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Rescuing legacy software in embedded system for fuel cell control

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Application of static code analysis, test driven development and automated software tests on legacy software to aid the adding of features without jeopardizing the integrity of the existing system. This was done using the free and open source software tools Sonar, CPPUTEST, GCC, CMake and Git. Using cyclomatic complexity, code block size and violations of the MISRA C coding standard as guidelines, the legacy code was analyzed to learn about overall quality. A parallel build system was added to enable the addition of automated tests while maintaining the integrity and functionality of the working code base. At all times, unit tests were added before touching the existing code, to lock down the functionality that was widely not documented. Test driven development created the platform for adding features and fixing critical bugs. Applying test driven development allowed for major restructuring of the code toward SOLID design that would have been daunting without this safety net.

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Robot workmate, a trustworthy coworker for the continuous automotive assembly line and its implementation

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The automotive industry is facing significant challenges due to shortened product lifecycles, increased product variances, and uncertain market conditions. The current assembly systems are not able to react on this change and handle these increased requirements efficiently. So new technologies like cooperative robots and intelligent assistance systems to plan and perform assembly processes properly. Human-robot collaboration has evolved as a solution to overcome these difficulties and create flexible and customizable automation processes. This paper delivers an approach for a methodology to implement lightweight robotic systems into the assembly line. This optimization allows for cooperation between robots and the manual labour, which enhances the ergonomics, productivity, and quality level of the process station. Shown application is commissioning processes for leak detection and overhead assembly processes like underbody shield and plate installation. The presentation ends with an outlook on realized plant installations.

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