18C/36T`. What is the relative speed of your CPU against the reference (both single thread and multi thread). The formula is the benchmark score divided by the reference score.
- For FurMark, record the following parameters of your GPU:
  - GPU Name, technology used (nano meter) and die size, approximate transistors, and vendor.
  - Show idle mode power consumption (at a percentage of TDP).
  - Find the maximum (boosted) parameters of your GPU, including (core speed, FP operations, memory speed, texture fill rate, pixel fill rates).
  - Conduct a burn on your GPU for a moment, and record its stable temperature.
- For UserBenchMark obtain the following results for your PC.

5.4 Lab Report

Your lab report is due before the next class.