

Simulations in 3D printer when x-axis and y-axis timing pulleys are modified

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This document presents the results of 49 simulations where the timing pulleys that control the x-axis and y-axis of the nozzle's position are not ideal. We work with seven different timing pulleys geometries, and we essentially simulate all the combinations of that seven pulleys. We call them as follows: *circleVerySmall*, *square*, *triangle*, *heart*, *circleSmall*, *full*, *line*.

Important assumptions in the simulation:

1. The XY-plane where the nozzle is printing is assumed to be partitioned in small rectangles. We utilize a matrix to model the plane. The nozzle starts printing in the first row, moving from left to right. Once it completes the row, it goes to the first element of the following row and repeats the process. In reality, the nozzle moves in diagonals, violating our assumption, but that behavior is harder to model. It is unclear if both simulations would be equivalent.
2. We assume that, at each step, we print one pulley, and at the end of the step, we substitute either the x-axis and y-axis pulleys with the just printed one, alternatively.
In other words: If A_x and A_y are the starting timing pulleys that control the nozzle's movement along the x-axis and y-axis, respectively, we attempt to print the ideal reference B , obtaining the non-ideal pulley C in the process. In the first step, we substitute $A_x \leftarrow C_1$, at the second step $A_y \leftarrow C_2$, and we keep alternating until the experiment ends.
3. Recall that non-ideal pulleys are not symmetrical, so their initial angular position is relevant. We are fixing this value $w_0 = 0$ for all simulations. Another approach can be to always choose a random value for different simulations and verify if the convergence follows for all possible values of w_0 .

Important: In the following pager, whenever it is written C_6 , it should be C_{10} .

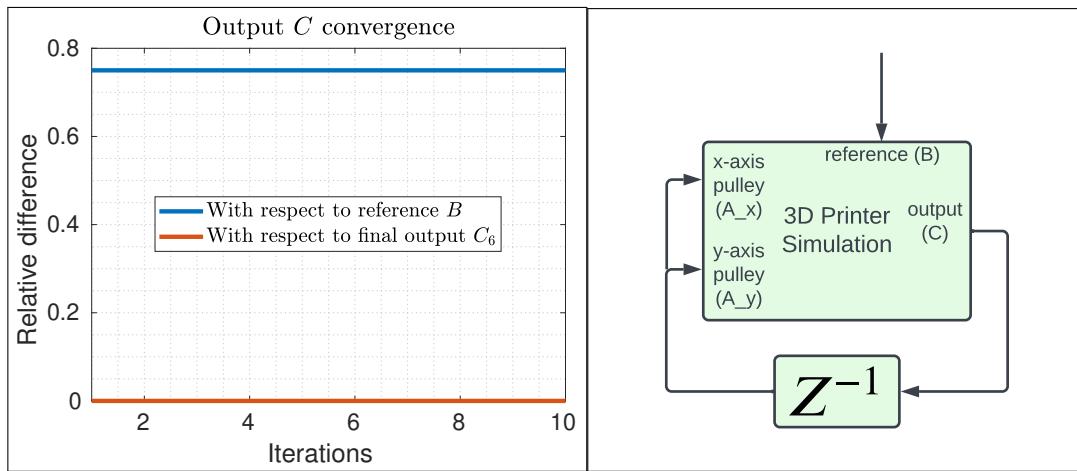
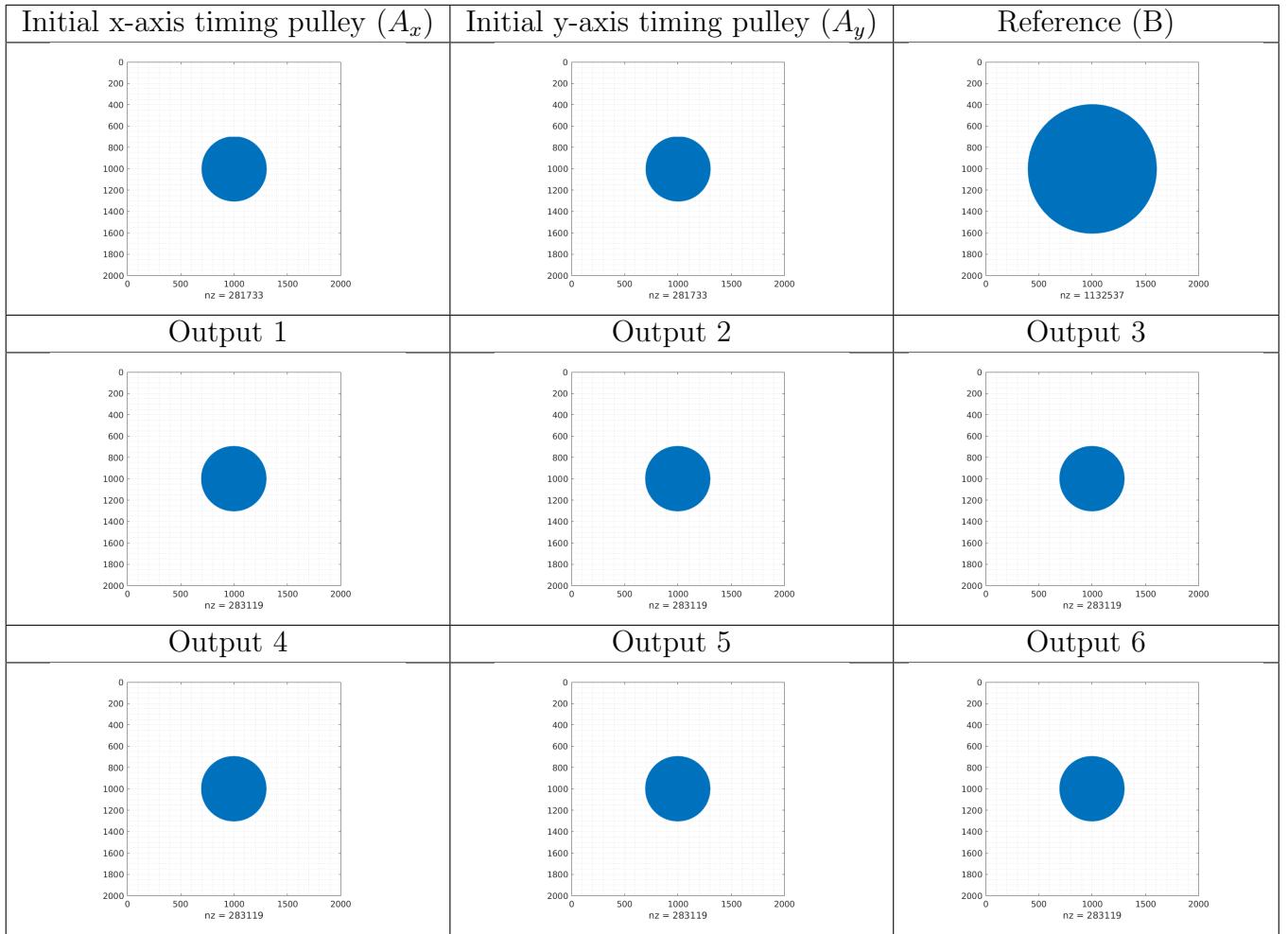


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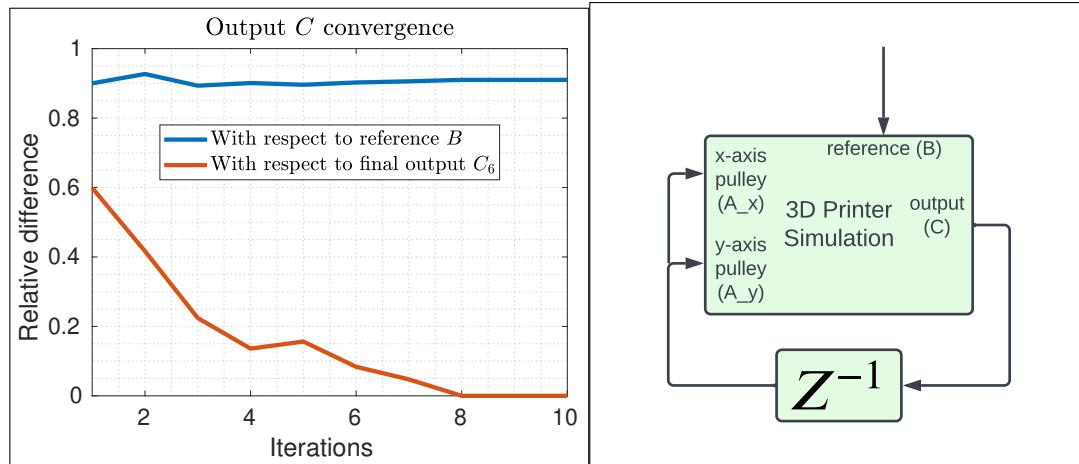
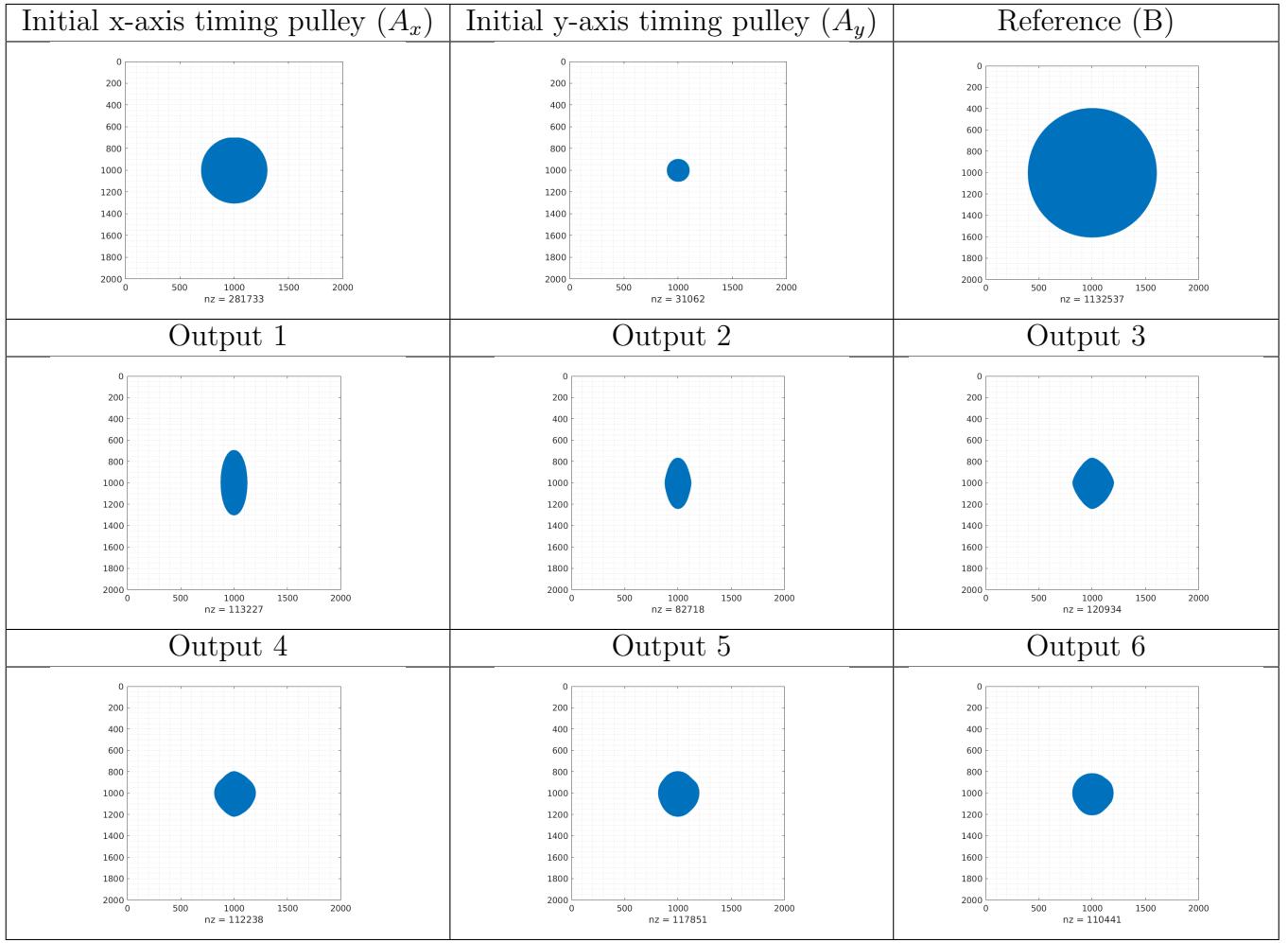


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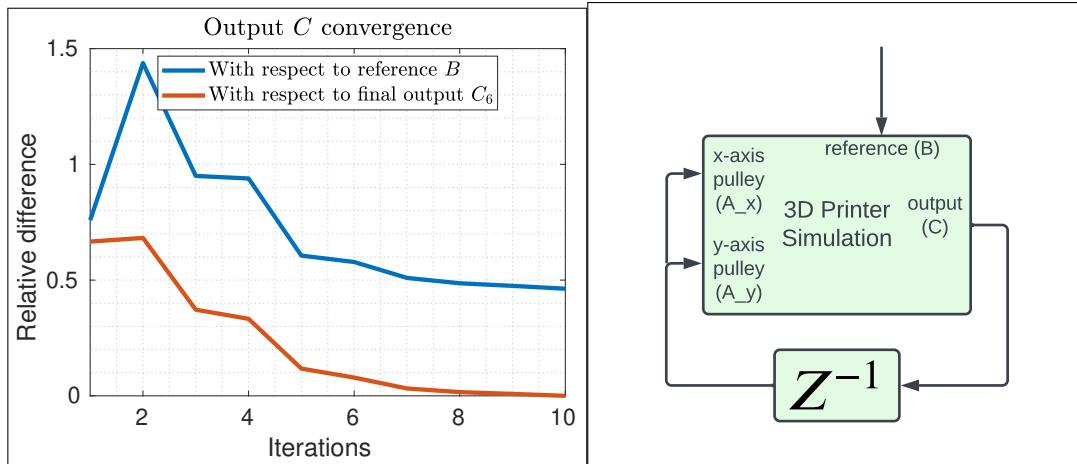
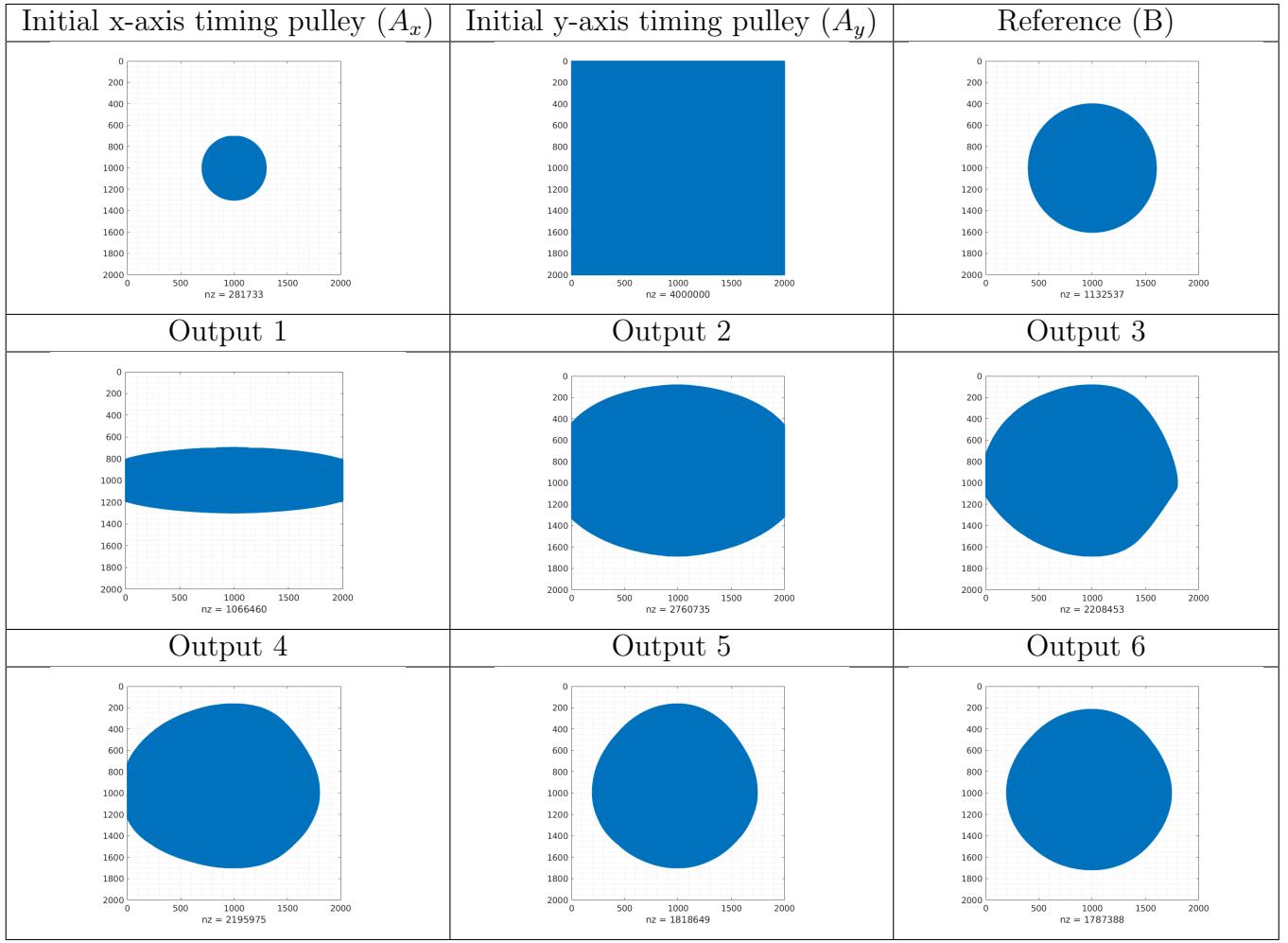


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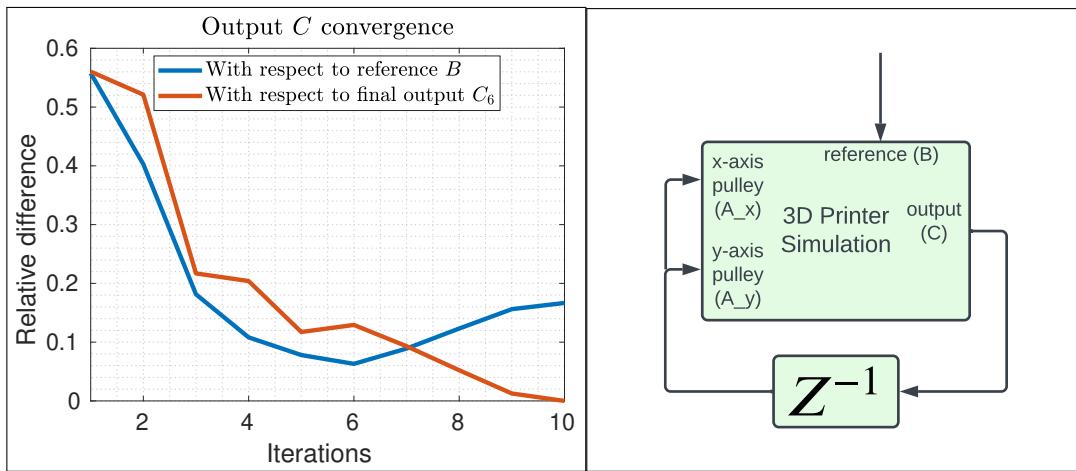
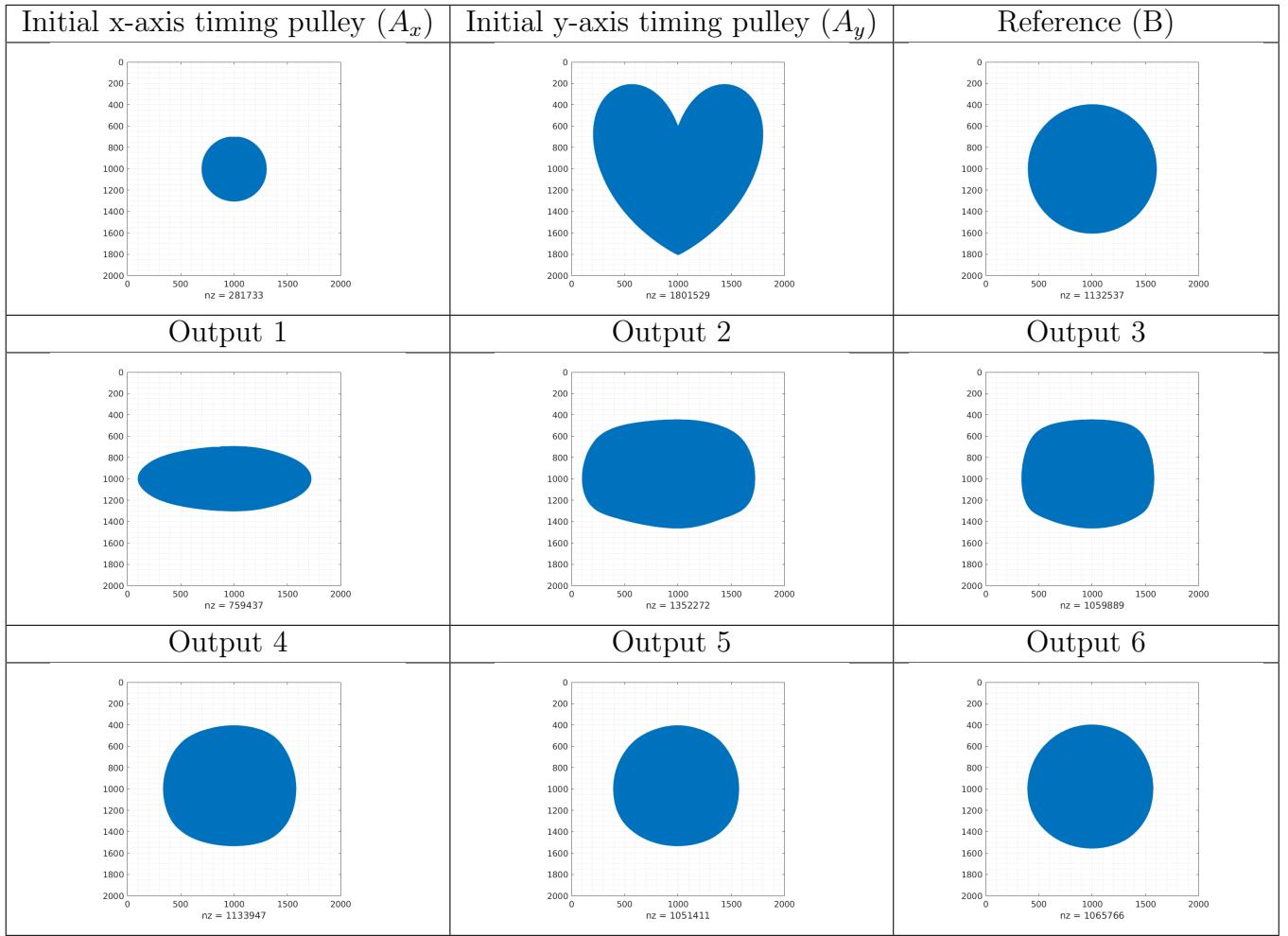


