We are discussing R-string DACs in class this week. As was pointed out, the major challenge facing the DAC designer is in identifying all problems that can cause a yield or performance loss at the target performance level and finding a solution to overcome these limitations.

Marcel Pelgrom published an excellent paper a number of years ago on the design of a dual-string DAC. The title of the paper is listed below. You can obtain a .pdf copy of the paper by going to Google Scholar from within the ISU system. In contrast to many papers from industry where the authors neglect to identify some of the critical issues surrounding a design, Pelgrom was meticulous at identifying all of the major problems and describing methods that he used to solve them. The homework assignment is to identify as many of the challenges as you can that Pelgrom has addressed along with the method he used for solving the problem.

This assignment is due at the beginning of the period on Wednesday. Please keep a copy of your solutions so that we can have a class discussion on what you have learned on Wednesday. Please do not look forward to the lecture slides that were posted from the previous semester as they discuss a solution to this problem but you will lose the benefits you derive from working with this excellent paper in a constructive way if you choose to look ahead for an assessment of the paper.

A 10-b 50-MHz CMOS D/A Converter with 75-Ω Buffer

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Abstract—A 10-b 50-MHz digital-to-analog (D/A) converter is presented which is based on a dual-ladder resistor string. This approach allows the linearity requirements to be met without the need for selection or trimming. The D/A decoding scheme reduces the glitch energy, and signal-dependent switch signals reduce high-frequency distortion. The output buffer allows driving 1 V_{pp} to 75 Ω. The chip consumes 65 mW at maximum clock frequency and a full-swing output signal. The device is processed in a standard 1.6-μm CMOS process with a single 5-V supply voltage.

Current-based circuits dump the complementary part of the signal current to ground; the power supply current is thereby twice the average signal current. If a two-sided terminated transmission line has to be fed by the high-impedance output of the current cell D/A converter, the current should be doubled to obtain the required output swing. In this case, the power supply current is four times the average signal current. A triple video D/A converter