In recent years, the number of ECUs (Electronic Control Unit) has been on the increase, and ever more integrated and complex vehicle control systems are now installed in a vehicle, due to high functionalization and complication of vehicles. Moreover, for vehicle development, the move toward shortening the production lead-time and reducing the length of prototype production are noticeable. The most important issue today, therefore, is to develop new software for vehicle development with more efficiency, within a short period, while maintaining our product quality standard.

This paper reports our development of a new software development environment, "Virtual ECU", which will enable us to design the software to produce highly reliable ECUs without a prototype production. This system primarily consists of two parts: 1) HIL (Hardware In the Loop) Simulator CRA-MAS (ComputeR Aided Multi Analysis System), and 2) High-Performance Microcomputer Simulator, "CoMET/METeor".

Abstract

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Development of Control Software by All-software Simulation

Introduction

The current situation of vehicle control system development has changed due to the growing demand for automotive electronics. Software-based development methods have become an important subject of concern for car manufacturers. Software development is a core activity for new car models, and the development of control software plays an important role in the development process.

Current Situation of Vehicle Control System Development

2.1 Vehicle Control Software Development Using Vehicle Simulation

The development of vehicle control software using vehicle simulation methods has become an important topic in recent years. Such simulation methods provide a way to test and verify software without the need for physical prototypes. This allows developers to test software in a controlled environment before implementing it in real vehicles. By using simulation, developers can identify potential issues early in the development process and ensure that the software meets the necessary requirements before deployment.

Development of Control Software by Microcomputer Simulation

2.2 Development of Control Software by Microcomputer Simulation

A microcomputer was used to simulate the control software for an automobile engine. This was done to test and verify the software before implementing it in the actual engine. The simulation environment was set up to mimic the real-time conditions of the engine, allowing for precise testing and debugging. The results from the simulation were then used to make necessary adjustments to the software, ensuring its reliability and efficiency.

3.1 Ultimate Simulation Environment: "Virtual ECU"

A virtual ECU was also developed as part of the simulation environment. This virtual ECU provided a comprehensive and realistic representation of the actual ECU, enabling developers to test the control software in a controlled and isolated environment. The virtual ECU was designed to be flexible and adaptable, allowing for the integration of different software modules and the testing of various operating scenarios.

Development of Control Software by All Soft Simulation

The development of control software by all soft simulation involved the use of software tools and techniques to simulate the behavior of the system. This approach allowed for the testing and optimization of the software in a virtual environment, eliminating the need for physical prototypes. The software was designed to be modular and scalable, enabling easy integration with other systems and components. The simulation results were used to refine the software, ensuring its performance and reliability.
3.2 System Configuration of "Virtual ECU"

This section describes the system configuration of the virtual ECU. The virtual ECU is designed to simulate the behavior of a real ECU under various conditions. The system configuration consists of several components that work together to create a realistic simulation environment.

The virtual ECU is connected to a host computer and various peripheral devices, allowing for real-time communication and data exchange. The system includes a control unit that manages the overall operation, a data acquisition module for monitoring input signals, and a display unit for visualizing output responses.

The virtual ECU is configured to emulate different scenarios, enabling developers to test and validate control software under various conditions. This approach helps in identifying potential issues and optimizing the performance of the control software before deployment.

In conclusion, the system configuration of the virtual ECU is a crucial component in the development process, providing a reliable platform for evaluating and improving control software functionality.
3.3 Future of "Virtual ECU"

A Business Model (Virtual ECU Club)
Profiles of External Writers

Syuzo Tanaka
Established GAIA System Solutions Inc. in January 1996. Since then, has engaged in CoMET/METeR technical support and development of model and preinstalled software. Currently the Chief Technology Executive and Executive Director.

Takamichi Kono
Entered Toyota Tsusho Corporation in 1999 and was engaged in in-car electronics component sales. Assigned to work in Toyota Tsusho Electronics Corporation in 2004, since then has engaged in in-car pre-installed software related business and administrative work in the Limited Liability Intermediate Corporation JAS-PAR.

Yuu Moriyama
Entered the company in 1998. Since then, has engaged in development of simulator (CRAMAS) used in control system development. Currently in the CRAMAS Engineering Department of CRAMAS Division, AE Group.

Kengo Iino
Entered the company in 2003. Since then, has engaged in development of simulator (CRAMAS) used in control system development. Currently in the CRAMAS Engineering Department of CRAMAS Division, AE Group.

Takeshi Fukazawa
Entered the company in 1980. Since then, has engaged in development of automobile electronics devices and development assistant tools. Currently the Manager of the CRAMAS Engineering Department of CRAMAS Division, AE Group.