Digitially Assisted Integrated Analog Mixed Signal Systems

Results in Brief

Reducing errors in digitisation of continuous signals

The world around us is largely analogue, a continuum of sensory inputs covering every possible shade of colour, every frequency in the spectrum of sounds produced. EU-funded researchers are developing advanced signal processing techniques to minimise the errors produced in efforts to represent analogue signals with digital electronics.

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Digital electronic components used to process analogue information and store it in the form of 0s and 1s often rely on integrated analogue mixed-signal interfaces to bridge the gap between the analogue real-world signals and the sensors, actuators and radio-frequency components with which they interact.

As more and more emphasis has been given to scaling down size, enhancing performance and decreasing power consumption of electronic components, complementary metal-oxide semiconductor (CMOS) technology has been a real boon for the digital side of the electronics.

The same cannot be said for the analogue components. Analogue blocks monopolise an inordinate amount of system space and energy often even compromising overall system performance.

European researchers supported by funding of the ‘Digitally assisted integrated analog mixed signal systems’ (Smartams) project are working to create innovative digital signal processing methods and components to ‘re-correct’ the digital bit streams while providing compact and energy-efficient solutions.

Investigators have developed simulation code using Matlab and Simulink platforms that accurately represent circuit issues of interest. In addition, they created an advanced signal processing algorithm able to correct both analogue mismatch (inability of analogue-to-digital (ADC) converters to accurately digitally represent an incoming analogue signal) and inter-symbol interference (ISI) errors in which one ‘symbol’ interferes with the representation of subsequent symbols, sort of blurring their representation and making them difficult to distinguish.

Scientists are working on ADC designs ensuring stability and performance for extended input amplitude ranges. These have already resulted in an ADC with significant increases in signal-to-noise ratio (SNR, an indication of the ‘power’ of the signal compared to the noise) relative to conventional systems.

Modifications of the cascade-modular architecture are focused on further optimisations of digital-to-analogue converter (DAC) noise parameters, performance and cost.

Continuation of the project will no doubt yield important advances in CMOS analogue mixed-signal circuits facilitating important size end energy consumption reductions while enhancing performance.

Project Information

SMARTAMS

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