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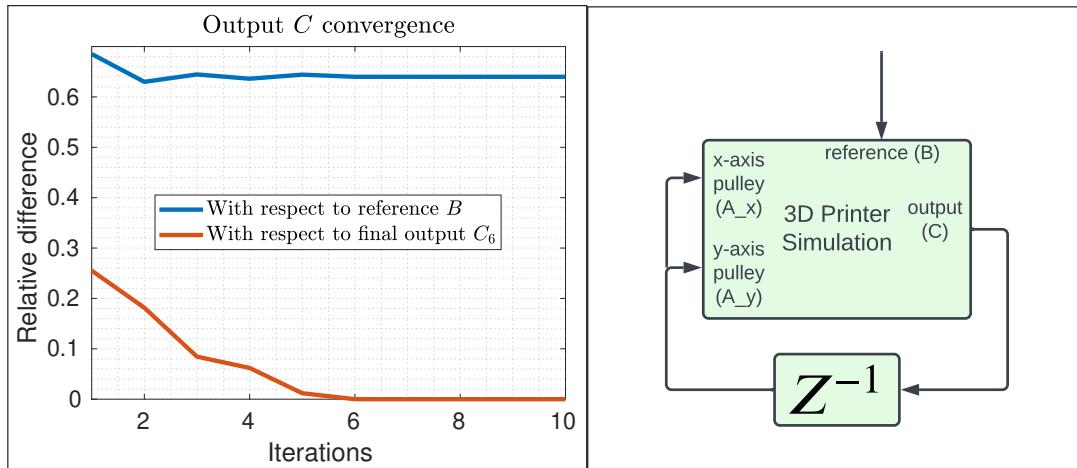
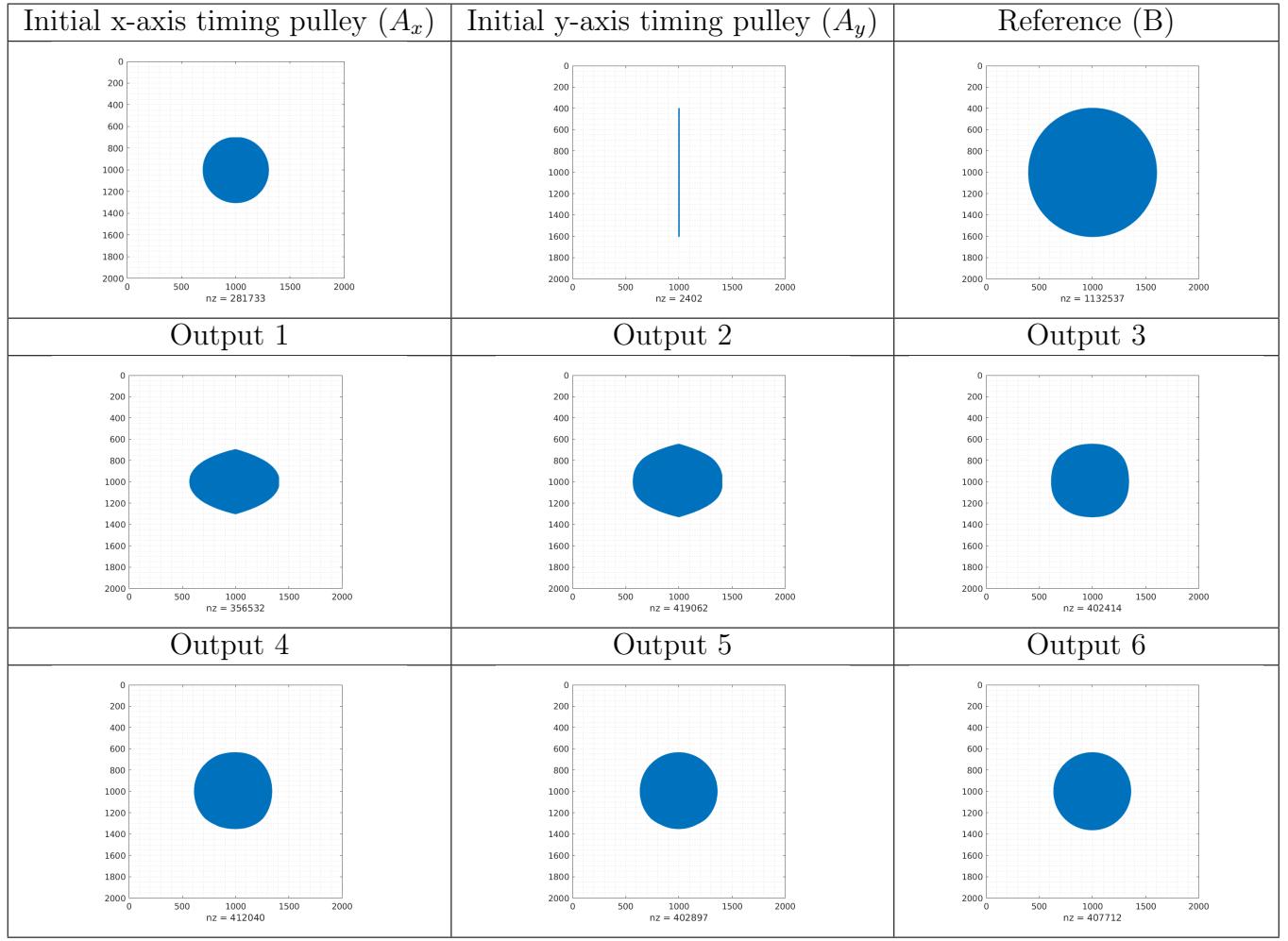


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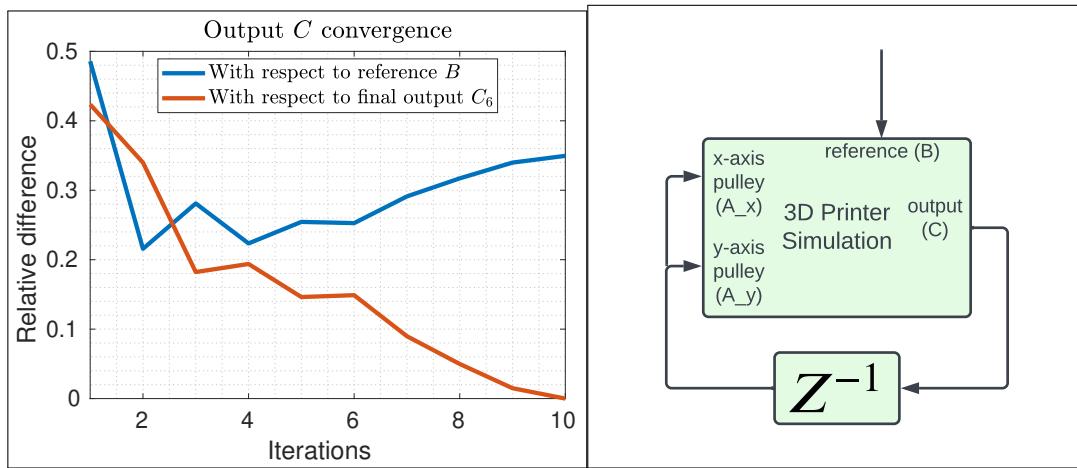
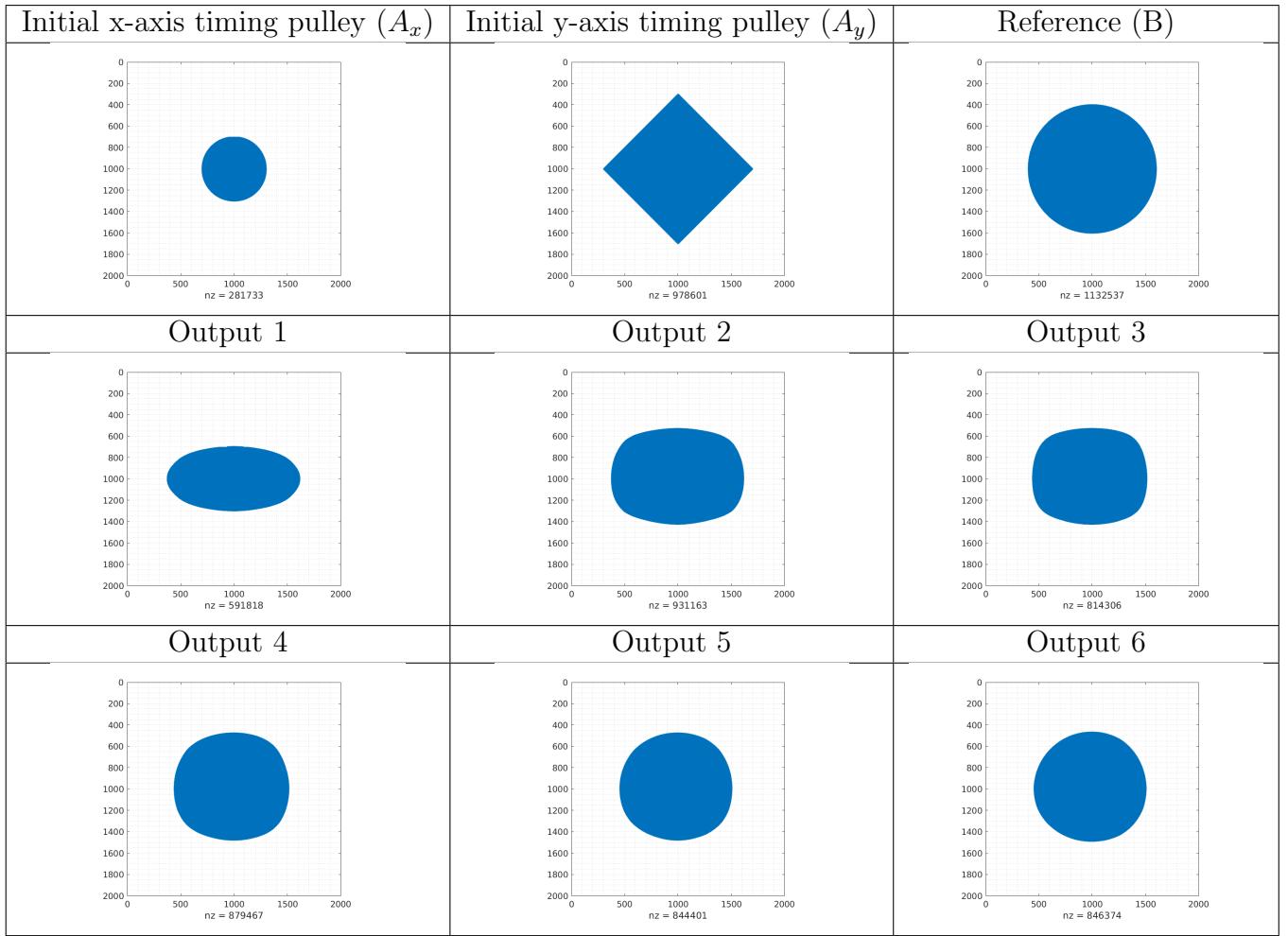


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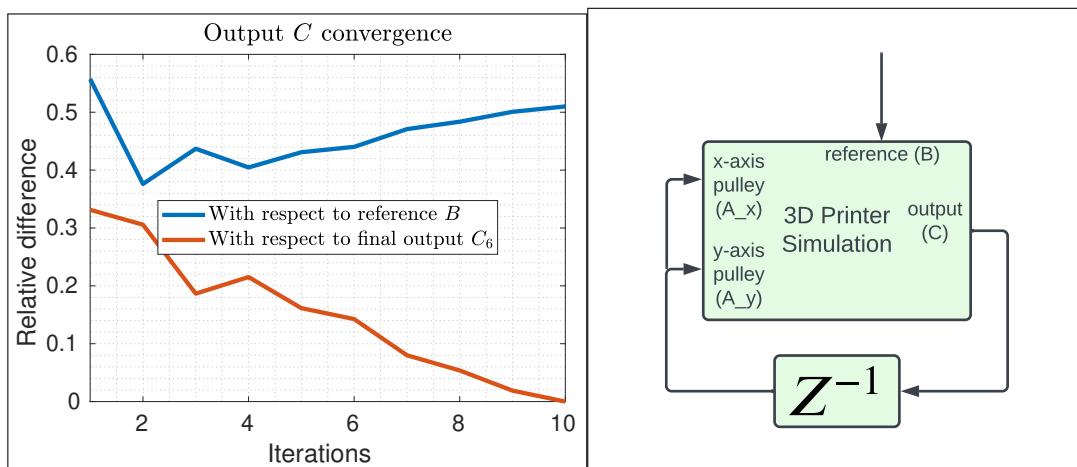
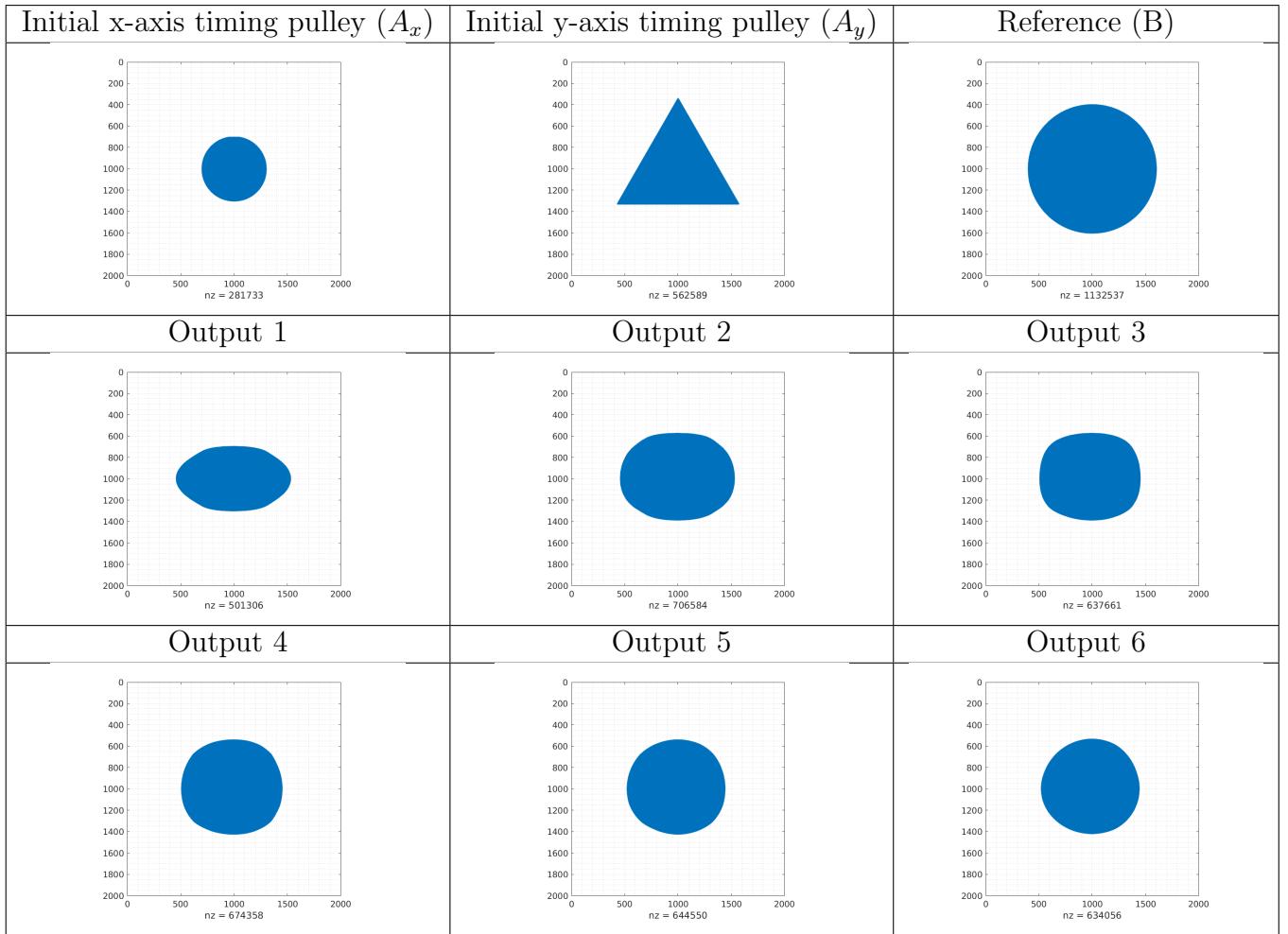


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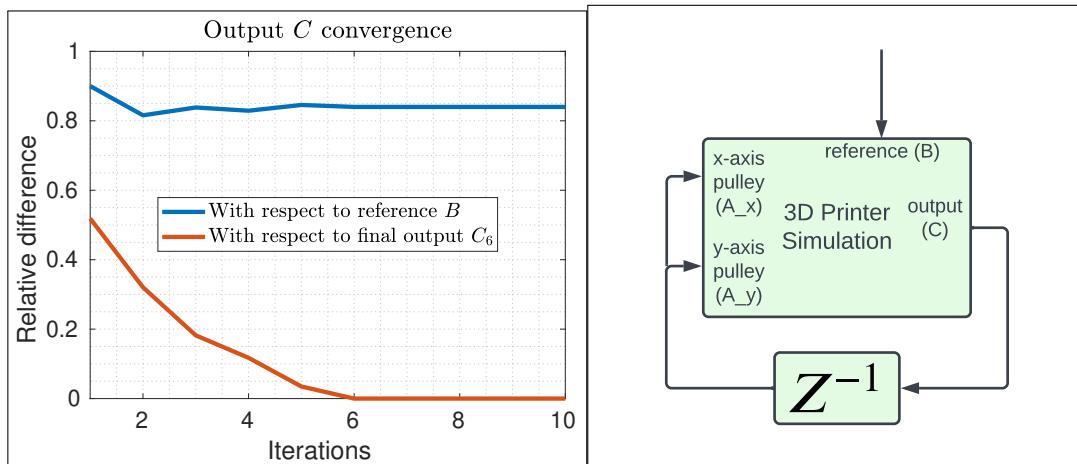
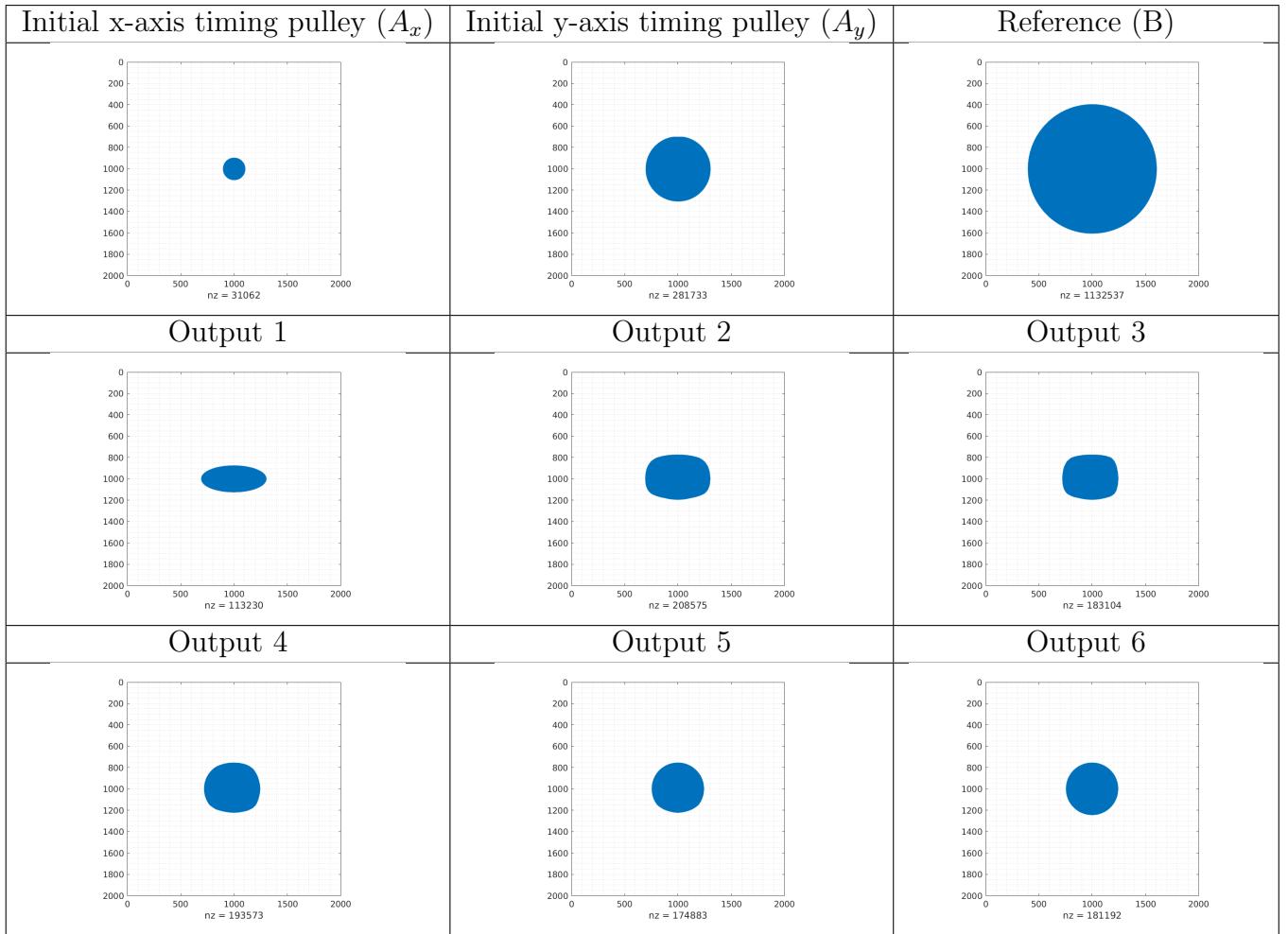


