Model Based Development of Embedded Control Systems : Historical Perspective and Recent Advances

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The thesis we wish to illustrate consists of showing that the safety-critical control industry has designed a very strong model-based development method in order to face the severe safety requirements it has to face. We shall illustrate this thesis based on the methods in use at Airbus in the design of early fly-by-wire systems. Then we describe the evolution of this method from these pioneering times up to the present time and show what could be an ideal workflow today. Then we present a recent advance in this framework consisting of faithfully implementing control systems in a multi-tasking framework in such a way that the implementation matches what has been modelled. We show how we can achieve this goal and show that this approach has also be taken in the Matlab/Simulink code generator. We conclude by drawing some perspectives for the future.