Software Framework for Hosting Component Video Analytics Engines

The present application claims a filing date of a Singapore patent application Nr. 10201805865T as its priority date, which was filed with IPOS (Intellectual Property Office of Singapore) on 07 July 2018, and has the title of an Efficient Software Framework for Hosting Component Video Analytics (VA) Engines. All relevant content and/or subject matter of the earlier priority patent application is hereby incorporated by reference wherever appropriate.

A software framework is described herein to host a variety of modular video analytics engines, such as face recognition, license plate recognition, vehicle detection and classification, intrusion detection, attribute detection and so on. The framework has standard interface, which allow different VA modules from different developers to be integrated into the platform in a plug-and-play manner. The framework is also flexible that the adding and removal of VA modules or components within a VA module easy. The software framework allows the video analytic solution developers to focus on the algorithm development without worrying about the software architecture.

The framework system is designed for real-time video analytic with high level of robustness and efficiency. The framework takes the advantage of data parallelism and task parallelism with multi-GPU structure in the server to achieve real-time processing speed. The software framework features a built-in anti-lock system. When more and more VA modules are added, with limited computing resources, the VA platform may hang and not able to produce the analysis result in time. With the software framework,

the platform can destroy the bad processes and therefore have “guaranteed response” in real-time operation. The designed system has high run-time robustness that the system can function as normal when some VA modules does not work, other ones will still function. The framework has system bottleneck identification and profiling, which can show insights into the system and where the problem might occur.

System Design I, Configuration: One Fixed camera, Functions:

Vehicle Classification, Vehicle Tracking/Detection

Features: Cannot do long term (non-adaptive tracker/detector/classifier)

[Embodiments of the module]

Figure 1 illustrates a comparison of a previous frame and a current frame;

Figure 2 illustrates a proposed system design I for people behavioral analysis.

The platform enables:

1. Adding/removing modules/edges without affecting the others at runtime/compile time.
2. Standard interface, programmers easy to test, debug, collaborate, easy project management, they don’t need to write a main for every case they want to test and compare results.
3. Fast and error-robust customization for customers, able to handle cases when customer changes his mind in the middle of the way.
4. Reusability of individual modules, enable communication between modules.

Robustness Real-time system

1. Anti-lock systems. When we are adding more and more modules, as computing resource is limited, the system will hang if it cannot meet the ‘deadline’ of producing the result. With the framework, the system will continue to function by destroying the bad processes and have “guaranteed response” as in any real time system.
2. Runtime robustness. When one module does not work, other ones will still function.
3. System bottleneck identification to show insights into the system

Dynamic computing resource allocation:

Real-time system must take advantage of data parallelism and task parallelism with multi-core structure to achieve the fastest processing. This allows programmer to focus on the algorithm instead of programming multi-threading. The research program normally doesn’t take data parallelism and task parallelism into account.

An open analytics platform for researchers:

The milestone integration platform can be used for analytics, in which the whole video analytics system is “outsourced” to a company to develop. This system, as we have seen, needs a combination of modules. These analytics modules themselves need a platform to develop and plug and play especially for high performance analytics system. Each researcher normally is best on one module and is not easy for them to test on an actual system. Our platform provides them with a channel to put their best into the system commercialize their technology at the same time.

In the application, unless specified otherwise, the terms "comprising", "comprise", and grammatical variants thereof, intended to represent "open" or "inclusive" language such that they include recited elements but also permit inclusion of additional, non-explicitly recited elements.

As used herein, the term "about", in the context of concentrations of components of the formulations, typically means +/- 5% of the stated value, more typically +/- 4% of the stated value, more typically +/- 3% of the stated value, more typically, +/- 2% of the stated value, even more typically +/- 1% of the stated value, and even more typically +/- 0.5% of the stated value.

Throughout this disclosure, certain embodiments may be disclosed in a range format. The description in range format is merely for convenience and brevity and should not be construed as an inflexible limitation on the scope of the disclosed ranges. Accordingly, the description of a range should be considered to have specifically disclosed all the possible sub-ranges as well as individual numerical values within that range. For example, description of a range such as from 1 to 6 should be considered to have specifically disclosed sub-ranges such as from 1 to 3, from 1 to 4, from 1 to 5, from 2 to 4, from 2 to 6, from 3 to 6 etc., as well as individual numbers within that range, for example, 1, 2, 3, 4, 5, and 6. This applies regardless of the breadth of the range.

It will be apparent that various other modifications and adaptations of the application will be apparent to the person skilled in the art after reading the foregoing disclosure without

departing from the spirit and scope of the application and it is intended that all such modifications and adaptations come within the scope of the appended claims.

Claims

1. An efficient software framework for hosting component video analytics engines for real-time robustness and efficiency, comprising:

multi-GPU structure to achieve the fastest processing;

wherein

- the software frame allows programmers and video analytics vendors to focus on the algorithm instead of software architecture;
- the software framework is in-built with anti-lock systems;
- when we are adding more and more modules, as computing resource is limited, the system will hang if it cannot meet the ‘deadline’ of producing the result;
- with the framework, the system will continue to function by destroying the bad processes and have “guaranteed response” as in any real time system;
- the designed system has high run-time robustness, which means that, when one modular video analytics engines does not work, other ones will still function; and
- system bottleneck identification and profiling which is able to show insights into the system and where the problem might occur.

2. A software framework for hosting component video analytics engines substantially as shown and described.