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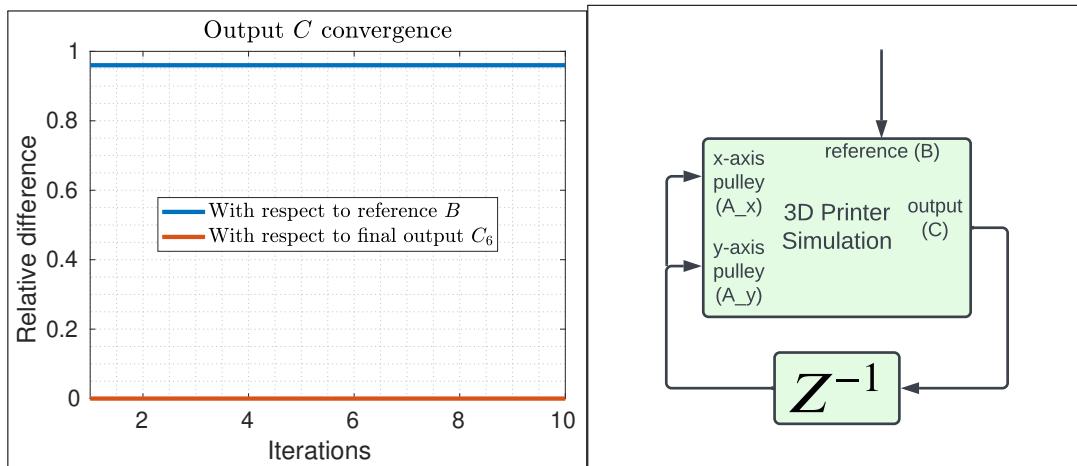
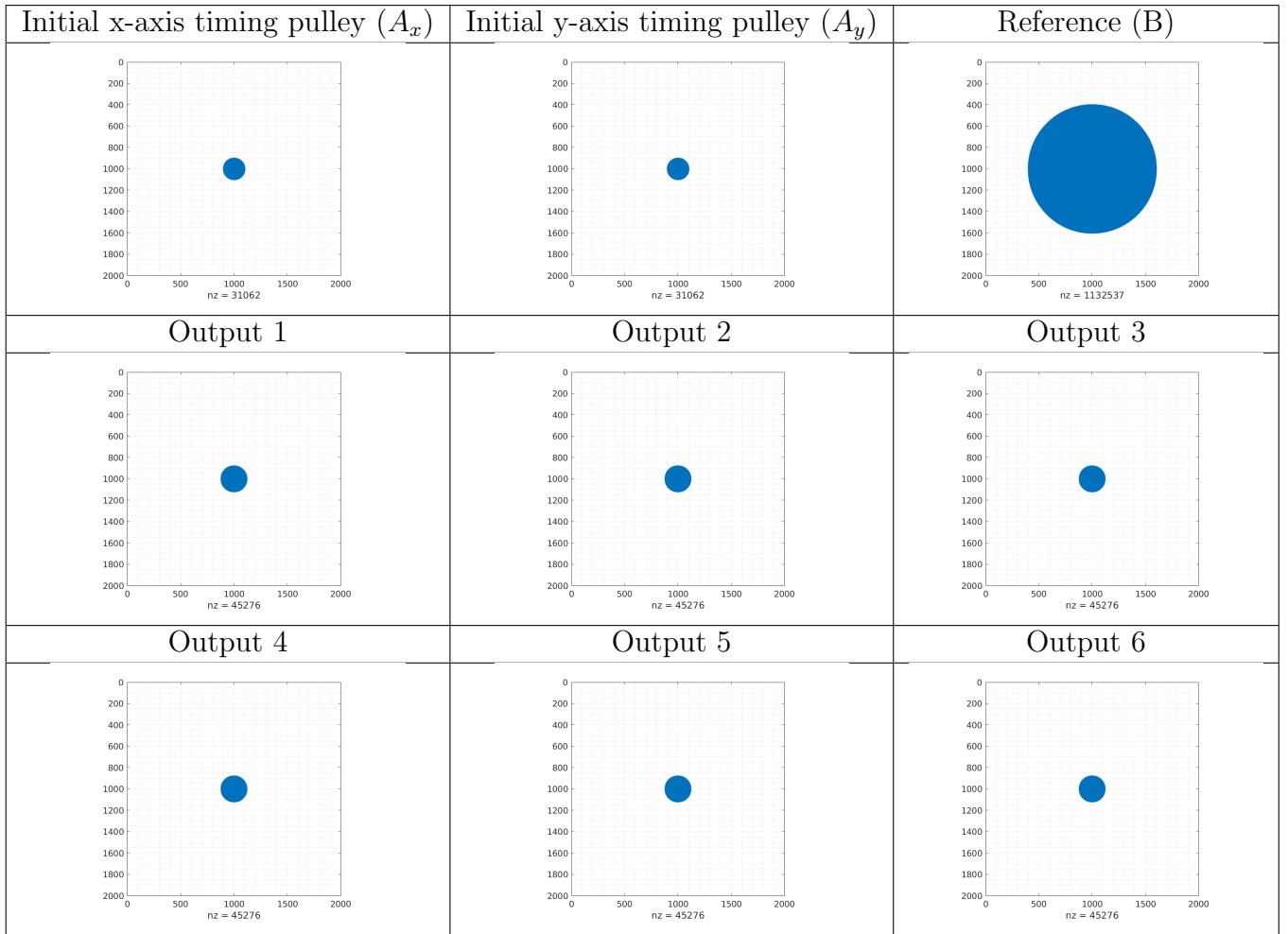


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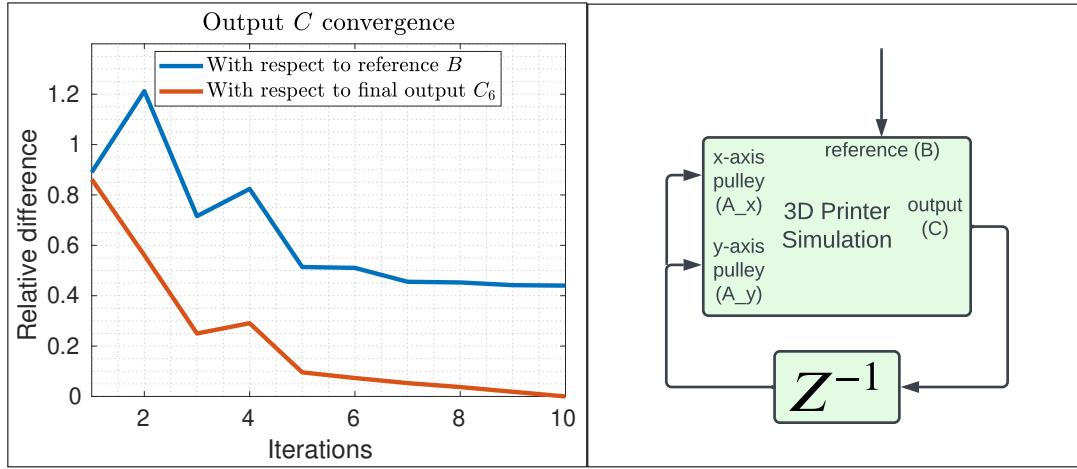
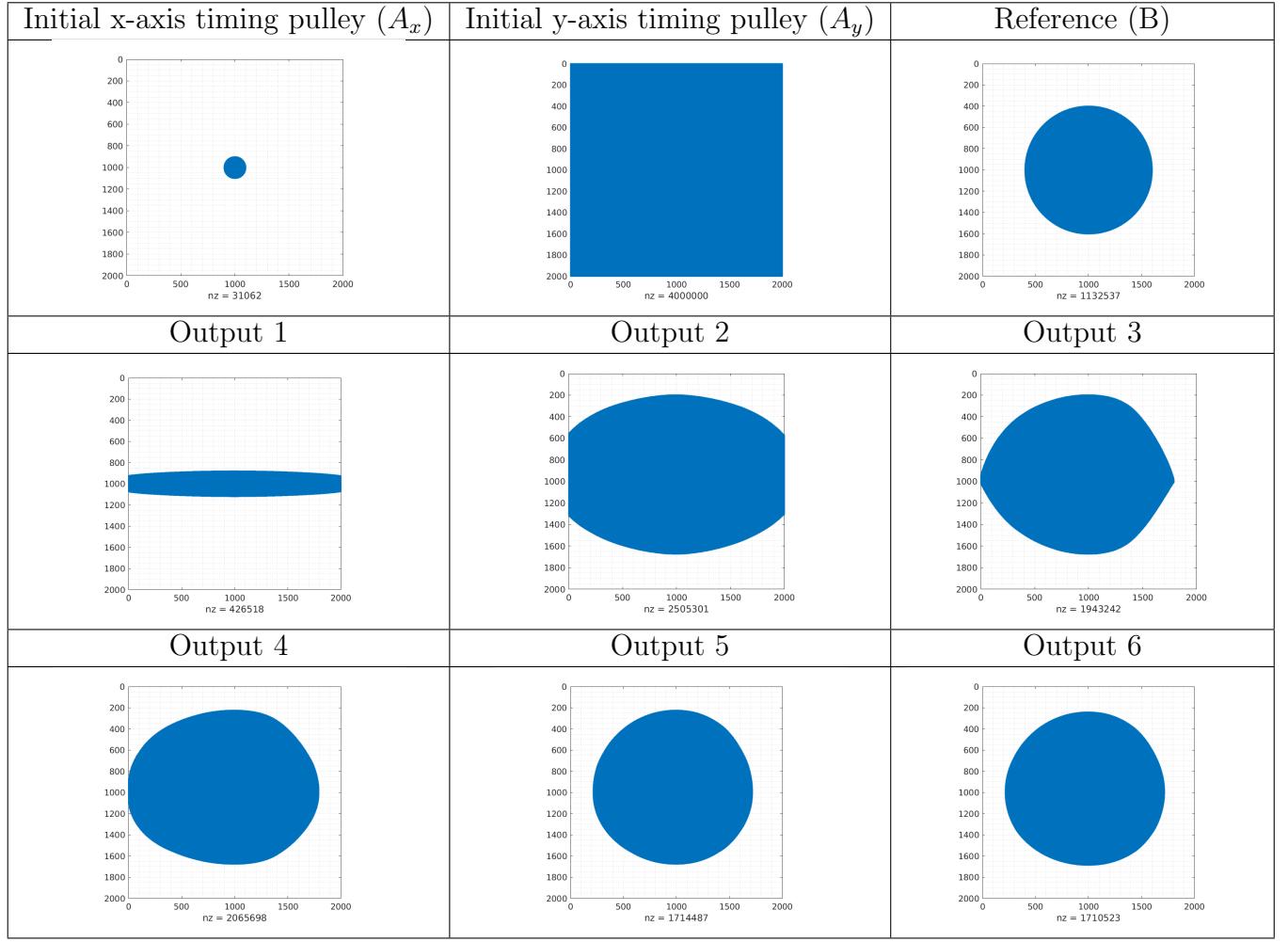


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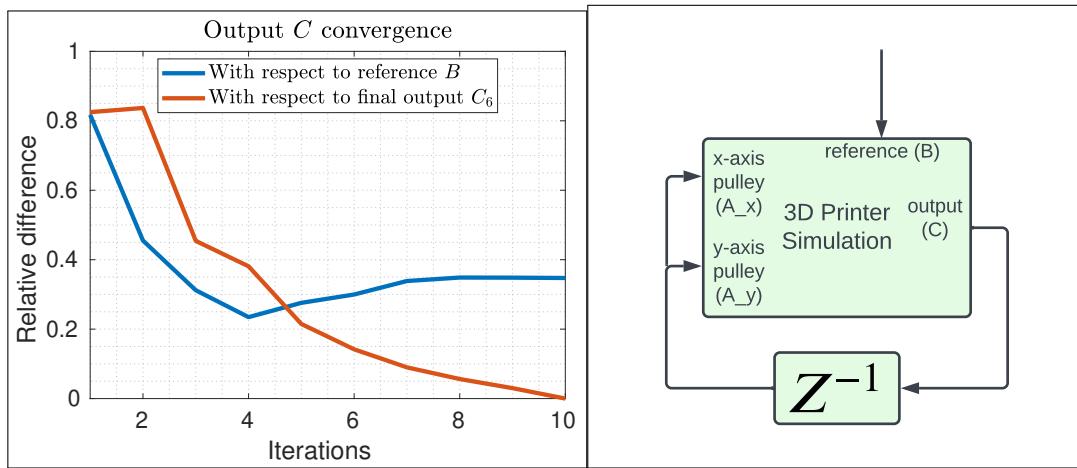
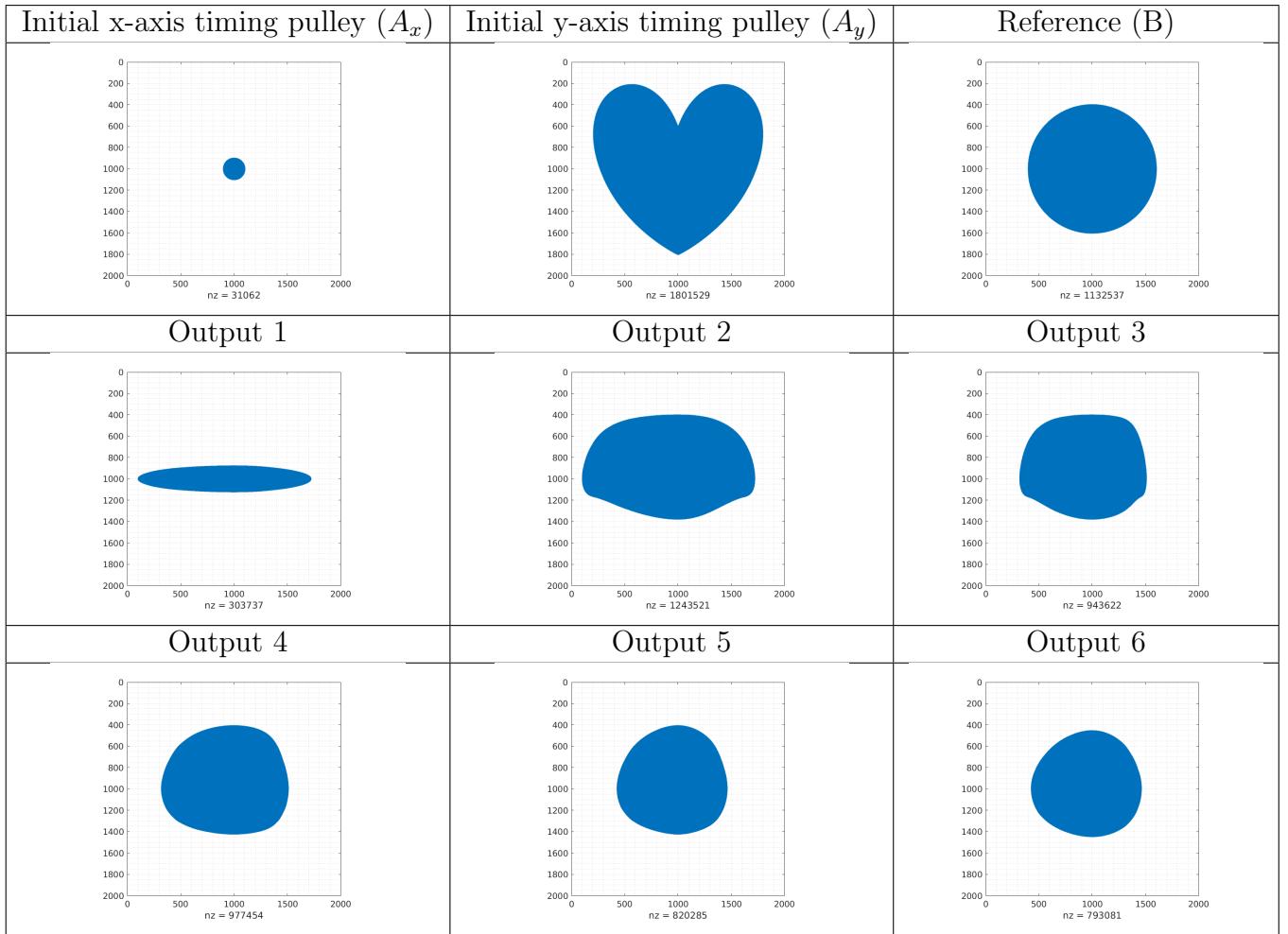


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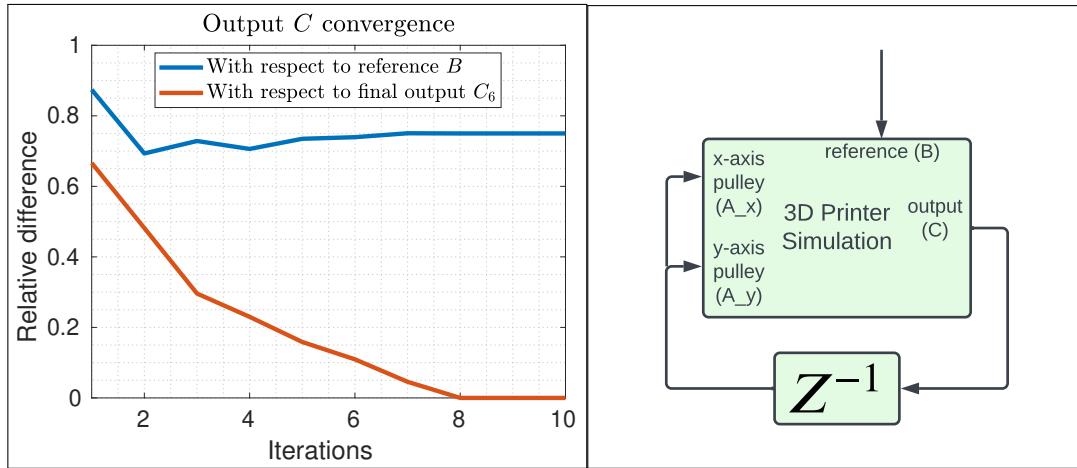
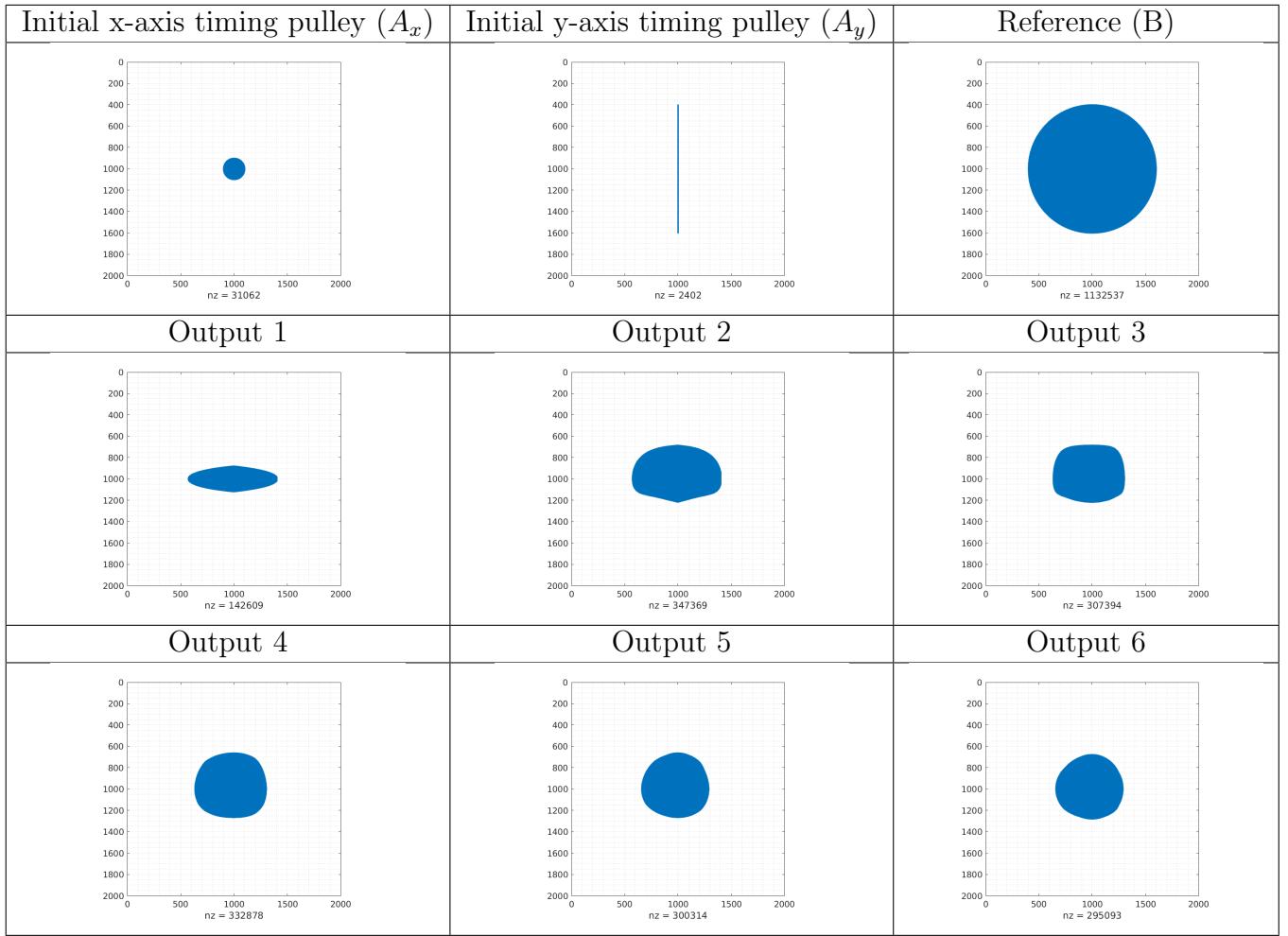


