流水线技术 阅读文献后回答：如何通过流水线技术实现AI芯片中的卷积运算？

Eyeriss: An Energy-Efficient Reconfigurable Accelerator for Deep Convolutional Neural Networks

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Abstract—Eyeriss is an accelerator for state-of-the-art deep convolutional neural networks (CNNs). It optimizes for the energy efficiency of the entire system, including the accelerator chip and off-chip DRAM, for various CNN shapes by reconfiguring be more energy-consuming than computation [10], [11], the processing of CNNs has to not only provide high parallelism for high throughput but also optimize for the data movement of the entire system in order to achieve high energy efficiency

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- **3.2**

  考虑如图所示IIR数字滤波器框图。假定乘法操作时间为2u.t.，加法操作时间为1u.t.。

  （a）计算IIR滤波器的关键路径。

  （b）在适当的前馈割集中插入锁存器，使IIR滤波器变成流水线结构，其关键路径延时降低为3u.t.。

习题
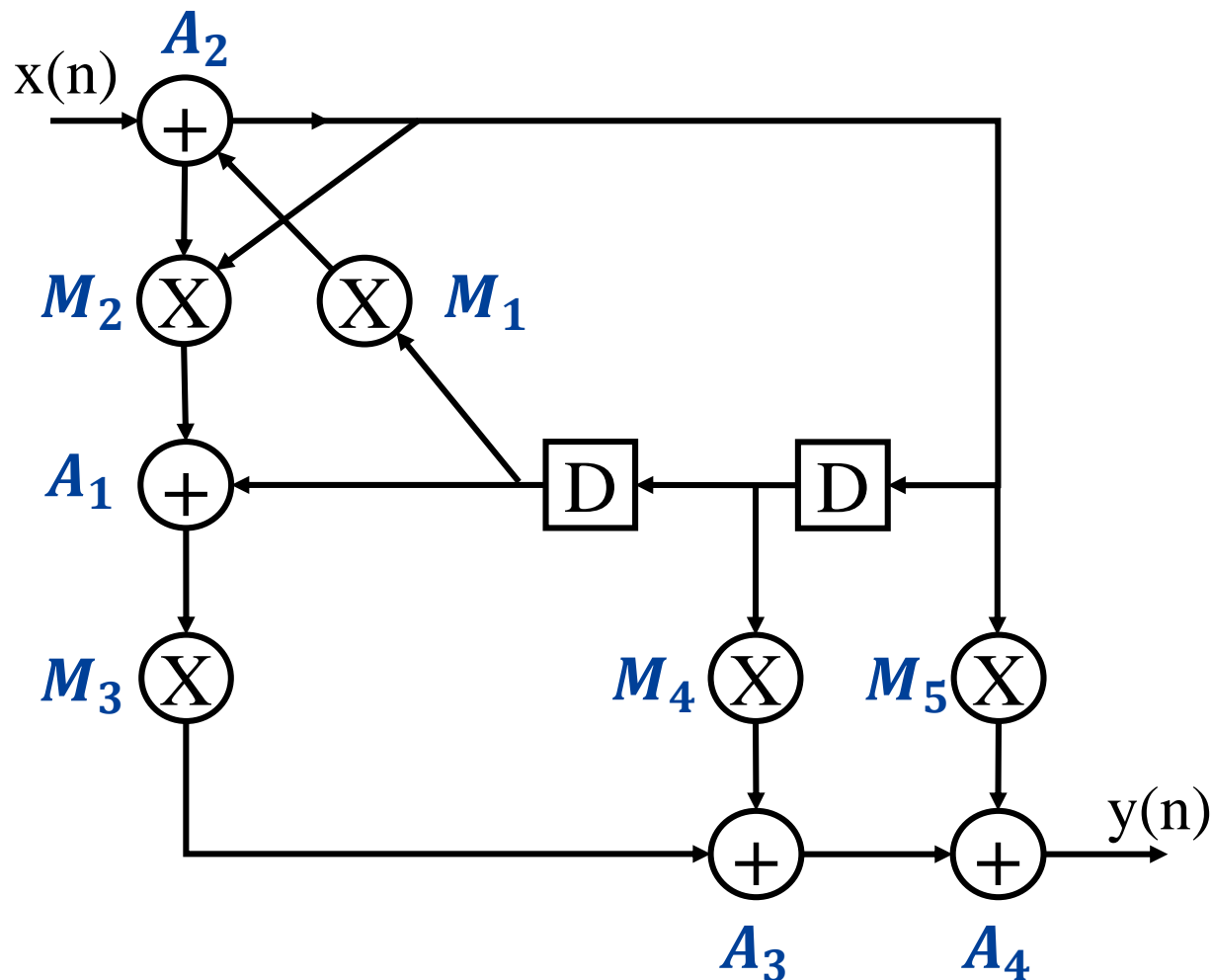
● **3.3 3.9**

考察如图所示的非递归信号处理结构，找出一种与该算法等价的数据广播实现方法，来改善系统的速度，不要使用附加的锁存器，计算广播结构的吞吐量或采样速度。（提示：图中的2输入1输出系统中不能进行转置操作。）