MBT for real-time embedded software

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MachineControl @ G&D Banknote Processing Systems

MachineControl within BPS (BanknoteProcessingSystem) responsible for

- Monitoring and control of mechatronical system for
  - banknote singling
  - banknote tracking, sorting and stacking
  - banknote packaging and delivery

MachineControl: typical I/Os

- G&D Fieldbus (CAN)
- ModuleController (µC-based unit)
- Analog Inputs
  - Micro switches
  - Reed contacts
  - Light barriers
  - Ind. prox. switches
  - Encoders
- Outputs
  - Pneumatic Valves
  - stepper motors
  - DC-motors
  - solenoids

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MachineControl: Software internals: typical MDC-application

![Diagram of MDC application]

MachineControl: How to get testcases?

Specification available as hierarchical, parallel state machine.

Is used as reference for software component development.

Contains enough details to generate tests automatically.
Reuse of specification for MBT

MachineControl: Software internals

Dealing with input events

To / from other ModuleControllers via G&D-Fieldbus (CAN)
MachineControl: Software internals

Dealing with input events

To / from other ModuleControllers via G&D-Fieldbus (CAN)

Operating System

Testing of application logic with MBT and TTCN-3

Real target-application runs on real MDC HW without peripheral mechatronic system

Testing of application logic with MBT and TTCN-3
Summary

Introducing MBT is straightforward if
- you have the necessary information available
- you have an existing test automation
- you understand the generated tests

Very promising results:
- Reproducible testing of real application on real hardware
- Peripheral mechatronical system not necessary
  - development of control software in parallel with development of mechatronic system