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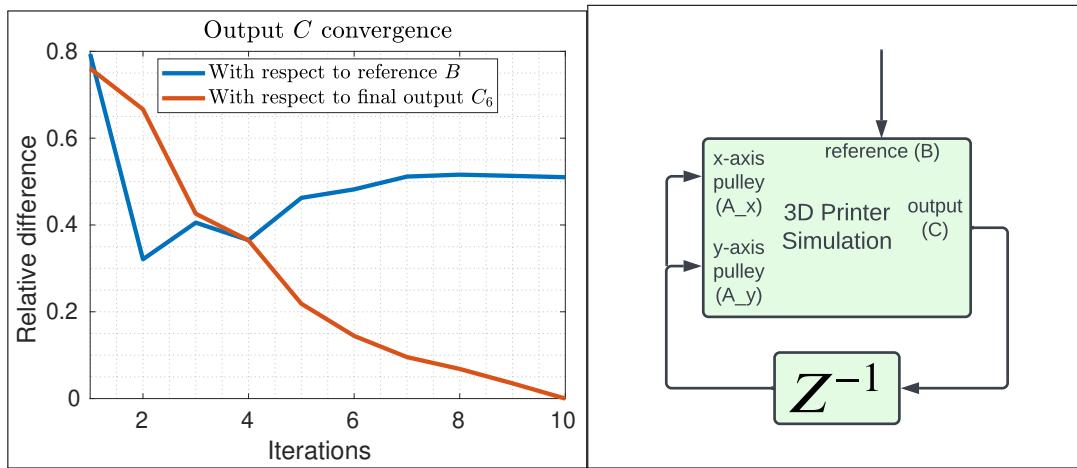
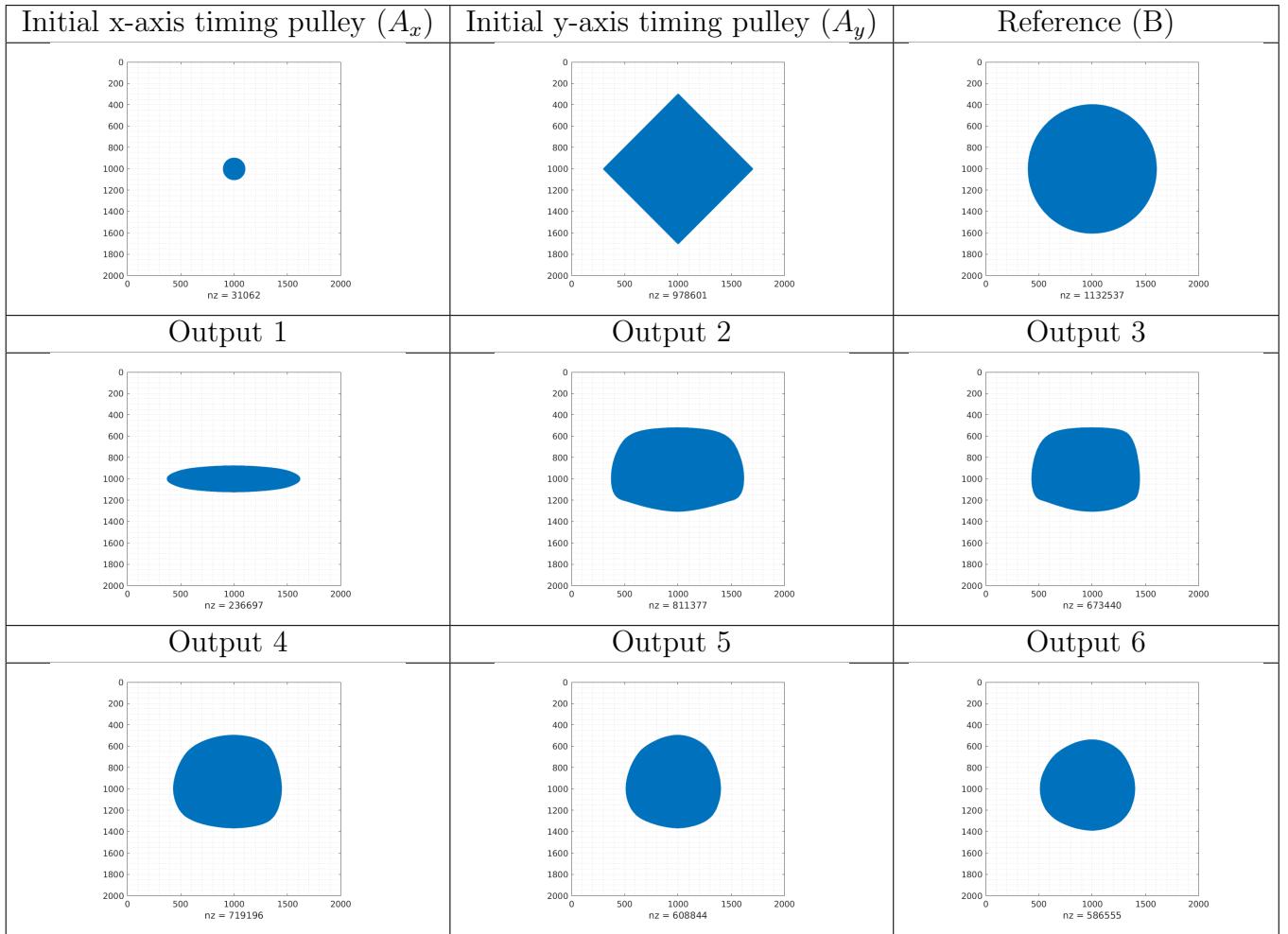


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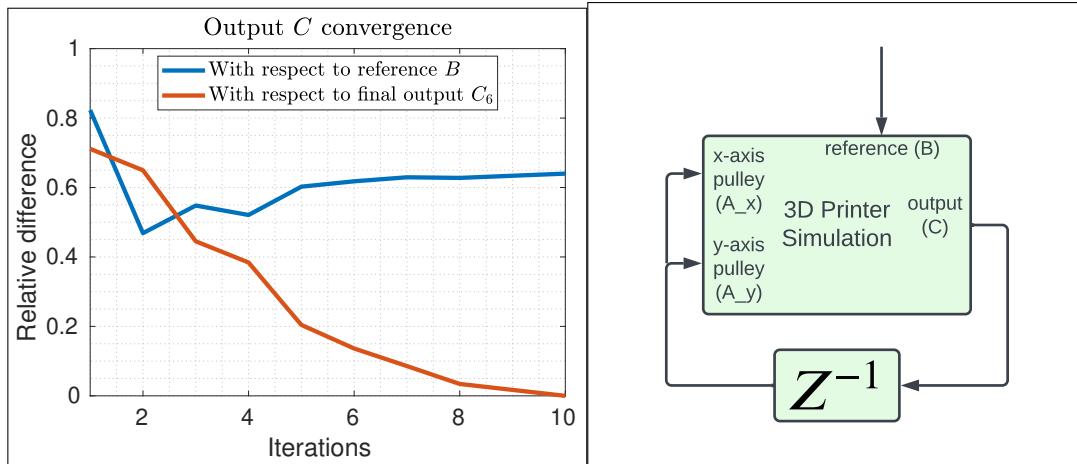
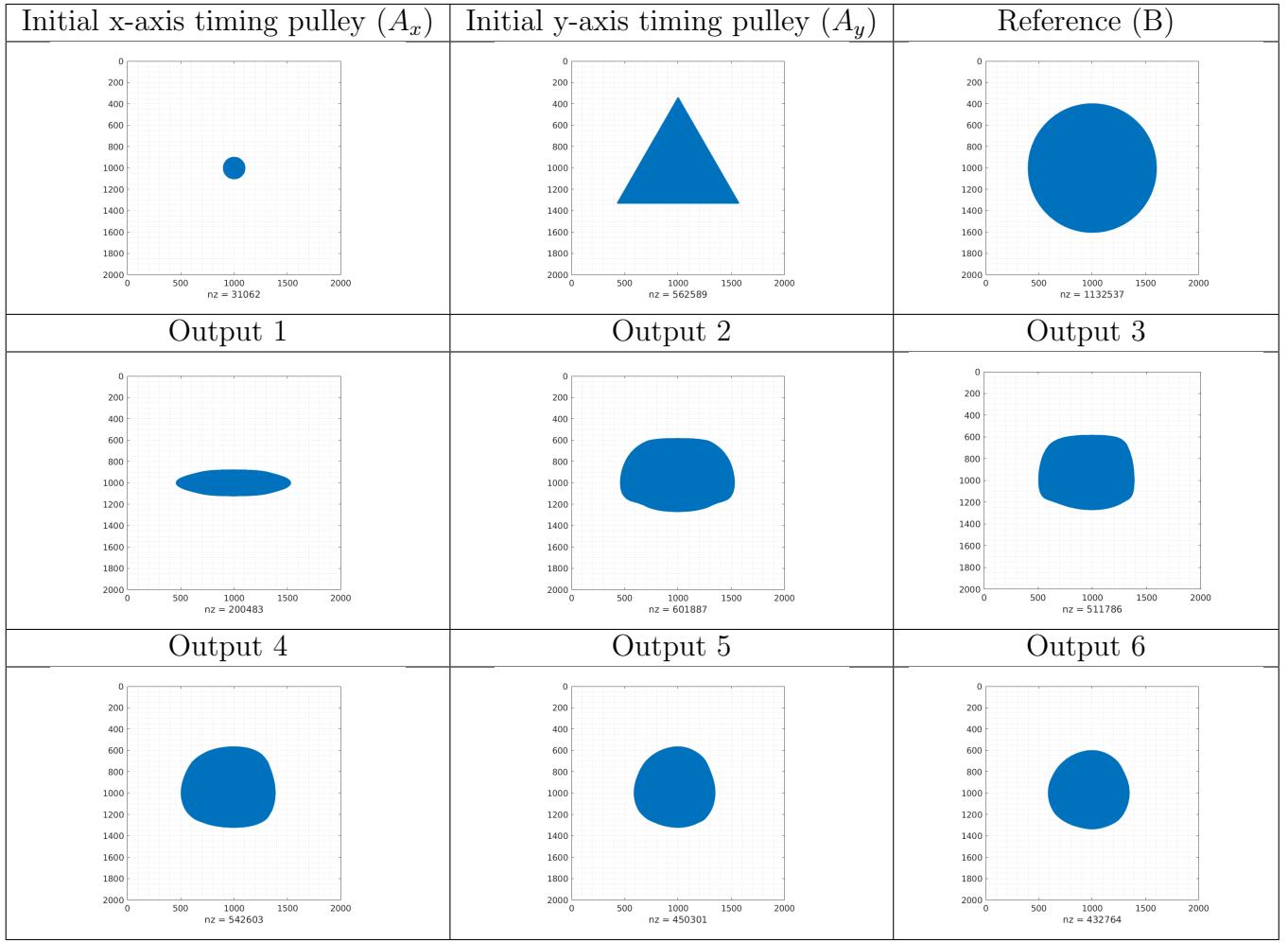


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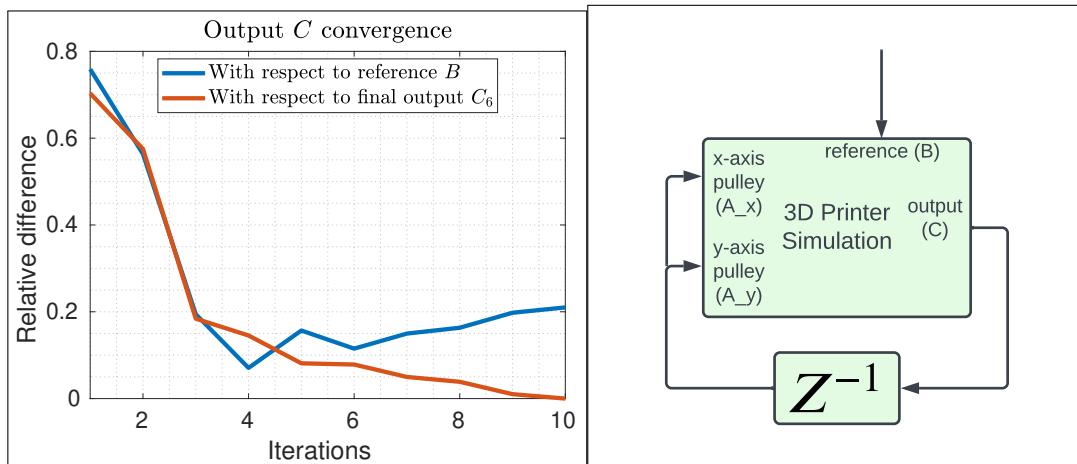
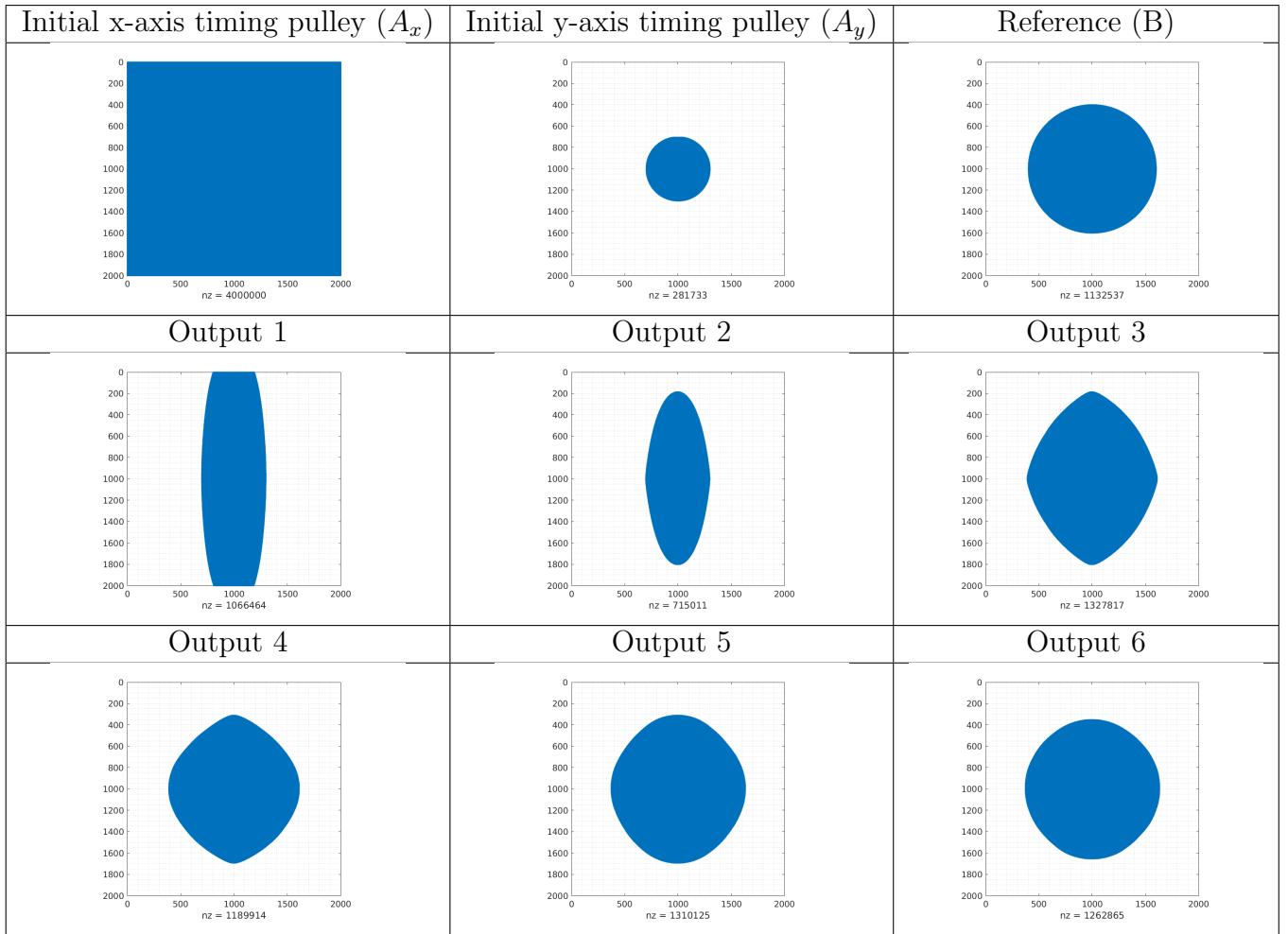


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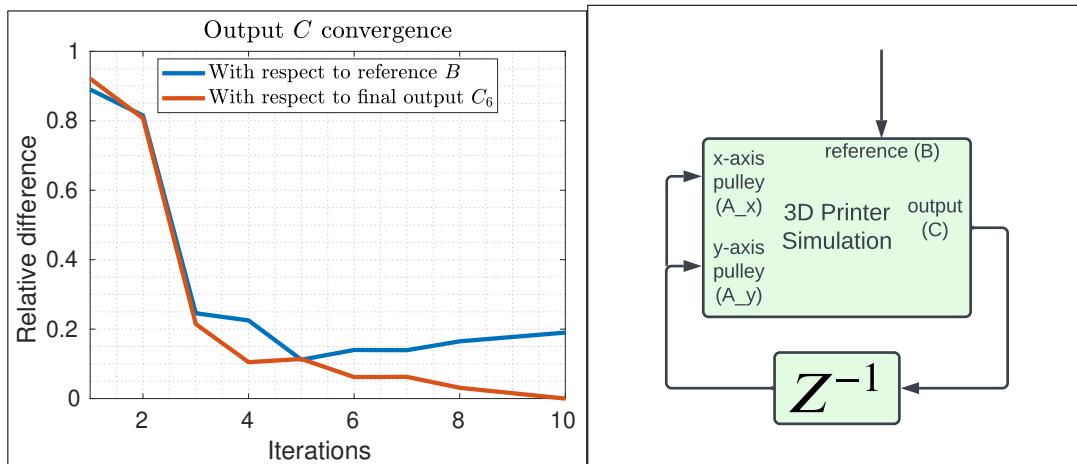
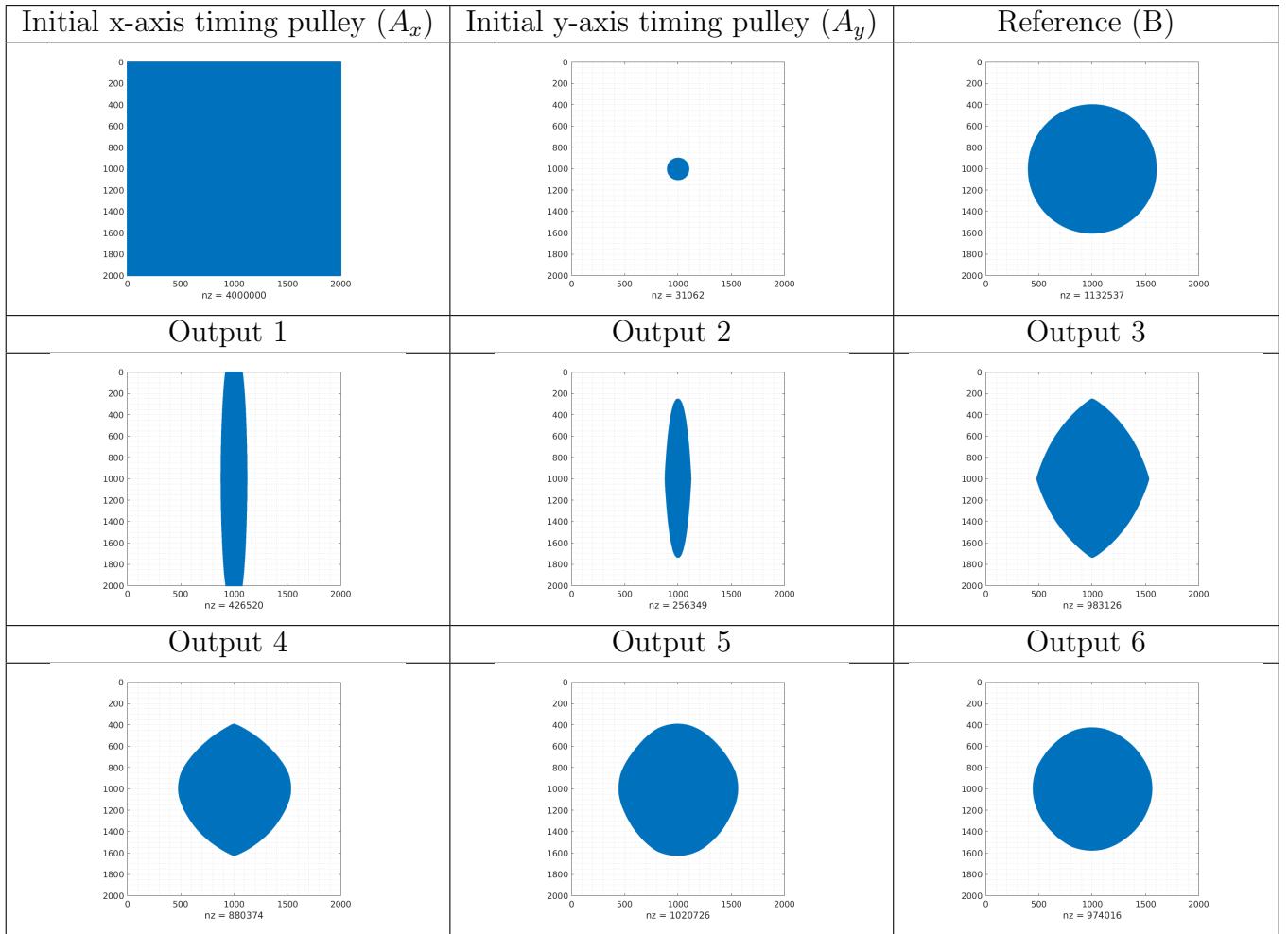


