Parallel Programming Skills

1. The raspberry pi's components include: ARM CPU, Videcore GPU, 1GB of RAM, SD card for a hard disk, mini USB port, HDMI port, Ethernet port, USB, LEDs.

2.The Raspberry Pi has a Quadcore CPU.

3. The two types of processors, ARM and x86 differ greatly from each other as they are built for different purposes and work on different architectures.

To start, Arm processors adhere to the RISK architecture and as a result can only execute a single simple instruction per a cycle regardless of the GHz of the processor. In contrast the x86 CISC architecture allows multiple cycles for executing an instruction which allows these instructions to be much more complex. Therefore, when coding instructions for x86 one might write a line which would be the equivalent of 6 lines of instructions for Arm processors.

As a result, Arm processors aren’t as powerful in comparison to x86 processors. This is evidenced by the fact that Arm processors are usually found in devices that don’t need extremely high processing power such as phones. Smartwatches etc.

However, they’re also in such devices because they are inherently more power efficient than x86 processors, which are gluttons for power in comparison.

4. Sequential processing differs from parallel processing in that sequential processing cannot compute two instructions at the same time. In contrast, parallel processing is the capability to do such things.

5. In a computational problem, when a computer is performing data parallelism it creates a subset of input data and passes it to the different CPUs or Cores which are computing the same operation.

In contrast when a processor is performing task parallelism it splits the problem based on sub tasks rather than data and assigns each CPU different operations to do from the subtasks.

6.Processes and Threads are both instances of execution, the difference is that threads run in a shared memory space, and processes run in separate memory spaces.

7. OpenMP is an API that developers use to make parallel applications; which are programs that are designed to carry instructions on shared memory across different CPUs or Cores. OpenMP directives, or pragmas, tell the compiler how should input be processed, specifically a directive might only refer to how a compiler handles a small section of the program’s code. For example, an OpenMP directive called “omp parallel” tells the compiler if a block of code is a parallel region, and in response a group of threads are created to execute the code.

8.Some applications that benefit from multi-cores are: video editing software like Adobe Photoshop, graphic intensive games like “Fortnite”, audio processing and sequencing programs like “Fruity loop Studios”, and resource hungry productivity programs like Excel.

9. With Multiple Cores one can do parallel processing which is faster than having a single core attempt to Multitask. As a result of being able to do parallel processing, Multicore CPUs can perform at the same level as a single extremely fast higher frequency processor while using less power. In correlation, multicore CPUS tend to last longer as they use less power and therefore generate less heat; which over time damages the CPU. And lastly, many applications are developed so that they can utilize all cores of a CPU; and as a result, run far faster while having less CPU usage than a single core regardless of clock frequency.