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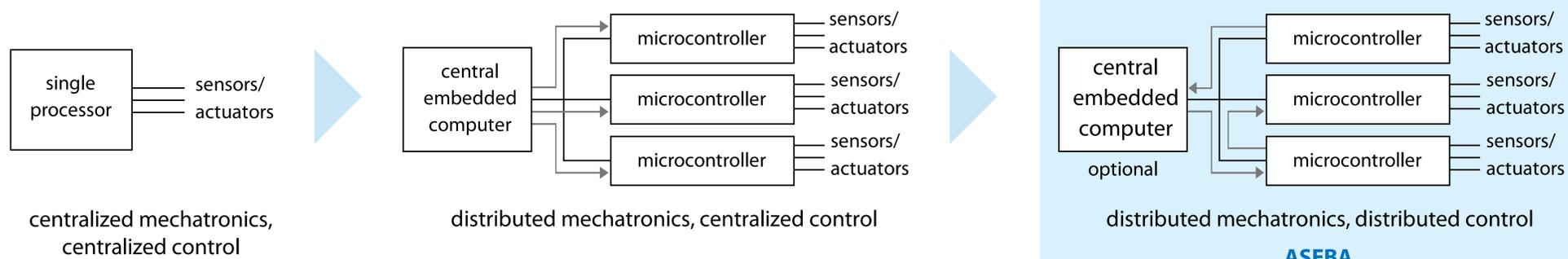


Abstract

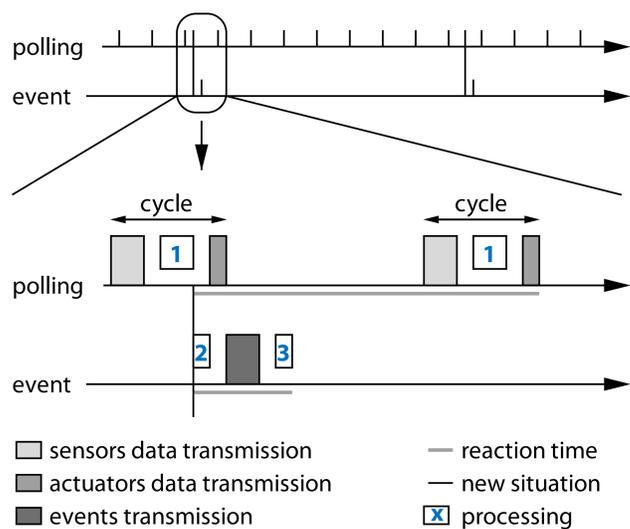
ASEBA distributes processing by running scripts inside virtual machines on self-contained sensors and actuators nodes. Thanks to scriptable modules, ASEBA provides instant compilation and real-time monitoring and debugging of the behavior of the robots. Our results show that with respect to other architectures, ASEBA reduces latency to environmental stimuli, offloads any central computer, and allows the integration of a larger number of sensors and actuators.

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Evolution of mechatronics and low-level control architectures



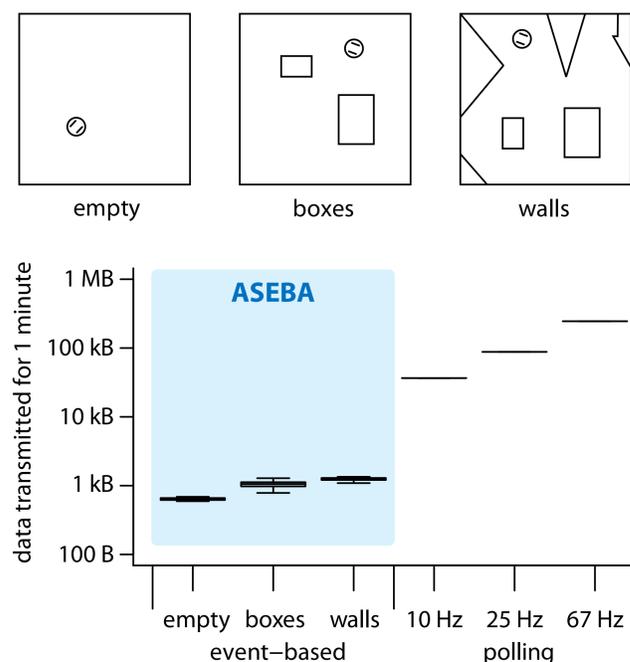
Advantages of events-based over polling



1. a central computer processing all sensors,
2. a microcontroller processing its local sensors,
3. a microcontroller processing the incoming event and setting actuators.