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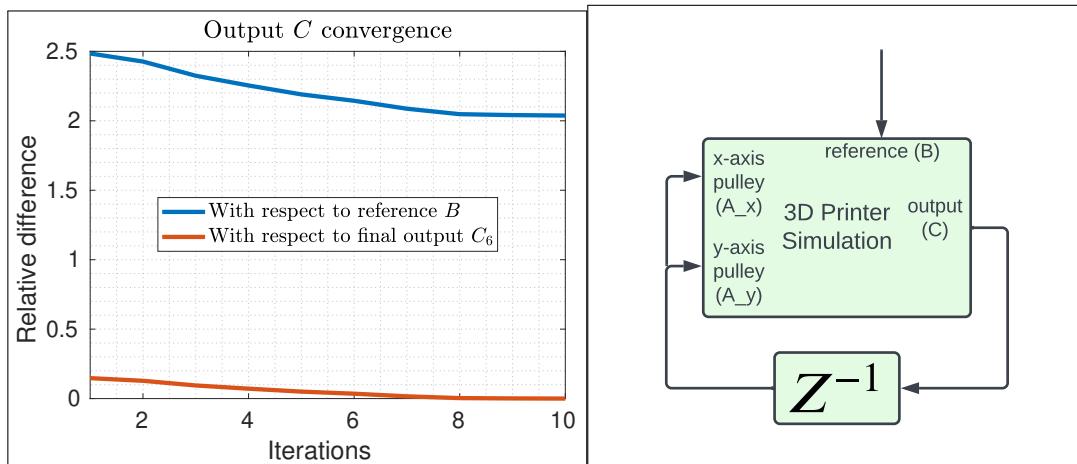
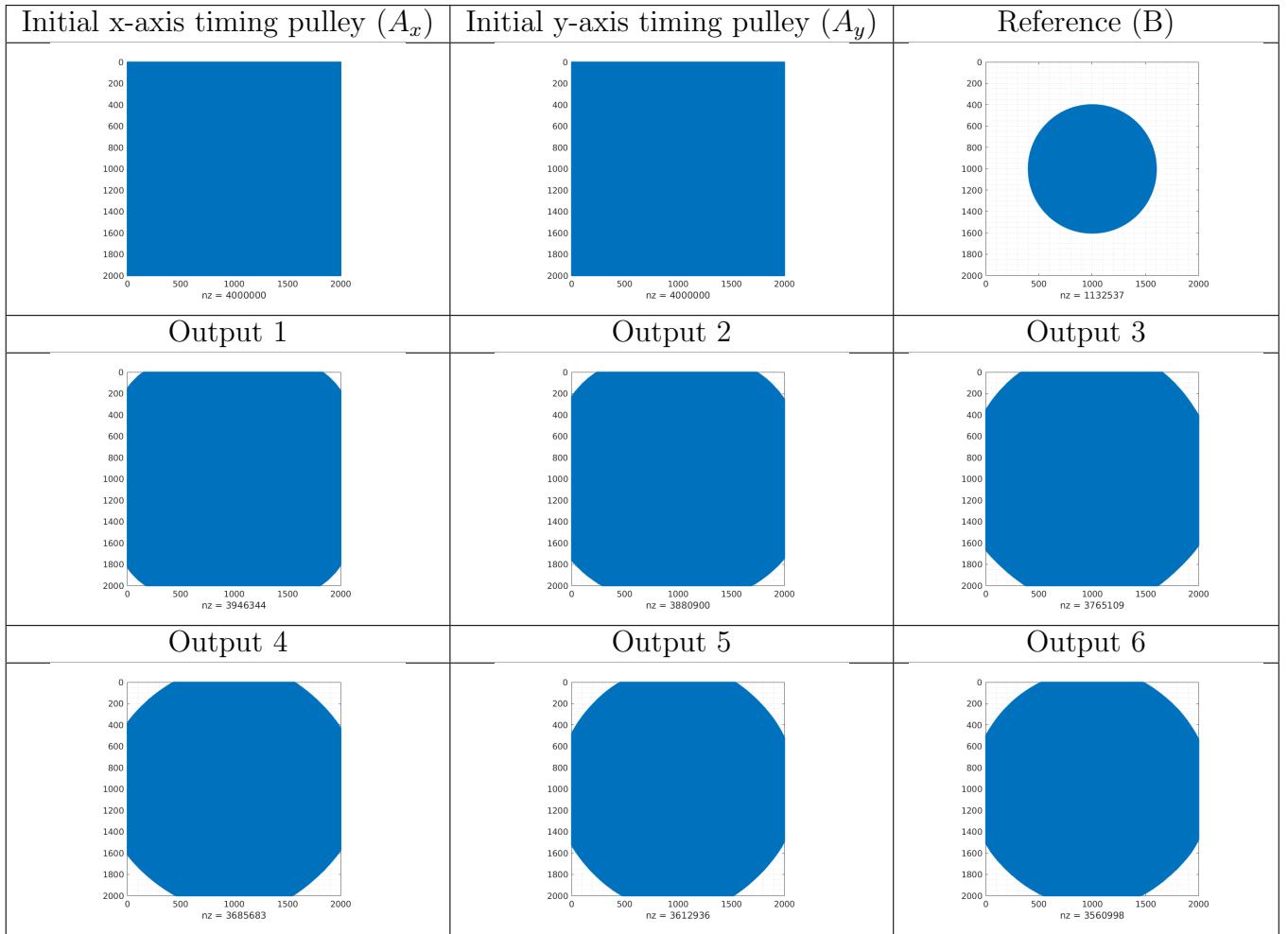


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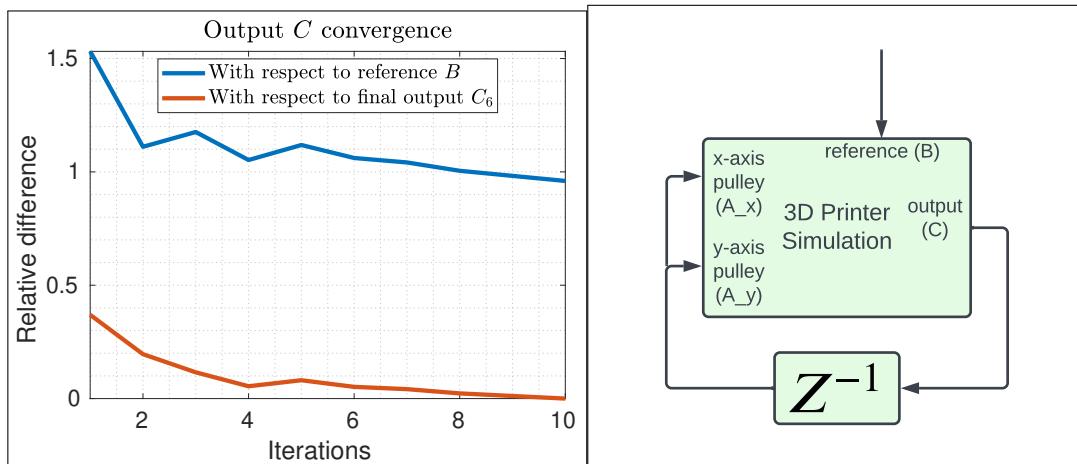
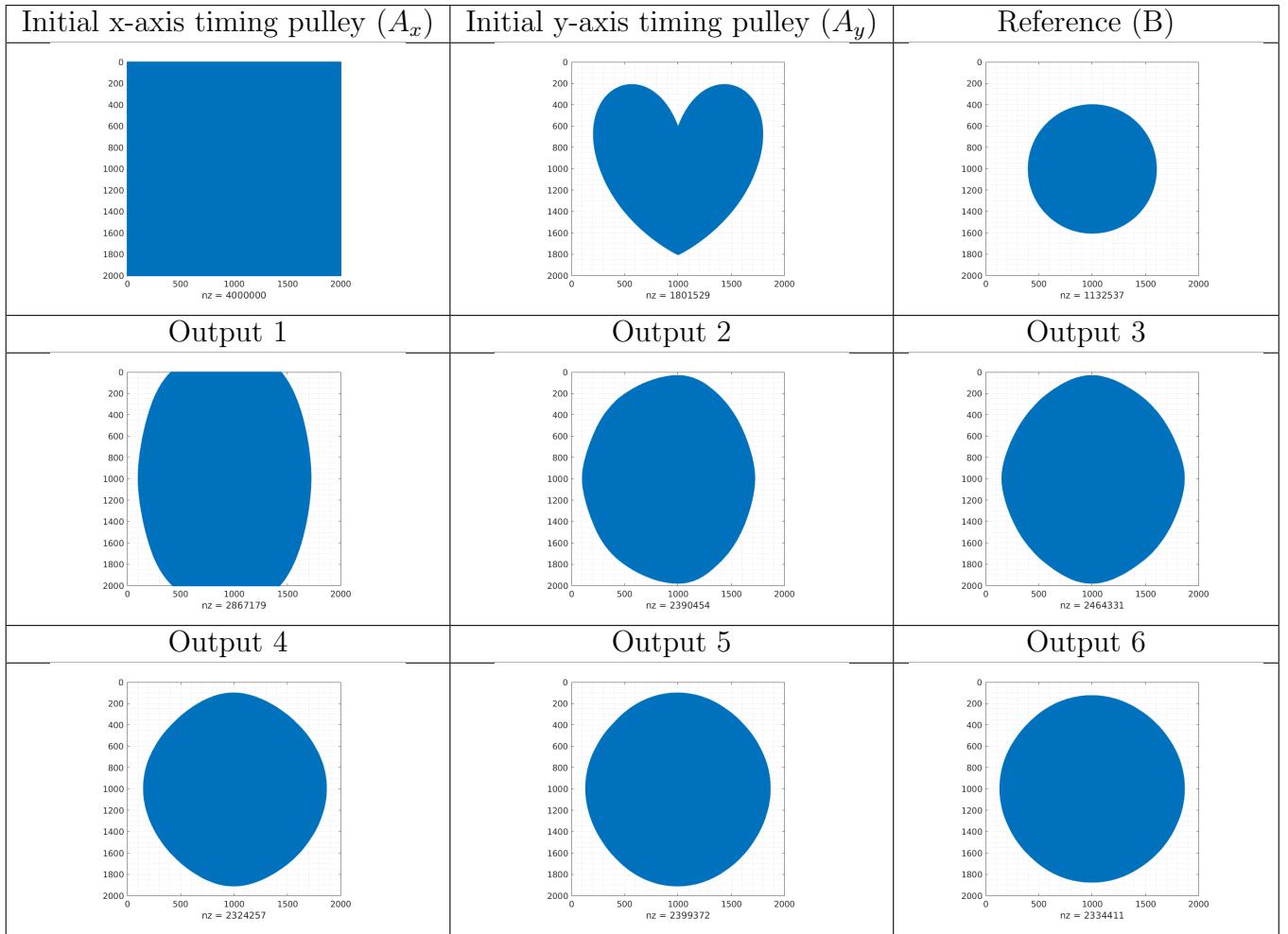


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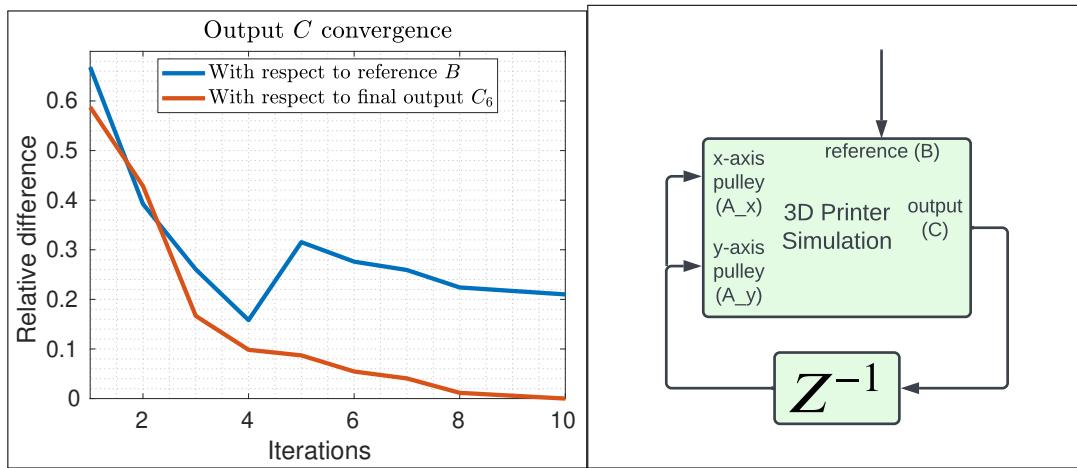
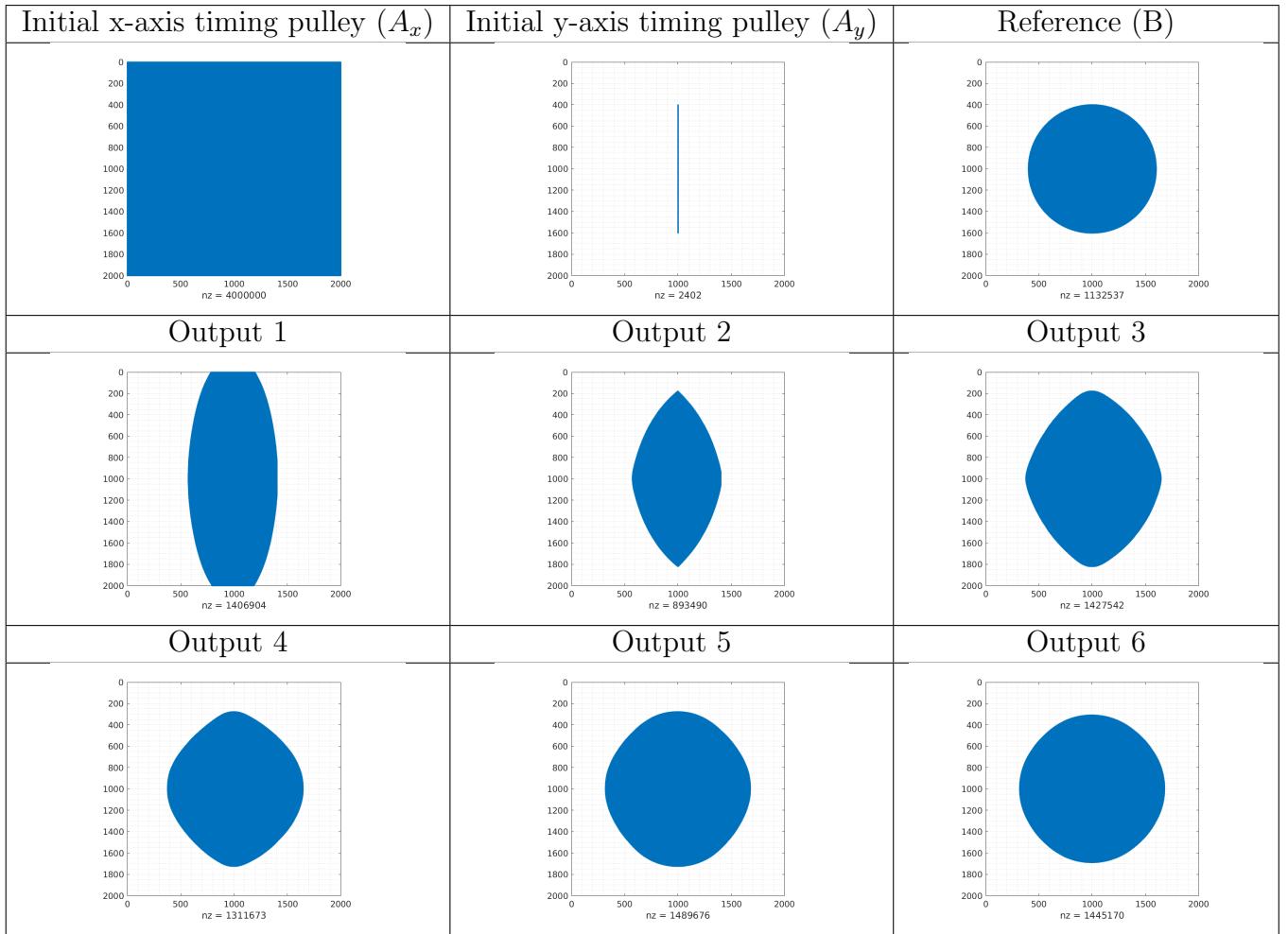


