PROTOTYPE RESEARCH AND DEVELOPMENT FOR IMAGE PROCESSING SOLUTION FOR BOARDS TESTING IN THE AUTOMOTIVE INDUSTRY

Goal of the project

The main goal of the project is to obtain a prototype, able to execute boards inspection, based on image processing, functioning in accordance with the company requirements for the production line.

Short description of the project

The starting point of the project was represented by an experimental model. The activities were to adapt, to improve, to test and to validate the software from the experimental model within a new mechanical-hardware structure in order to obtain a prototype that is able to perform ECU tests based on image processing functioning in accordance to the Hella company requirements in the production line.

Implementation period

22/11/2018-22/03/2019

Main activities

The prototype was conceived and implemented, and the solution was integrated, tested and validated in the production line.

Results

Some results are detailed below:

1) Starting from the experimental model (consisting of 4 compact modules, each containing a Raspberry Pi and a camera), the solution was modified within the prototype in order to fit the high number of different ECUs from the production line and to reach the test indicators. A prototype solution was conceived and implemented, based on 6 Raspberry Pis and 6 cameras, this time physically separated, and improving the quality of the inspection for the connectors with perspective issues. Having separated cameras, the prototype allows besides higher possibilities to eliminate the perspective, a higher luminosity on the ECUs analyzed surface.
2) The capability to vehiculate data between 1 master and 5 slaves, including from request/response transmissions toward data aggregation, concluding procedures and reporting.
3) A generic platform was created for n processing modules. Therefore now, the prototype contains only two branches: 1 master branch and 1 slave branch, and the software from the slaves is generic for any Raspberry Pi slave in the scheme.
4) The prototype solution is extended to function for the 4 main classes of ECUs from the production line. The extension required a whole new concept for the software module.
5) Modules were conceived and developed to include layouts from all main classes of boards and all the particular sets of boards inside the main classes.
6) The pin search module was optimized to reduce the search area and the processing times.
7) New detection modules were researched and implemented based on islands identification, separation and grouping, for more accurate conclusions.
8) A new method was researched and developed to establish a dynamic illumination threshold associated to each pin.
9) The layout saving, storing and loading was optimized due to the high number of layouts in the production line.
10) Detection task request optimizing was researched and implemented mainly in a sense that the master equipment extracts and sends a list of the connectors to analyze for each slave equipment. This procedure eliminates the fix slaves, each being able to be replaced without application issues.
11) The processing time was significantly reduced by eliminating the necessity of connector rotation for the slave's software.
12) A new module was implemented for new layout learning, placed only on the master equipment. This way no ssh/vnc connection is necessary for each slave.
13) A new offset (search area) separation was researched and implemented so that each pin has now its own offset. Also, a new module was created that establishes the filling factor for the offset for each pin.
15) The prototype is able to apply all the changes in configuration from the graphical user interface.
16) The prototype functions in complete correlation with the traceability software within the company.

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HELLA ROMANIA S.R.L.

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