

Title: A Model-based approach to Automated Test Generation and Error Localization for Simulink/Stateflow

Abstract: Simulink/Stateflow is a popular commercial model-based development tool for many industrial domains. For safety and security concerns, verification and testing must be performed on the Simulink/Stateflow designs and the generated code. We present an automatic test generation approach for Simulink/Stateflow based on its translation to a formal model, called Input/Output Extended Finite Automata (I/O-EFA), that is amenable to formal analysis such as test generation. The approach automatically identifies a set of input-output sequences to activate all executable computations in the Simulink/Stateflow diagram by applying three different techniques, model checking, constraint solving and reachability reduction & resolution. These tests (input-output sequences) are then used for validation purposes, and the failed versus passed tests are used to localize the fault to plausible Simulink/Stateflow blocks. The translation and test generation approaches are automated and implemented in a toolbox that can be executed in Matlab that interfaces with NuSMV.