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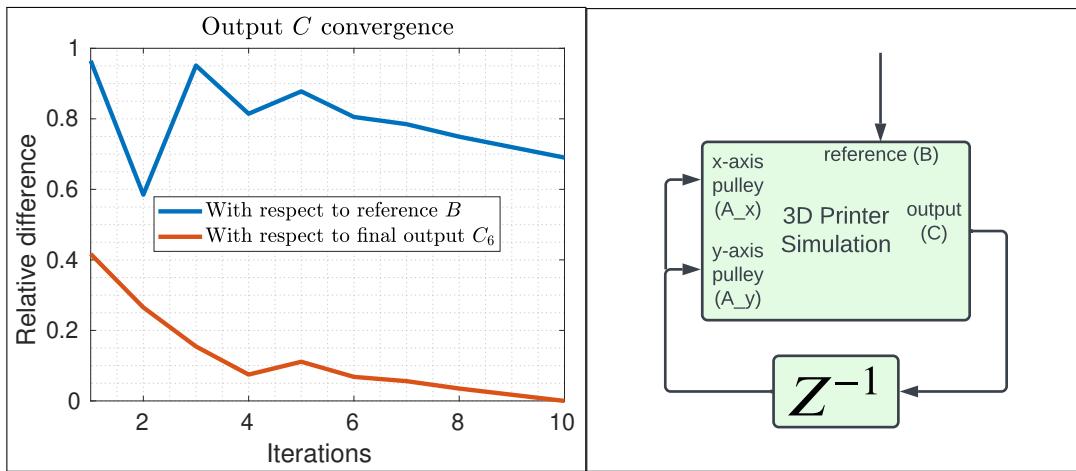
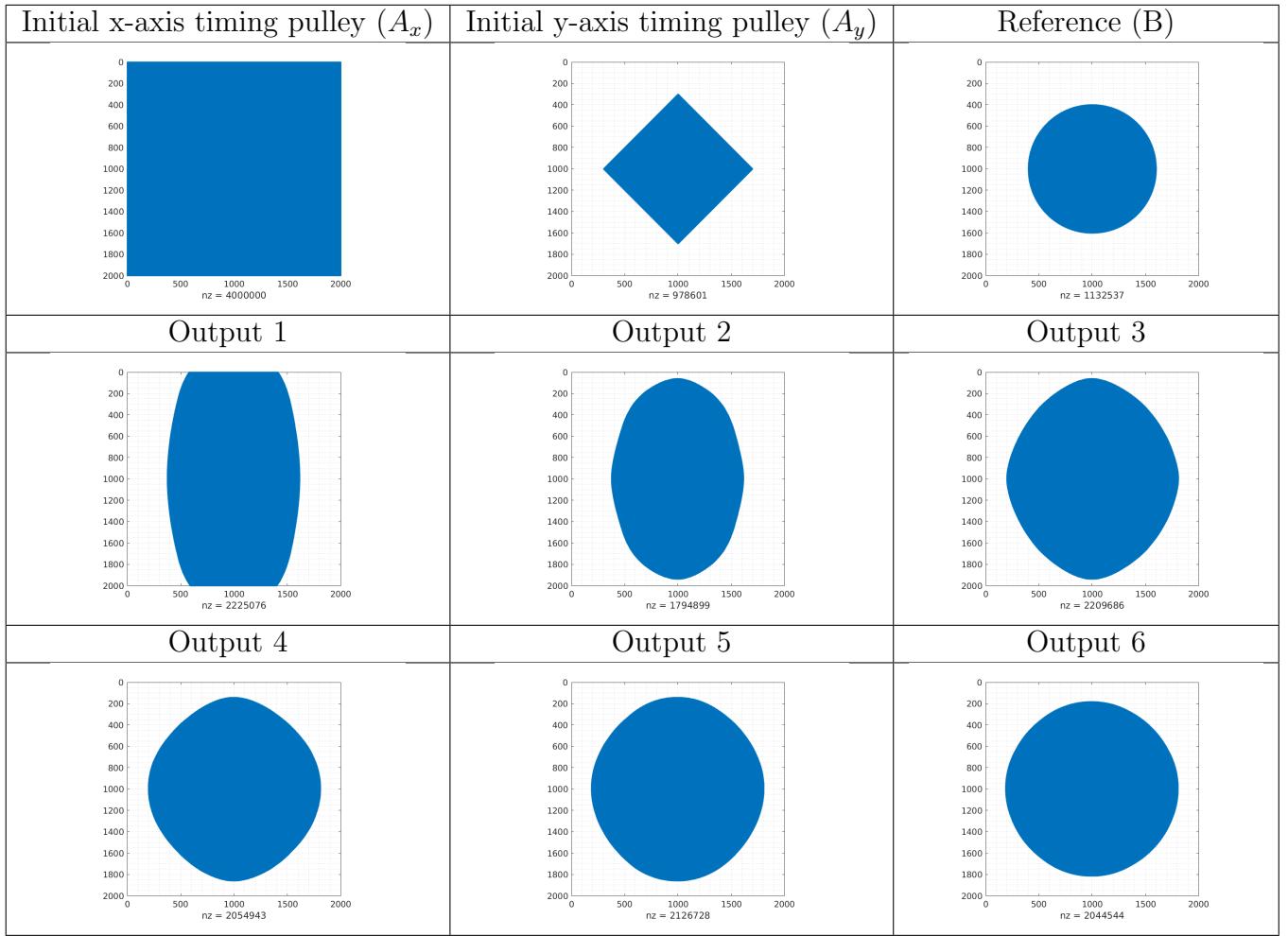


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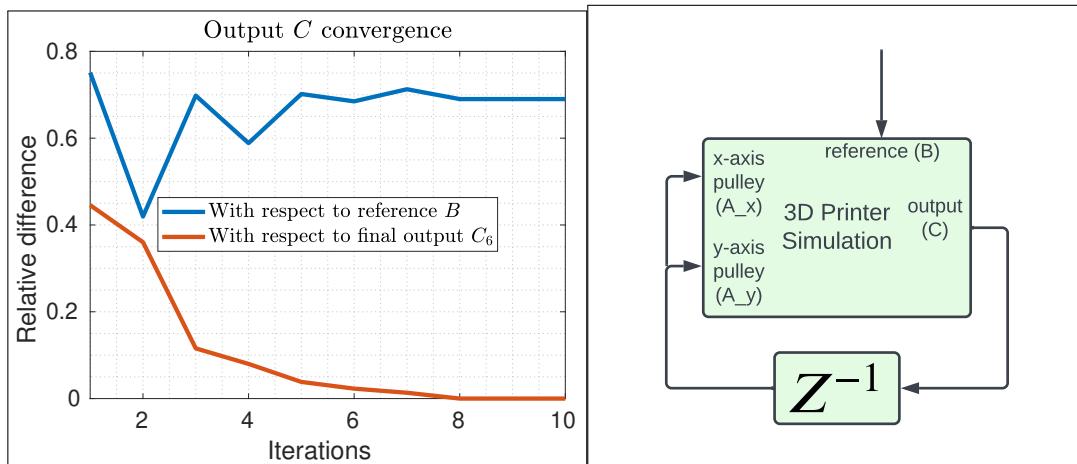
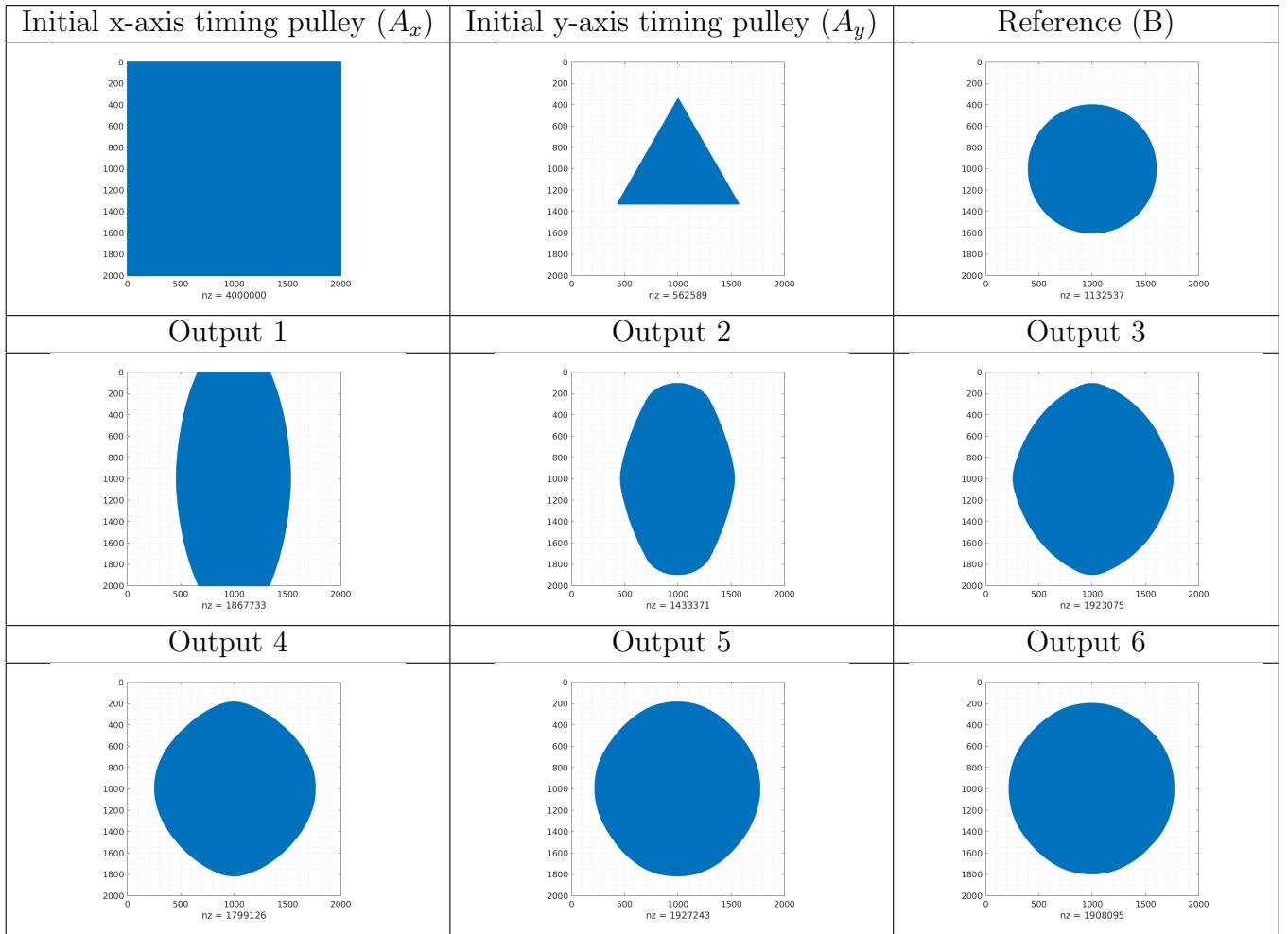


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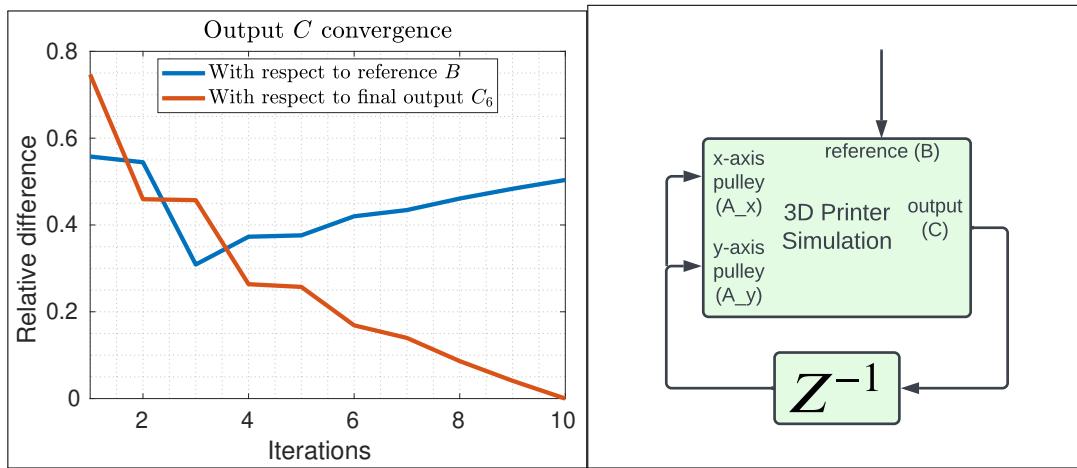
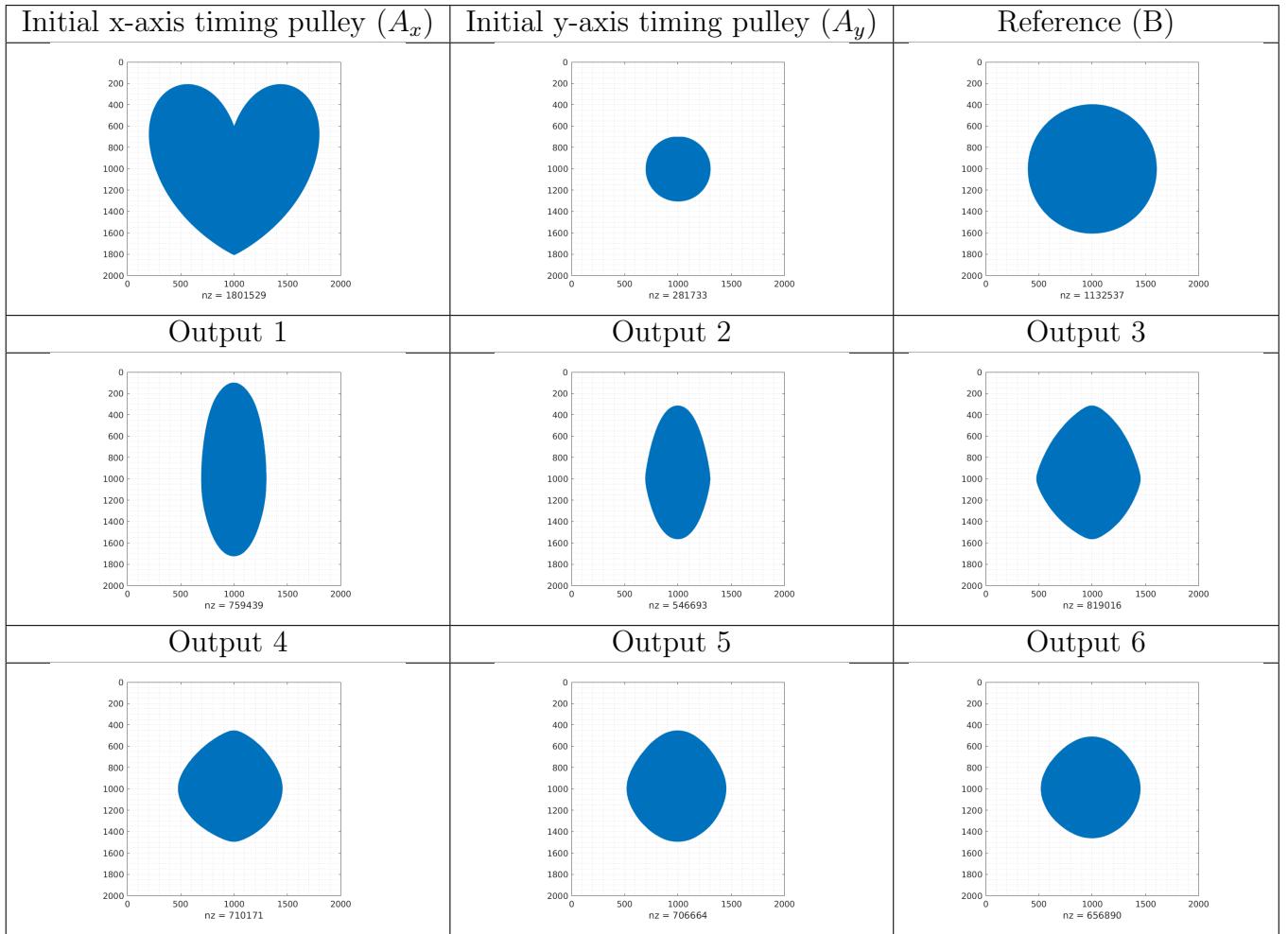


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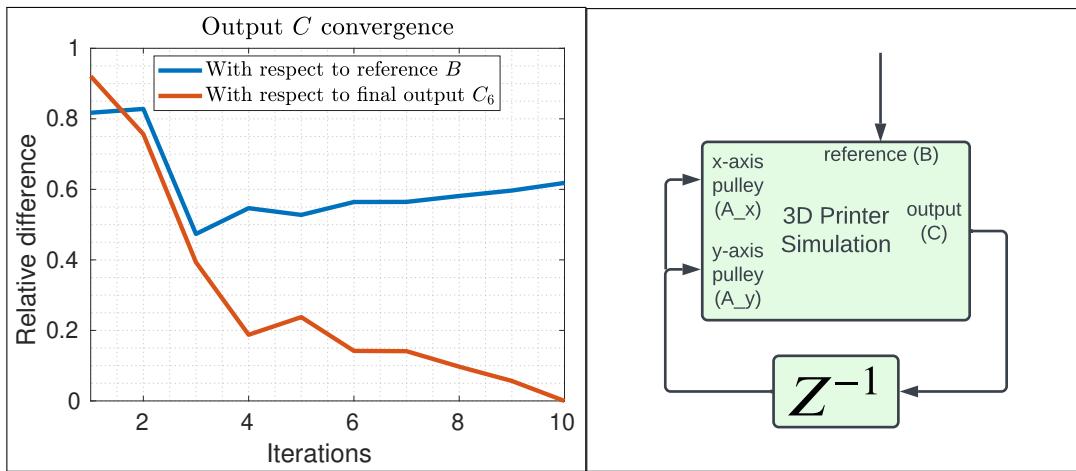
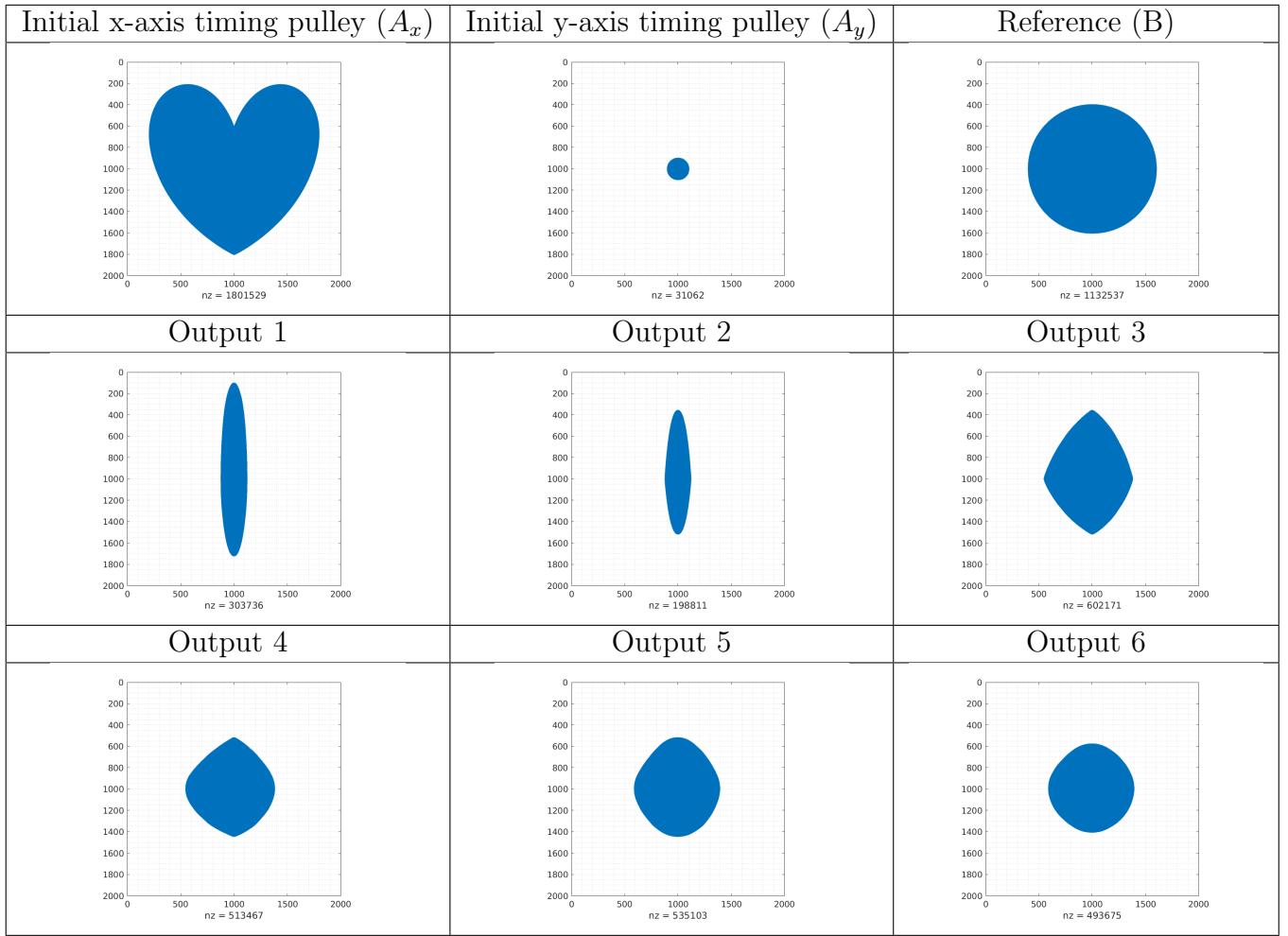


