

Thesis proposal: Parameter-varying lowpass filters based on switched-capacitor circuits

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I. JUSTIFICATION OF THE THESIS PROPOSAL

Parameter-varying filters are a new class of filters whose transient response has been improved by means of the temporary variation in time of one or more of its describing parameters. Although the theory behind the operation of these filters has been mainly formulated for the continuous-time case [1]–[4] and some applications for these filters have been found in the field of instrumentation systems [4]–[6], there are few analogue implementations of these systems (see, for instance, [7] and [8]).

II. AIM OF THIS PROJECT

In the frame of this thesis proposal, research work must be carried out to find a suitable implementation of a second-order lowpass parameter-varying filter based on switched-capacitor circuits. The research work comprises not only system theory aspects but also practical circuit design.

It is expected that, before the start of the design cycle of the circuits blocks required for the parameter-varying filter, the student involved in the project will test his/her design using a Field-Programmable Analog Array (FPAA). Evaluation boards containing one of these devices are available in the frame of this project.

FPAAs are the analog equivalent of the Field-Programmable Gate Arrays (FPGAs). Like FPGAs, FPAAs can be configured in real time as well. For this aim, each FPAA evaluation board includes a PIC16F876 microcontroller which is used to configure it via the SPI protocol. Therefore, *it would be very desirable* that the participant in this project has a basic knowledge in the usage of PIC microcontrollers and their programming. However, this is not a strong requirement for participation in this project.

III. EXPECTED PRODUCTS

The following products are expected from this thesis project

- A MSc degree thesis report which describes the results of the research work carried out during the project. The thesis will be defended in front of a thesis committee *not later than August 2013*.
- A prototype of a second-order lowpass parameter-varying filter whose dynamic behaviour has been experimentally verified using a FPAA.
- A complete layout of the filter prototype for its fabrication in a standard CMOS process. The technology which will be used will be defined in the course of the project.

IV. ADDITIONAL INFORMATION

Any interested student should contact Dr. M.Á. Gutiérrez de Anda (office 1422) to obtain further information.

REFERENCES

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