It is justified to modify the algorithm from to .

By setting the two equations equal to each other, subtracting β from both sides, and then multiplying by -1, we can see that

Multiplying by , we get

Expanding J =QR, we find

This simplifies to

As Q is orthogonal and, therefore,

Expanding the inverse:

As :

There are multiple benefits for modifying the algorithm in this way. As Q is orthogonal, its condition number is one; the lowest possible. As such, the conditional error decreases greatly with the modified algorithm. In addition, as there are less matrices being multiplied, there are less computations involved, speeding up the program. While it may be a miniscule when the dimensions of the original matrix are small, it is not insignificant if the dimensions of the mxn matrix were very large, such as 1000x1321.