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Automatic and Optical Testing of Features of Electronic Control Units in Automobiles since the Early Prototype-Phase

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Innovative products and new technology enjoy increasingly popularity in all areas of life. Due to this fact we see many new features in automobiles appearing every year. Especially new infotainment components accomplish the demands of customers on having more entertainment in cars and making car driving more comfortable. The automobile industry meets the demands of customers by transferring new multimedia technology continuously in cars and by developing continuously more and more driver supporting assistant systems.

As a consequence of developing technology quantity and complexity of electronic components in automobiles increase enormously. And this results in complex test equipment and test processes for testing the high-grade networked electronic control unit (ECU) components. In this paper we present a new testing system which provides testing opportunities of complex networked ECU's in early prototype phases focusing on automation of tests. This is particularly meant for proving optical responses on displays and instrumentations in cars.

The presented innovative system provides a complete automatic module for observation of instrumentations in automobiles and test of ECU's without any human intervention. Tests can be adjusted to work many days repeating the same test cases several times under exactly the same conditions and reporting absolutely autonomously the results. The system consists mainly of a camera-system, a robot-arm, a special image processing software, data logger and a powerful restbus-simulation captured in a closed box. It is purposed for applying exactly the same test cases in high numbers to incoming new versions of ECU's and their software and is very qualified to find sporadic errors.

The system offers beside repeatability and reproducibility the advantage of high accuracy, objectiveness and high reachable numbers of repetitions using night and day. This fact allows earlier finding of errors than usual in prototype- ECU's, which means high reduction of costs due to less expensive removal of errors, before the start of production.

A high number of test cases applied to the ECU's increases the probability for finding errors. Performing the tests manually in a very high number is not possible due to leak of resources, leak of time and the fact that there is no guarantee that the testing person is objective and precise enough in every repetition. Therefore automation of the testing processes is inescapable.

The system is supplemented by a powerful and new text detecting algorithm which was developed by VOLKSWAGEN AG. It is capable to find text on displays and works without any tedious learning steps. Thus the testing gets independent from design changes concerning the font, size of characters or background. This further feature enhances the extremely versatile system and extends the feature list of the system including needle detection, needle dynamic analysis, symbol recognition, sound analysis and many more options. Moreover beside performance tests different other kinds of tests like reaction measurement, stability test, blinking test are possible. A similar system does not exist in the market yet.