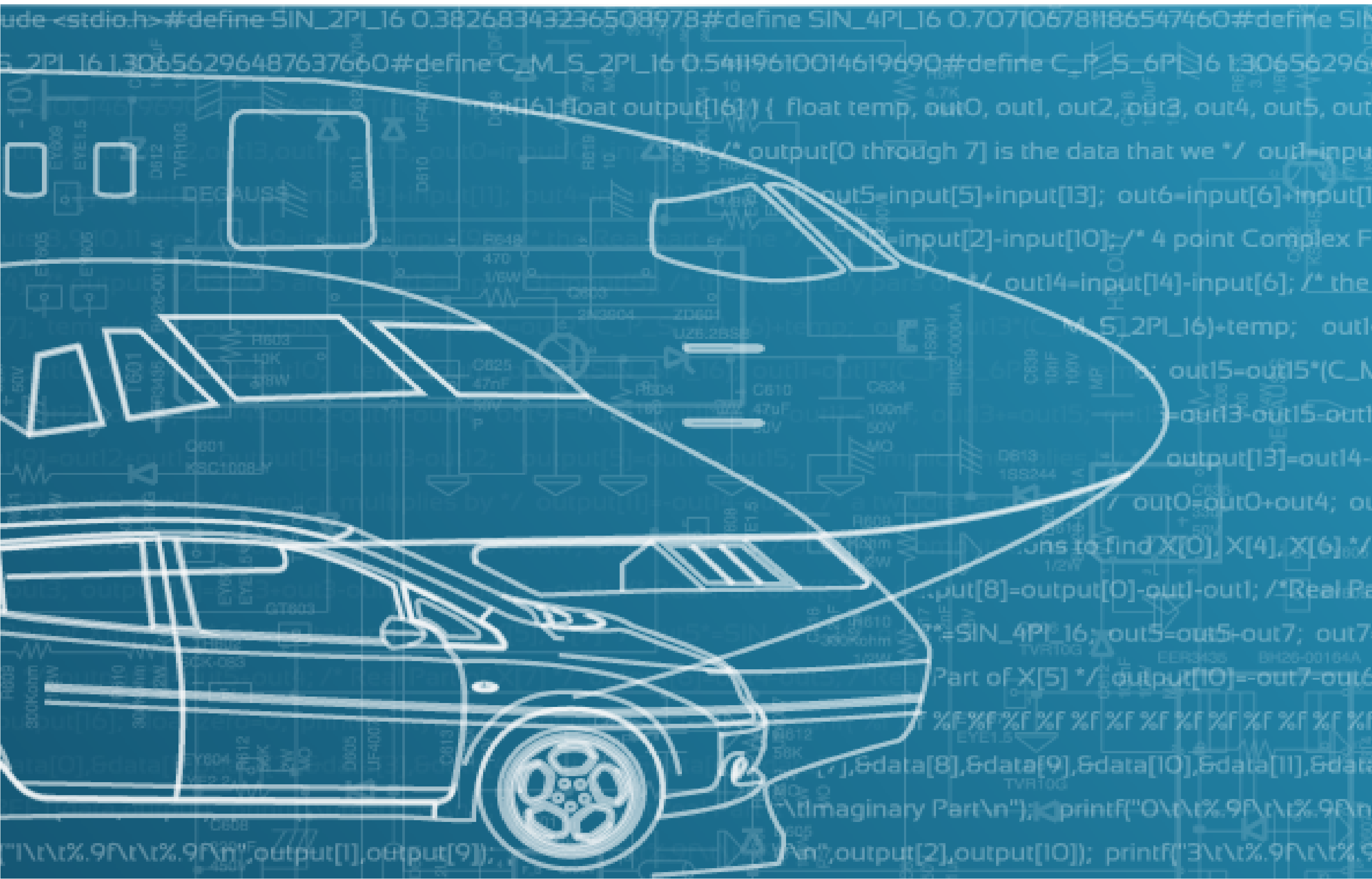
ASTERIOS

KRONO-SAFE

Safe design in real-time

LED Blinker

Rev K19.5



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Contents

This example is an introduction to the cadencing of Agents in PsyC.

Keywords: `advance`, `converttick`, `presenttime`

1 Specification

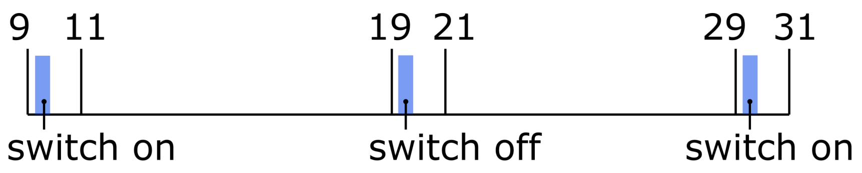
We want to write an Agent in charge of making blink a LED at a frequency of 50 Hz (period of 20 ms), such that over the course of each period the LED remains on for 10 ms, with a precision of +/- 2 ms.

The jitter of +/- 2 ms is critical for a consistent temporal design of the Application: a requirement stating that the LED has to be on (respectively off) for *exactly* 10 ms every period would make no sense physically. The Psy programming language enables you to formally specify the acceptable jitter for switching the LED on and off.

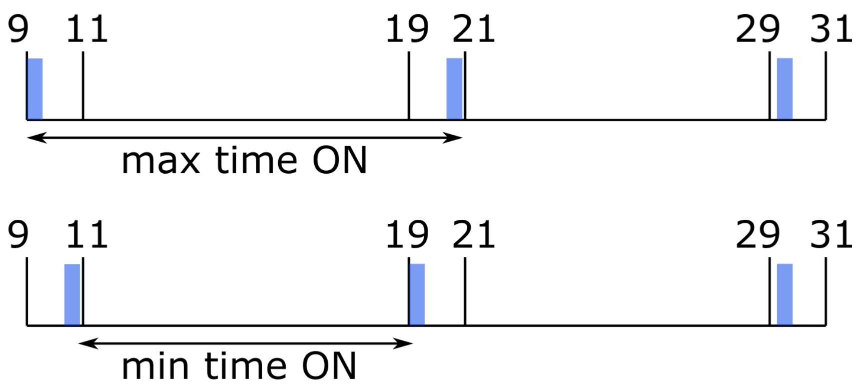
2 Implementation

The cadencing of Agents i.e. the definition of their Elementary Actions is based on the use of the `advance` statement. The syntax of this statement is detailed in the *PsyC Language Description* in the section *Modules and Tasks - Agents - advance*.

The behavior of the Agent `blinker` implemented in `blinker.psy` is represented in the following:



This implementation respects the above specification. The following figure illustrates it on two possible execution scenarios:



Depending on *when* the switching on (respectively off) will actually be executed within the 2 ms Elementary Action, the total time on (respectively off) of the LED will vary between 12 and 8 ms, as required.

3 `convertick` and `presenttime`

In this example, we use these two built-ins to retrieve the current date, independently from the Source on which the Agent is based.

`presenttime` returns the current date of the Elementary Action, as a number of tick of the Source `realtime` from the start of the Application. *The current date of an Elementary Action is always defined as the earliest start date of the Elementary Action*.

The fact that this value returned by `presenttime` depends on the period of the Source `realtime` makes the direct use of this value not portable. The `converttick (<clock>, <date>)` built-in enables to retrieve the index of the closest tick of the Clock `<clock>` preceding `<date>` (in Source ticks).

Therefore, `converttick(c1, presenttime())` returns the index of the tick of `c1` matching the Earliest Start Date of the current Elementary Action opened by the last `advance` statement met.