

Uncertainty-wise and Model-based Testing of Industrial Cyber-Physical Systems



simula

Man Zhang, Shaukat Ali, Tao Yue, Phu H. Nguyen
{manzhang, shaukat, tao, phu}@simula.no

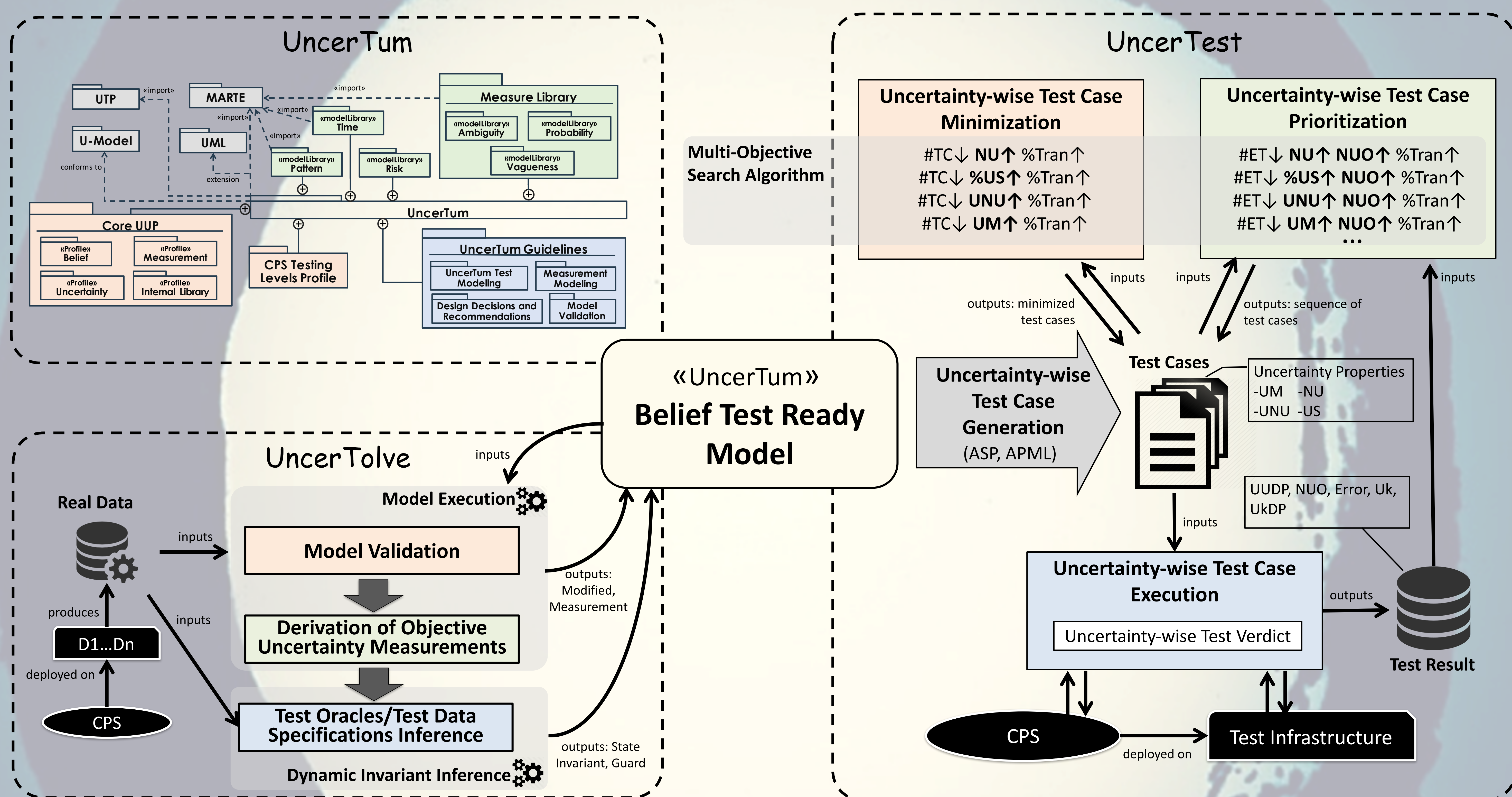


Motivation and Objective

The industrial applications of Cyber-Physical Systems (CPS) are visible in many domains, as for example, in robotic, aerospace, and healthcare. Given the critical nature of their applications, it is important that a CPS performs its function normally even in an uncertain environment.

U-Test project aims at ensuring that CPSs are tested adequately under uncertainty using systematic and automated techniques such as model and search-based testing to guarantee their correct operation in real environment.

Uncertainty-wise and Model-based Testing Framework



Industrial Applications



Handling System



GeoSports

Conclusion

- UnerTum is sufficient (100%) to specify uncertainty and its features in test ready models according to two case studies;
- UnerTolve successfully evolved 51% of belief elements, 18% of states, and 21% of transitions of the test ready model as compared to the initial test ready model developed for the GeoSports case study;
- To evaluate UnerTest, our best test strategy managed to observe 51% more uncertainties due to unknown indeterminate behaviors of the physical environment of the CPSs as compared to the rest of the test strategies. Further, we evaluated uncertainty-wise prioritization solution based on the execution results of test cases for GeoSports, and result shows that our prioritization solution improved the cost and effectiveness of test case execution significantly and at the same time maximized the occurrence of uncertainties.

Research Partners

Tool Vendor

Exploration

Case Study Providers

Test Bed Provider

Administration

[simula . research laboratory]



TECHNISCHE
UNIVERSITÄT
WIEN
Vienna University of Technology

Fraunhofer
FOKUS



IK4 IKERLAN
Research Alliance

future
position
60°40' North
17°06' East
213°141.90.204



NORDIC
MEDTEST



www.u-test.eu