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Programmable active filters based on digital potentiometers

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Abstract:
The digital potentiometers are flexible devices allowing many of the applications of the mechanical trimming to be replaced by a solid state solution. In this paper, we address issues related to the use of the digital potentiometers in the active filter design, in order to implement programmable analog functions such as controlling the corner frequency and filter type. Also, we propose here a simple interfacing solution that allows for quickly configuring not only programmable filters, but other common circuits employing I^2C digital potentiometers.

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I. Introduction

The active filters are very common circuits used in a wide variety of electronic applications, from data acquisition and measurement to telecommunication systems [1]–[4]. Usually, these filters are implemented with operational amplifiers combined with fixed resistors and capacitors, but very often their parameters, such as corner frequency, quality factor and gain, need to be adjustable. In this case, the digital potentiometers may play an effective role whenever the filter characteristics have to be changed by altering the resistance values.

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