# Designing A High Level Test Specification Language

## For iec 61499 function block diagram


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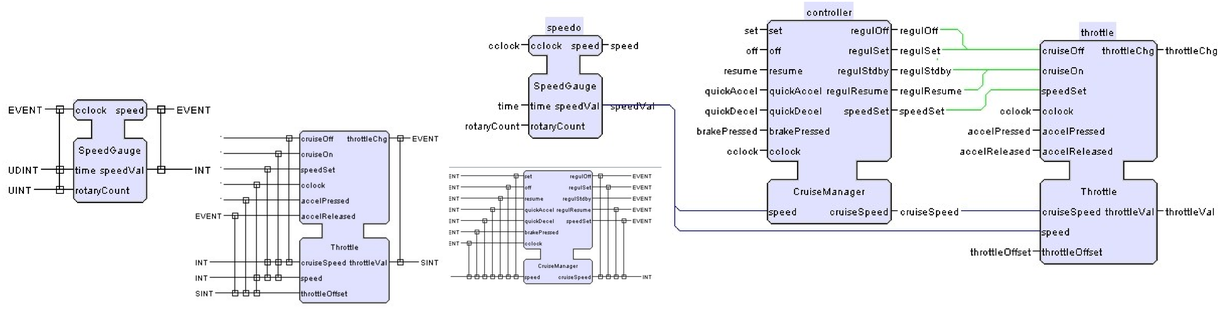
# INTRODUCTION

The function block diagram describes functions between input and output variables and consists of events, variables, states, and algorithms. It is used to provide logic for a control system. The current method to verify the logic is by using a model checker with a set of formulae specifications.



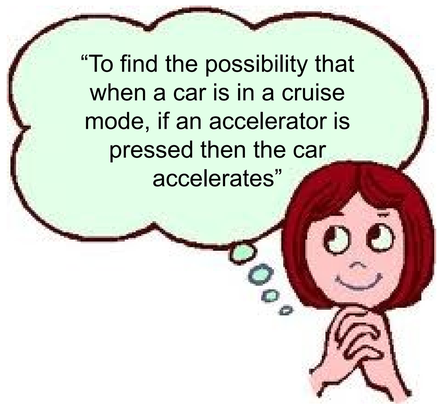

**(a) Basic Blocks** **(b) Composite Block**

**Figure 1. The IEC 61499 Function Block Notation.**

## IEC 61499 Function block

IEC 61499 is one of the standards for drawing function block diagrams. There are two types of function blocks in these standard: basic function blocks and composite function blocks.

Basic function blocks contain algorithms and an execution control chart (ECC). Meanwhile, composite function blocks contain a collection of basic blocks and/or other composite blocks.




AF ((label=throttle.CRUISE) & EX((input=accelPressed) & (label=throttle.ACCEL)))

EF ((label=throttle.CRUISE) & EX((input=accelPressed) & (label=throttle.ACCEL)))

## Formulae Specification

Most of the formulae specification or formulae semantics are written either in local temporal logic (LTL) or computational tree logic (CTL) syntax. These formulae specify the path quantors and temporal operators. Below is the example of CTL:

$$AG(P((EX.Q)(EX\neg Q)))$$

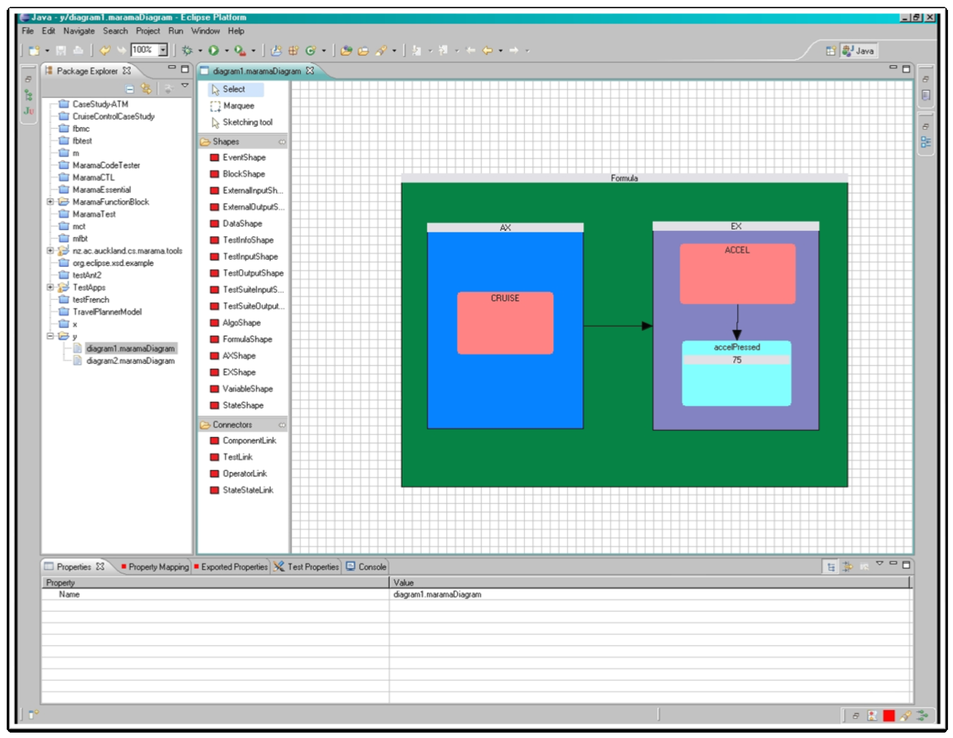



**Figure 2. The proposed High-Level Test Specification Language**

## Challenges

The drawback of this approach to formulae specification is that it requires in-depth knowledge of syntax and semantics to write it properly. If the syntax is wrongly stated or placed, a different result will be produced. Hence it will fail to capture the real test conditions. Most of the time intervention from an expert is required to translate the specification into a valid, correct formulae.


## Research aim

We are developing a high-level test specification language that shifts the current text-based specification syntax into visual-based specification method (WYSIWYG). The idea is to combine the power and flexibility of formulae specification with the ease of use of a graphical interface. In addition we will provide a means of correctness checking including syntax and simulation to pre-validate the formulae and visualisation of results.

This new approach to high-level visual test specification for Function Blocks will support end user participation in the verification and validation process without being limited by the unfamiliarity of formulae specification.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