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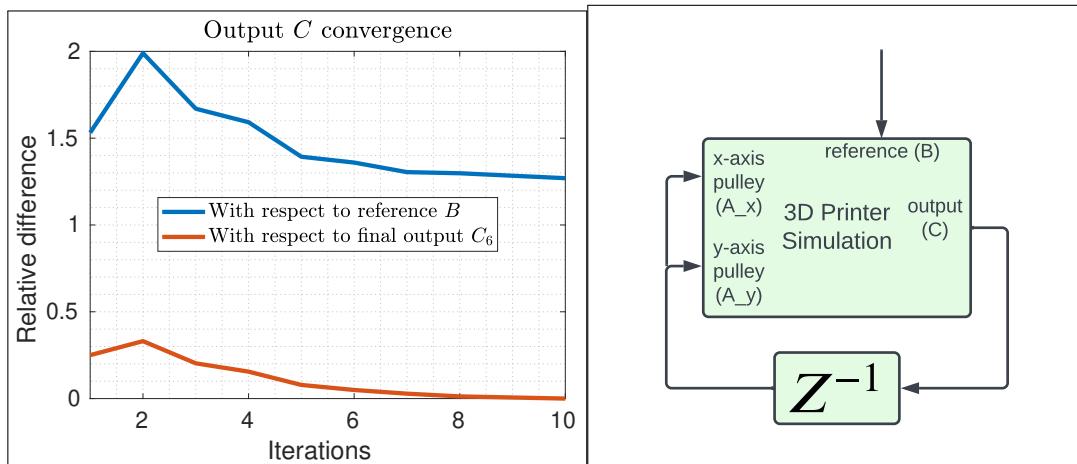
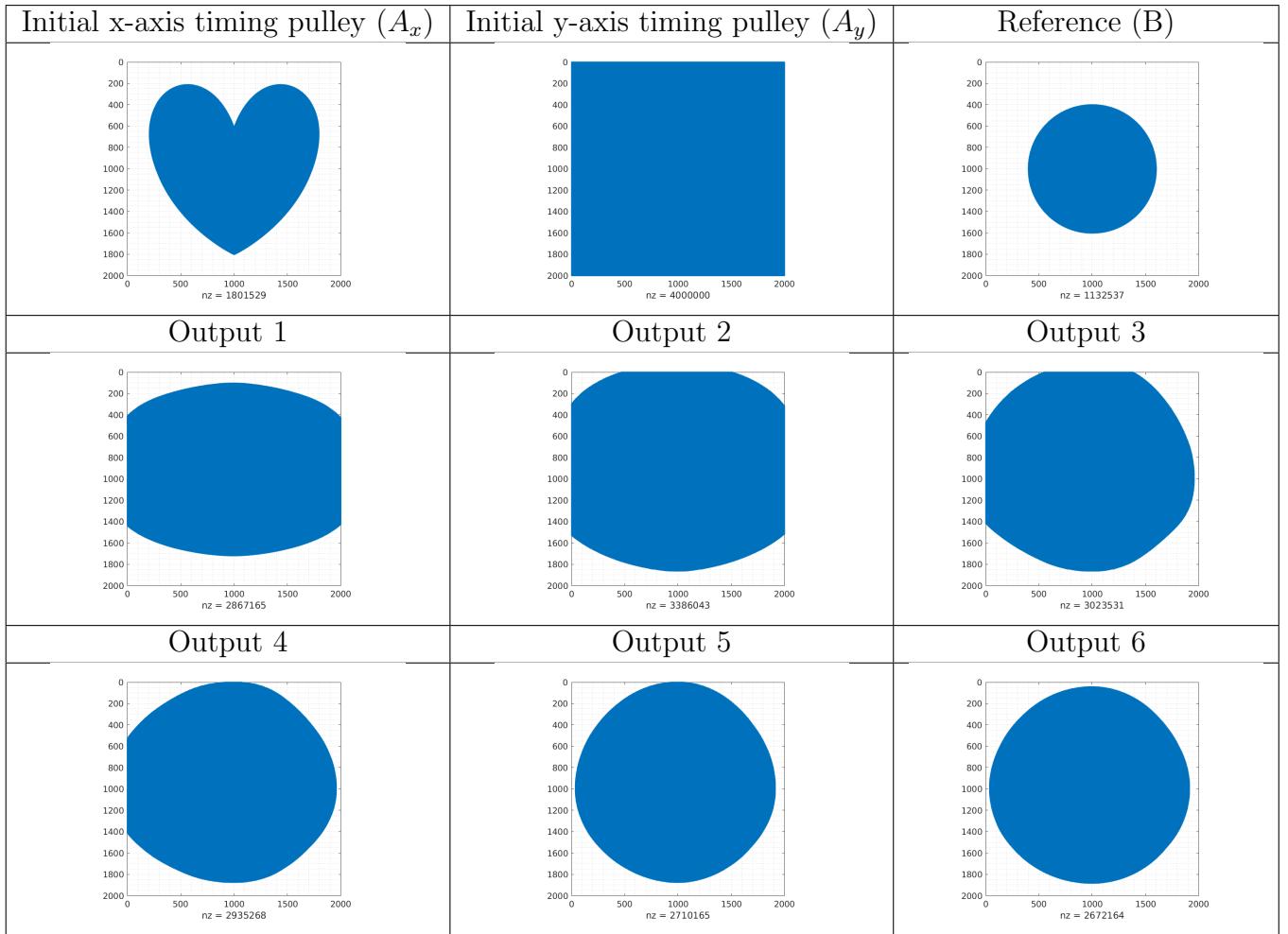


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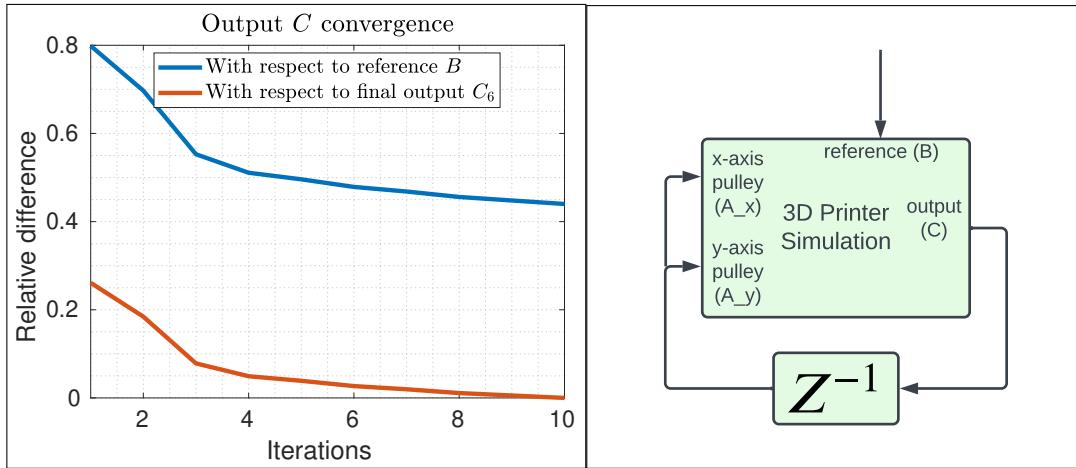
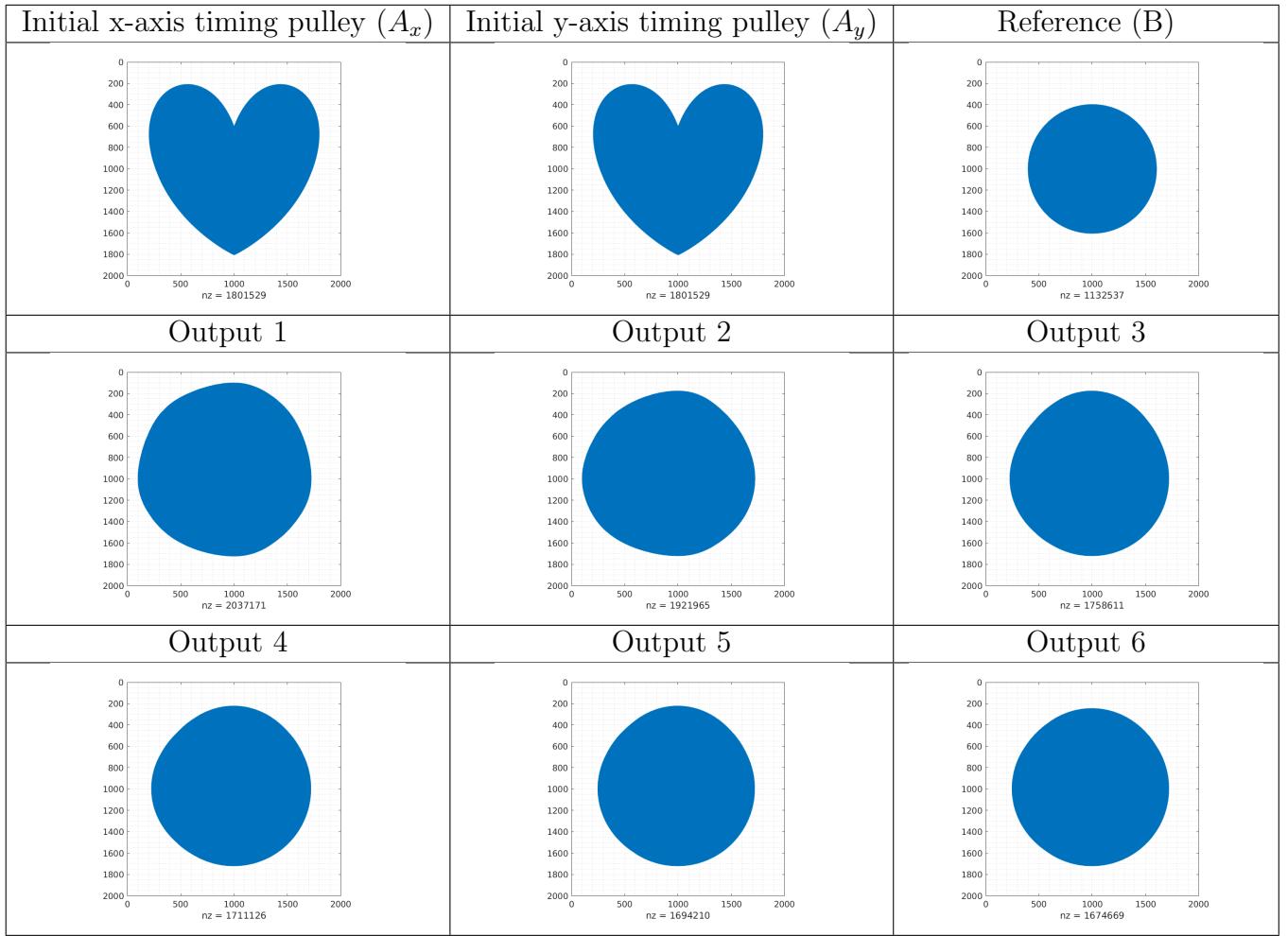


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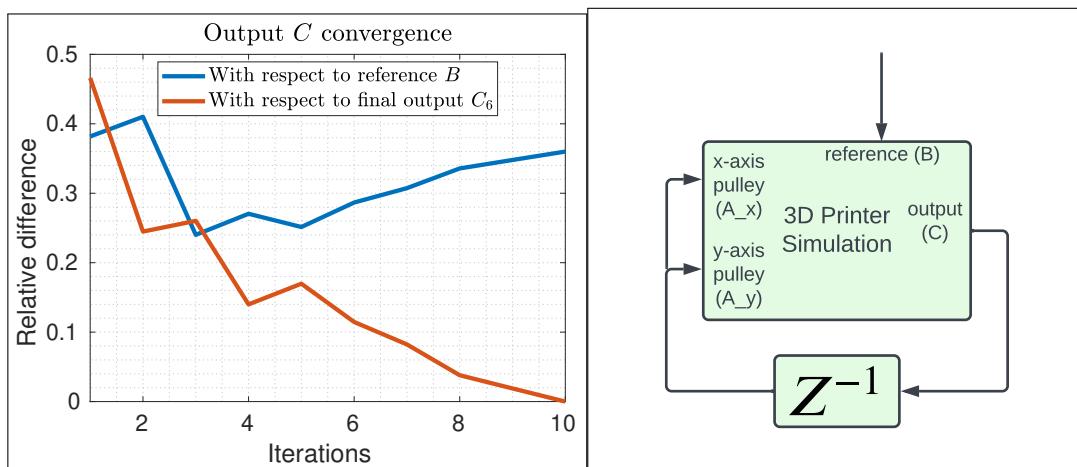
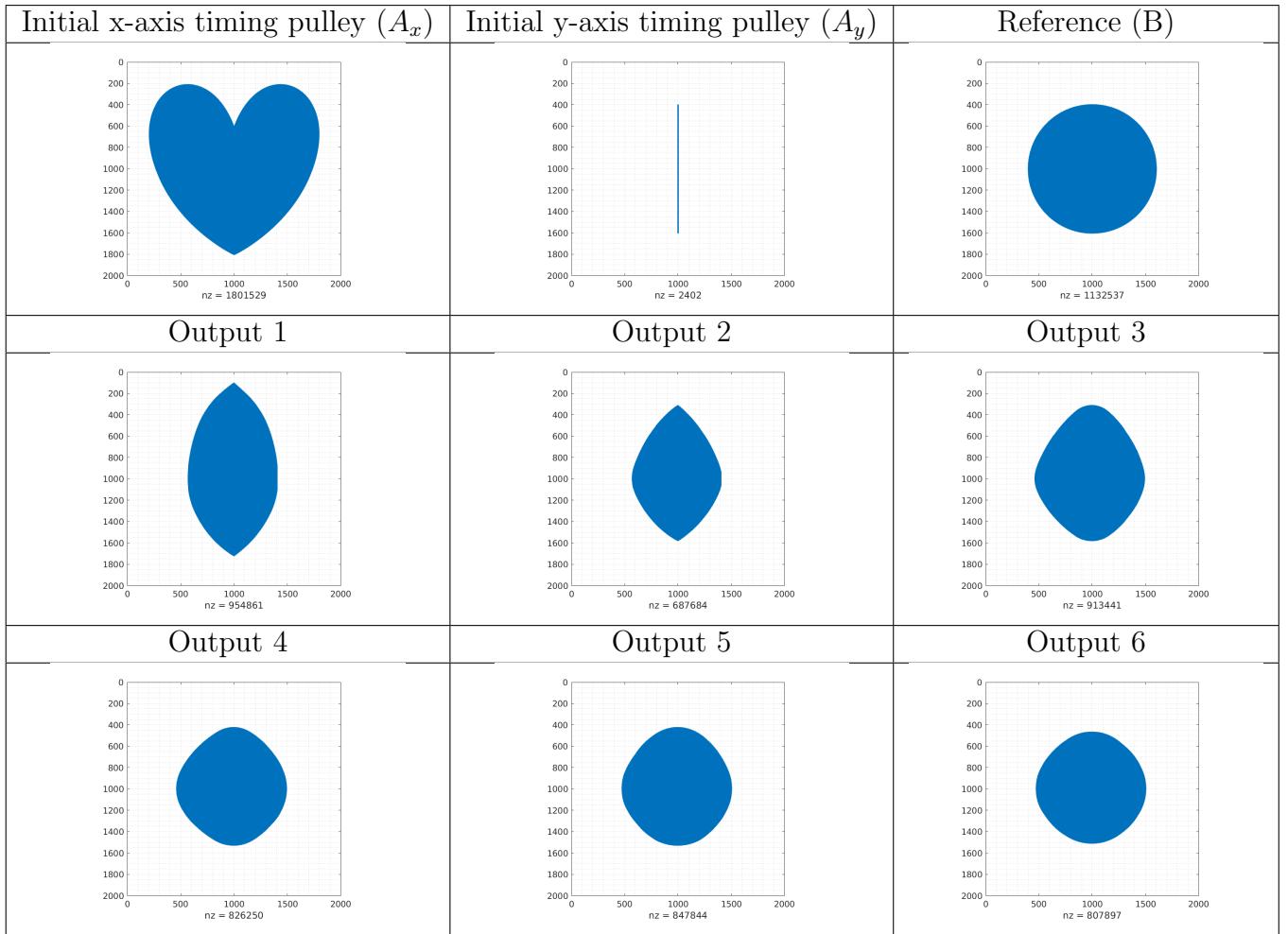


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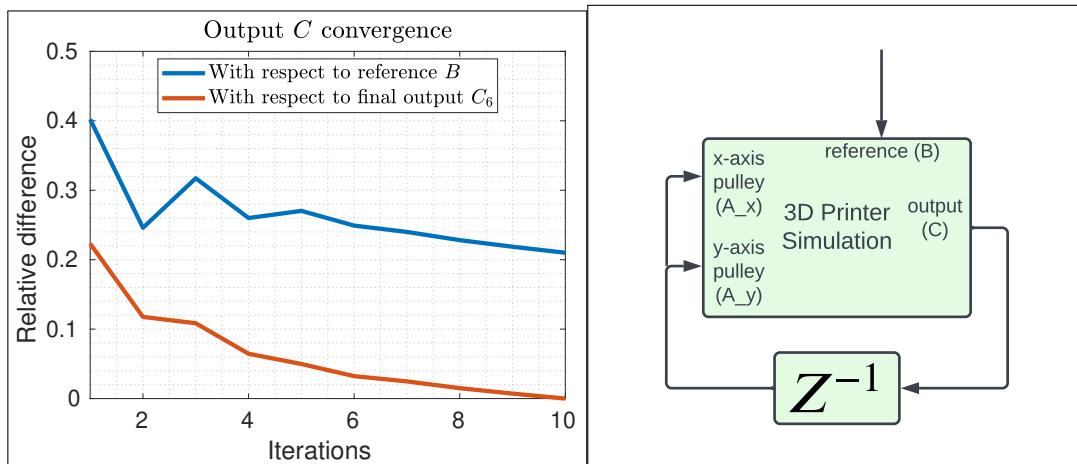
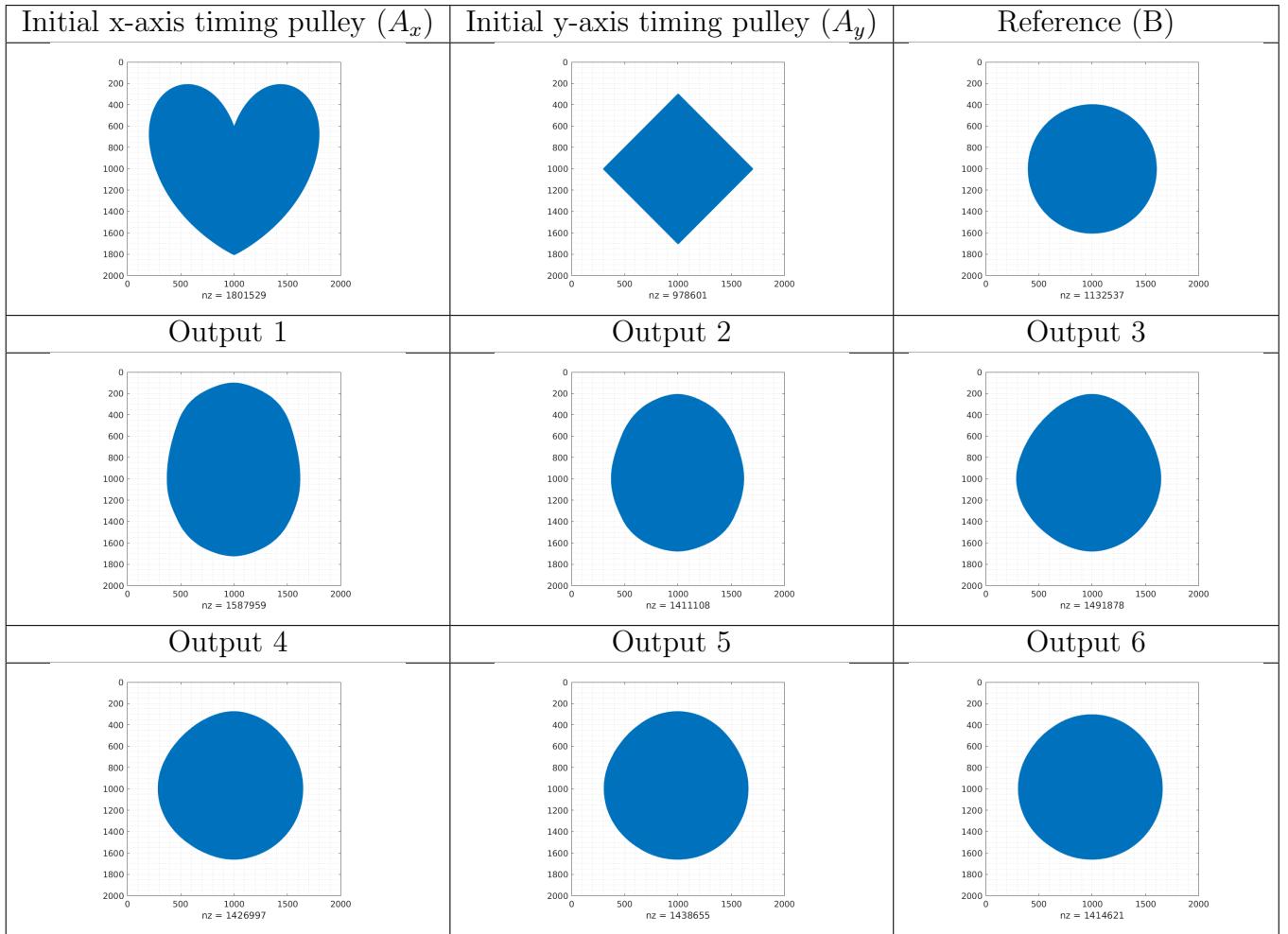