Bus load and reaction time are both reduced when using events, because processing is done locally in the microcontrollers and only useful data are transmitted and the transfer occurs asynchronously.

Measurement of bandwidth consumption

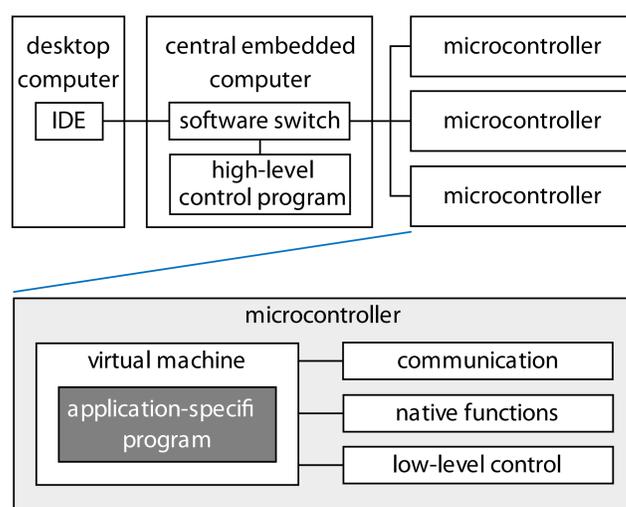


The marXbot moves and avoids obstacles.

We performed this experiment in three environments of different complexities (number of obstacles).

The box plot shows the bandwidth consumption in these along with the theoretical values for polling.

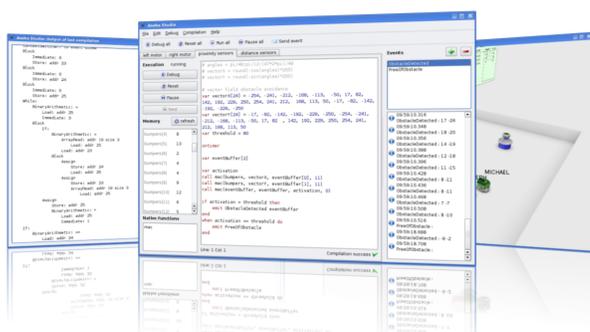
Architecture of ASEBA



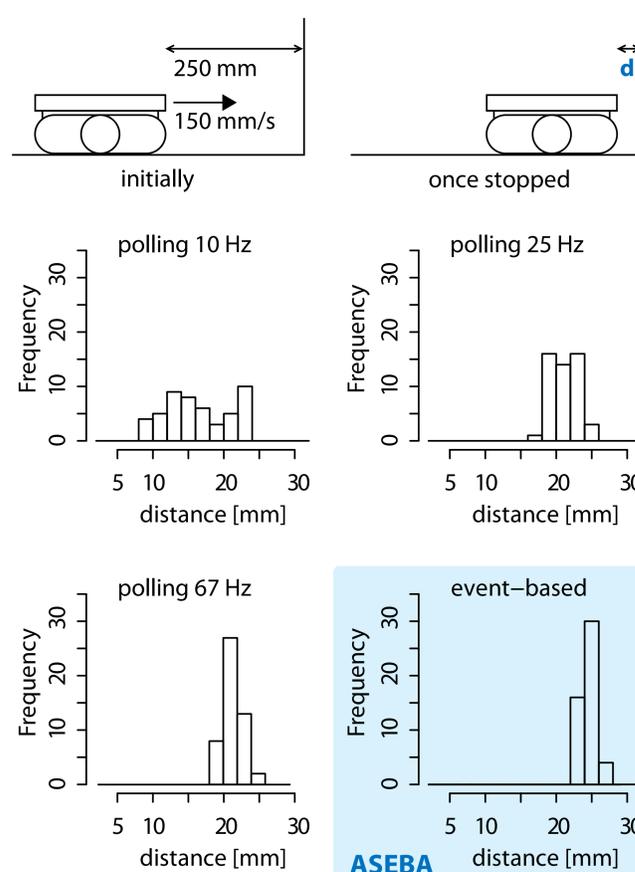
ASEBA provides event-based communication between hardware modules, typically microcontrollers.

Each microcontroller runs scripts in a virtual machine. Internal or external events trigger the execution of scripts.

A user-friendly IDE allows real-time debugging and monitoring of events and state of microcontrollers. The IDE provides instant compilation as well.



Measurements of latency



The marXbot moves towards a wall at the speed of 150 mm/s starting from a distance of 250 mm.

When its front sensors detect the wall at a closer distance than 30 mm, the robot stops. We then measure the distance d to the wall.

The histograms show the distribution of d .