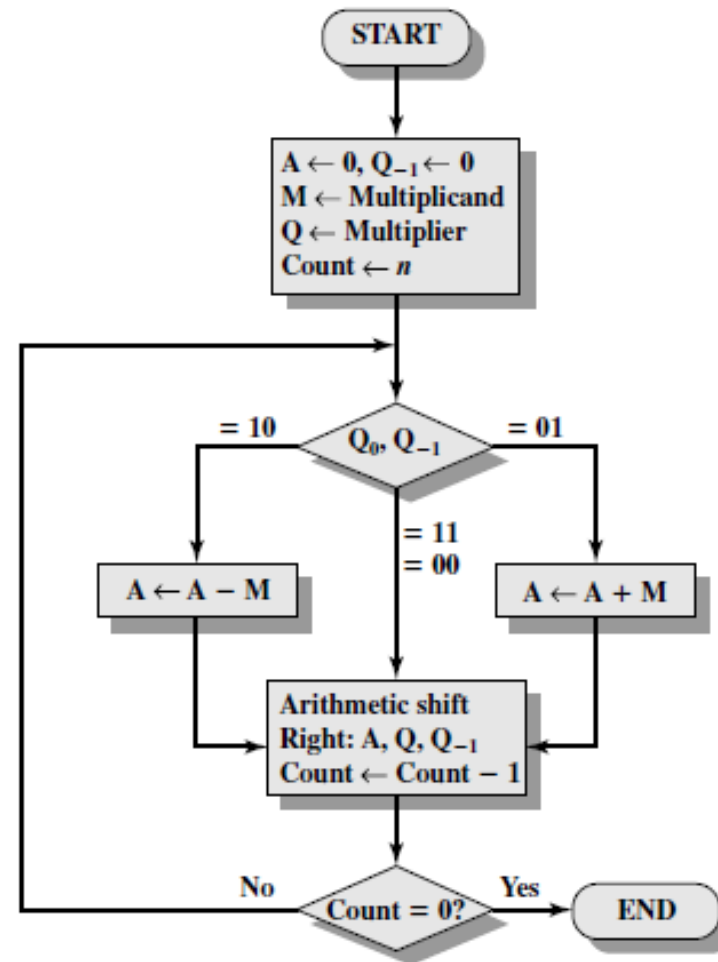


Enhancement for Lab 3

Booth's Algorithm

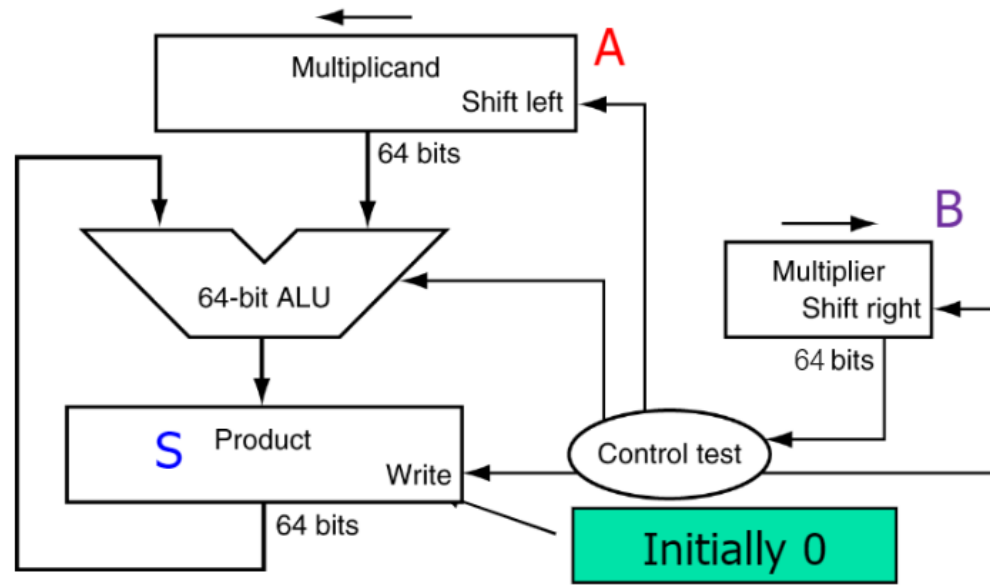
Booth's algorithm



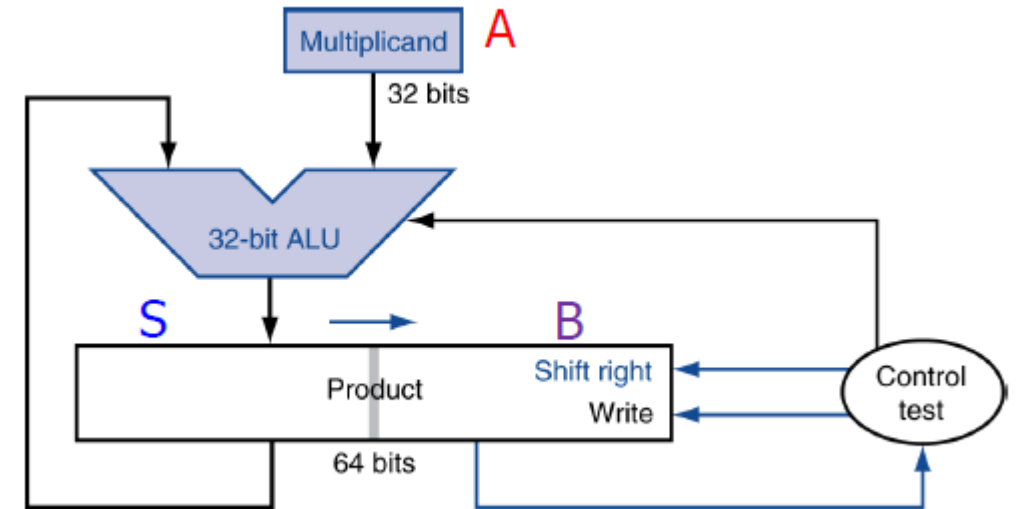
Original vs Improved (Clock cycles)

- The original algorithm for the signed multiplication requires signed extension of the multiplier and multiplicand, whereas the improved algorithm does not.
- This essentially means that the number of cycles required for the improved algorithm will be cut by half as only 32 bits of the multiplier will be processed in order to get the product, whereas the original's multiplier will be 64 bits.

Original vs Improved (Hardware)



Original



Improved

What has been improved

- Number of bits for register used to hold **multiplicand** has decreased from 64 to 32
- Number of bits for **ALU** has decreased from 64 to 32
- **Multiplier** will be **sharing** register with **Product**, hence saving a 64 bit register

Points to note

- In most general case, booth's algorithm will lead to less number of additions required during computation of the product.
- This could save power in the long run as it is computationally less taxing for the processor
- Furthermore, if processor is fast enough, the algorithm can be further improved by having all consecutive shifts in one clock cycles, hence the number of clock cycles needed will be even lesser.