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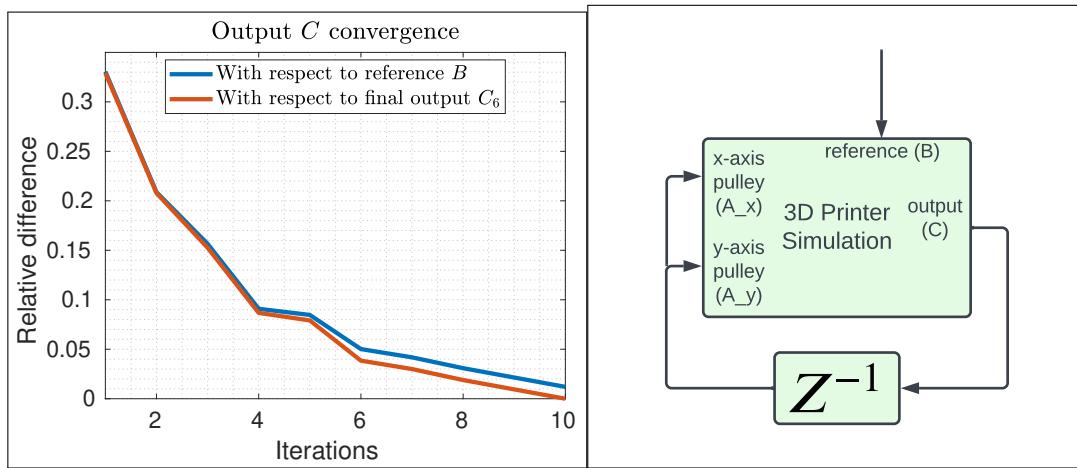
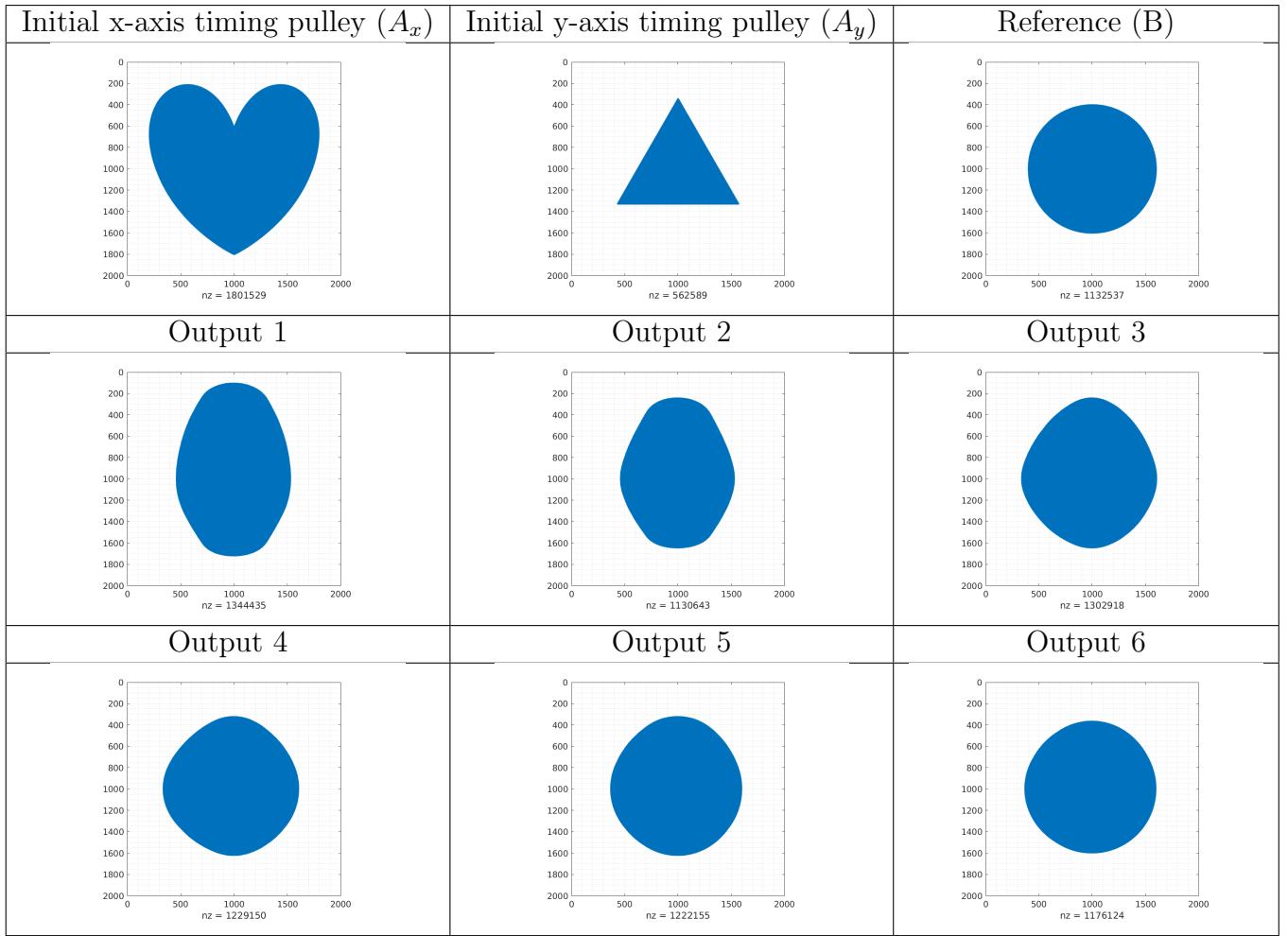


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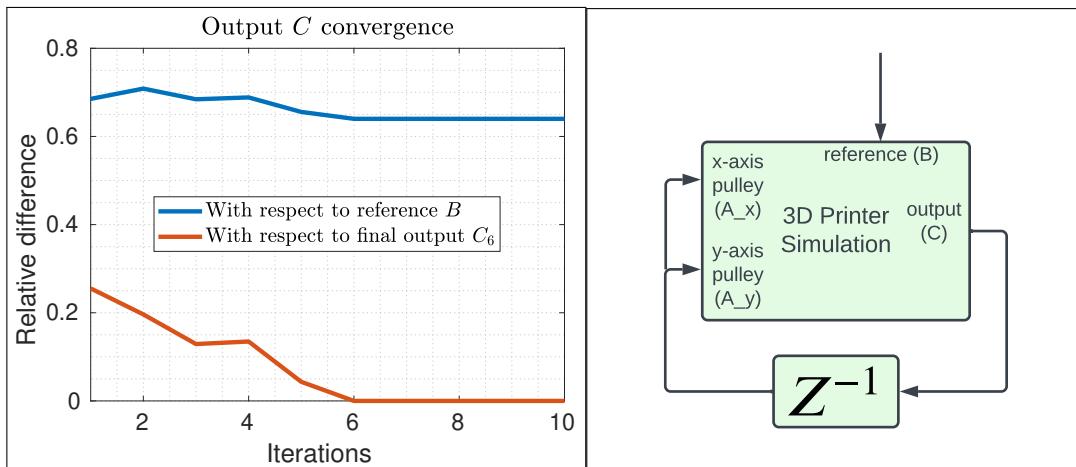
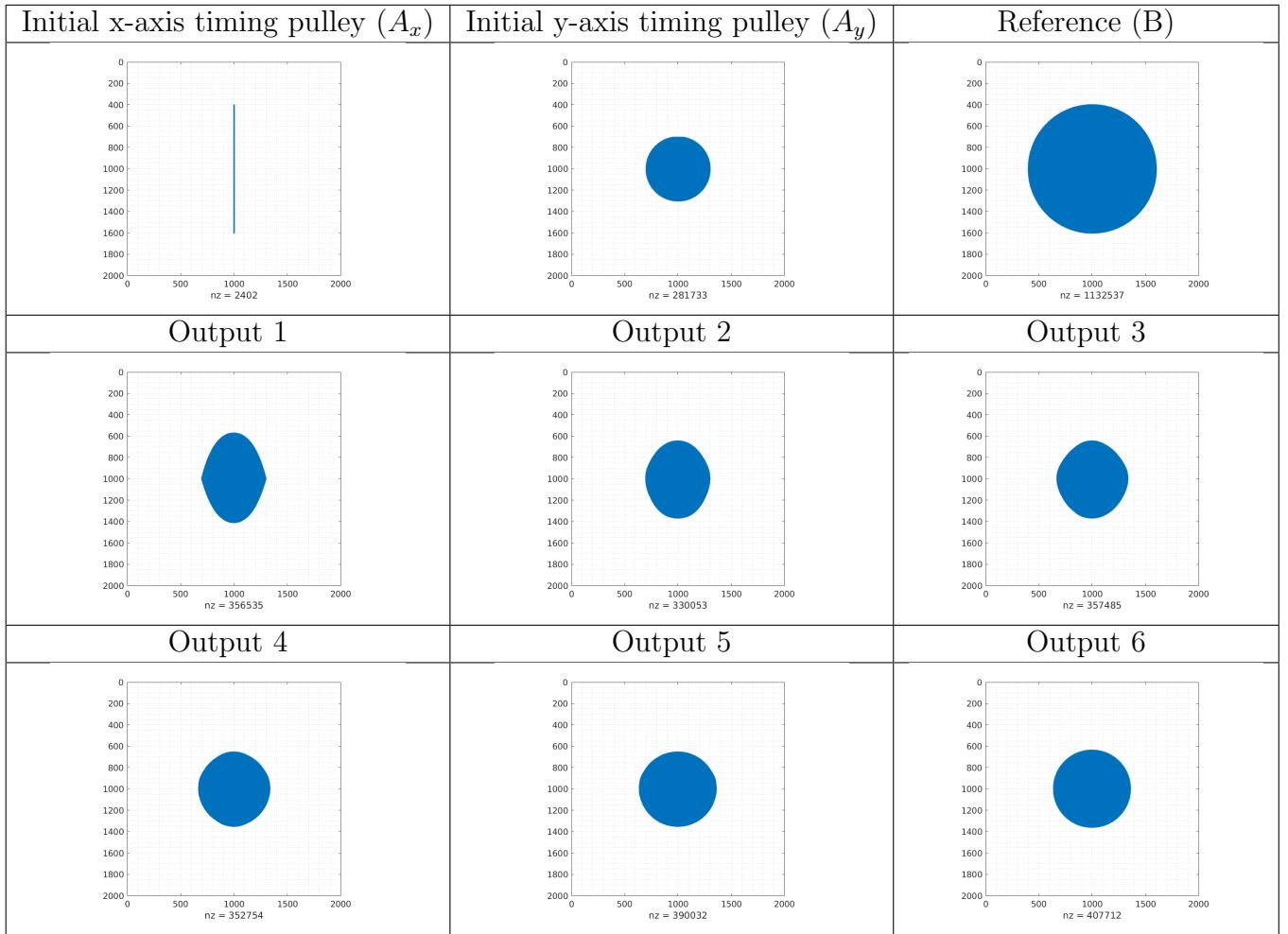


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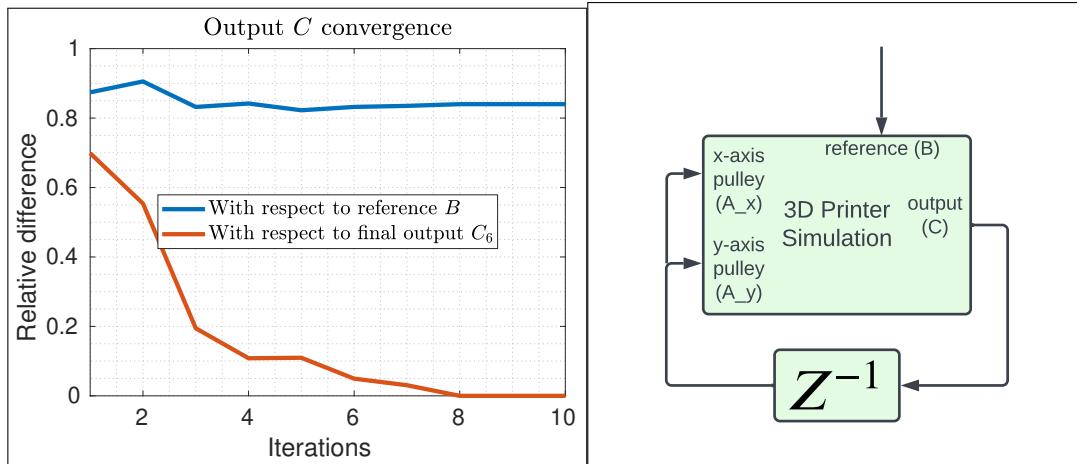
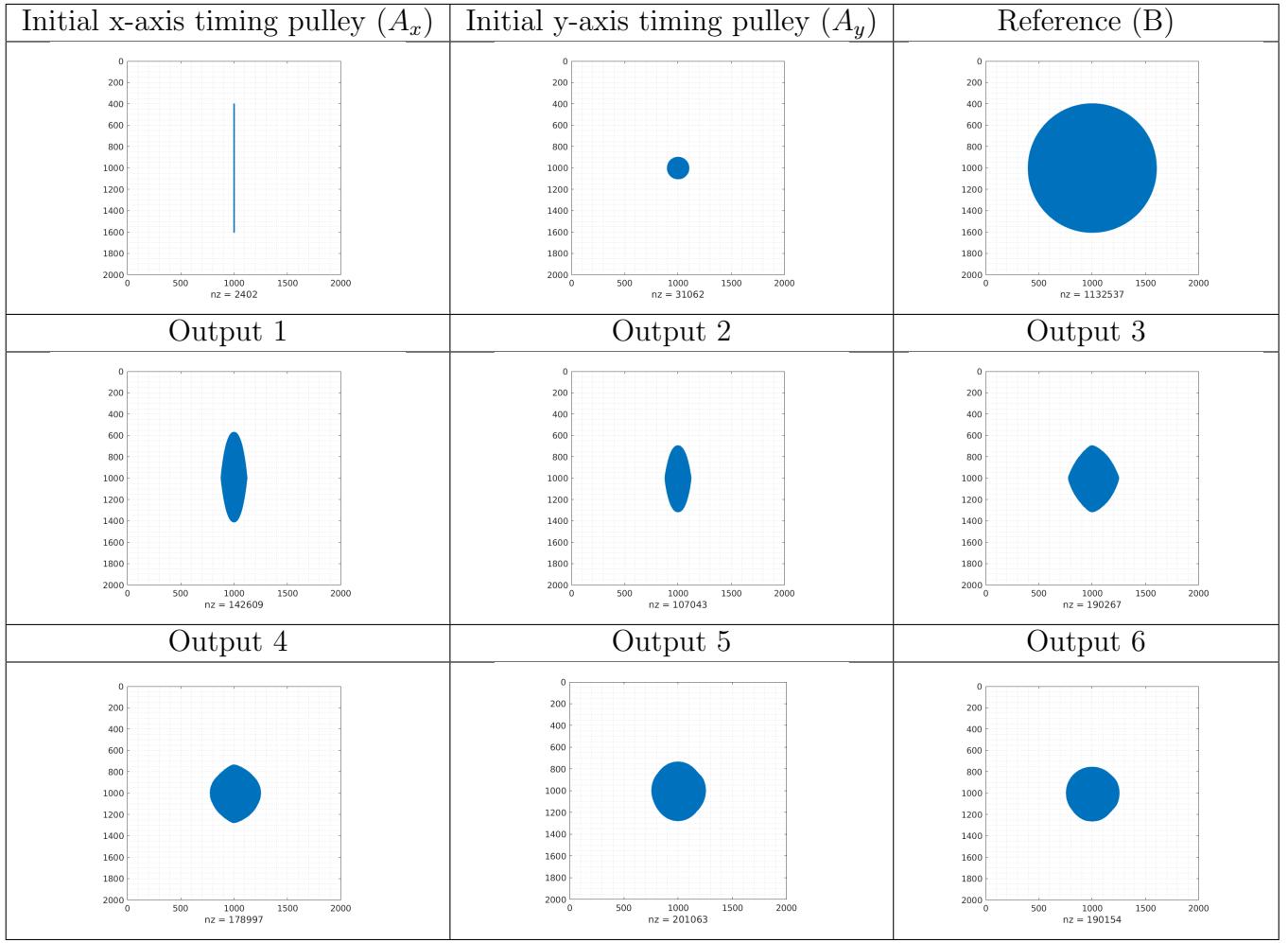


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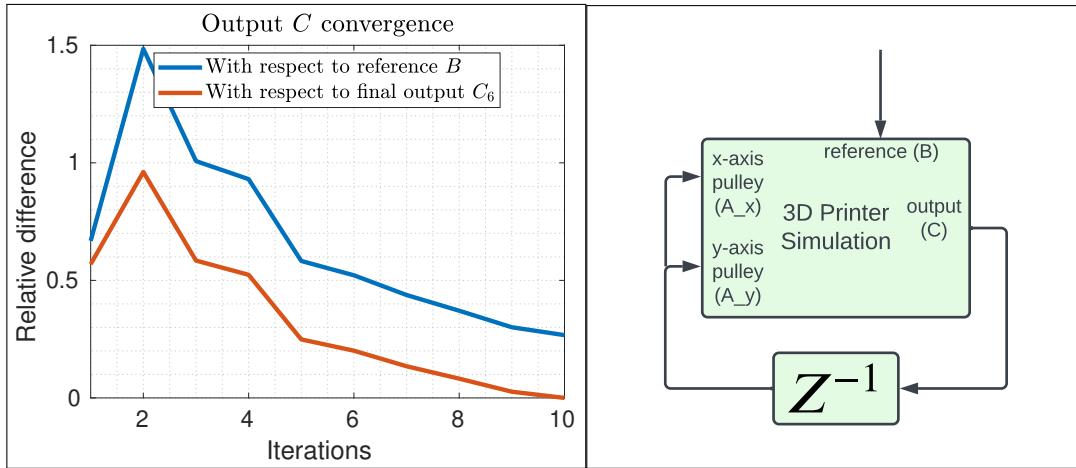
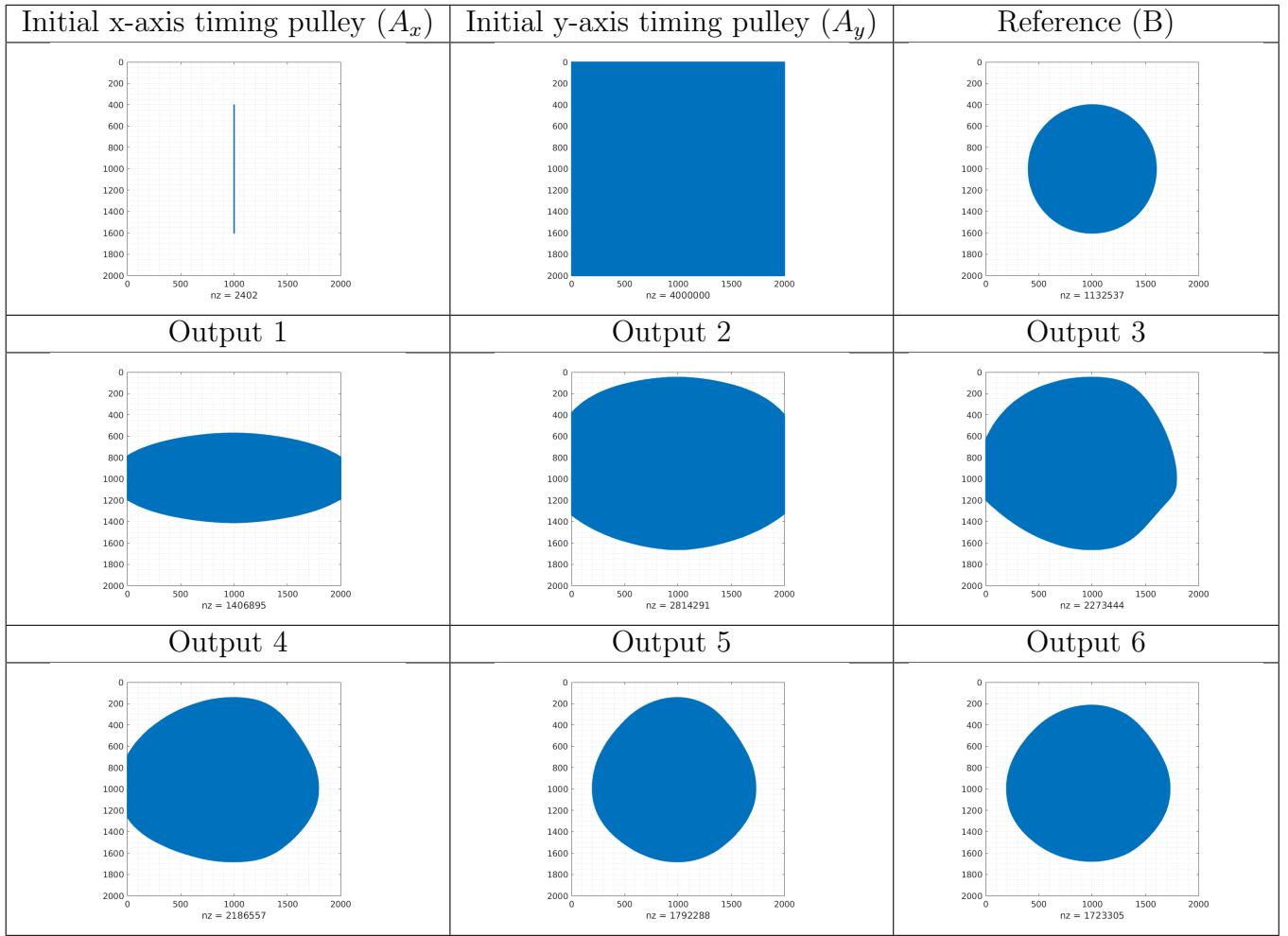


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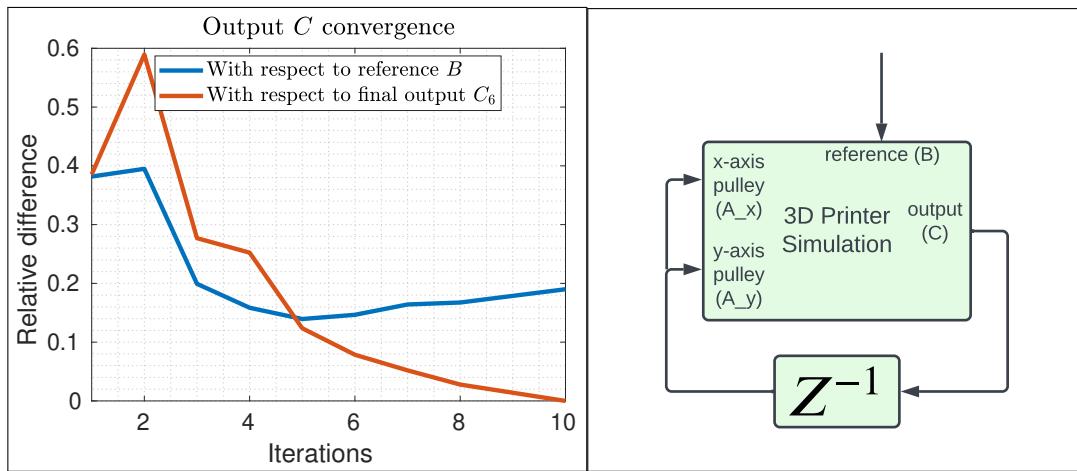
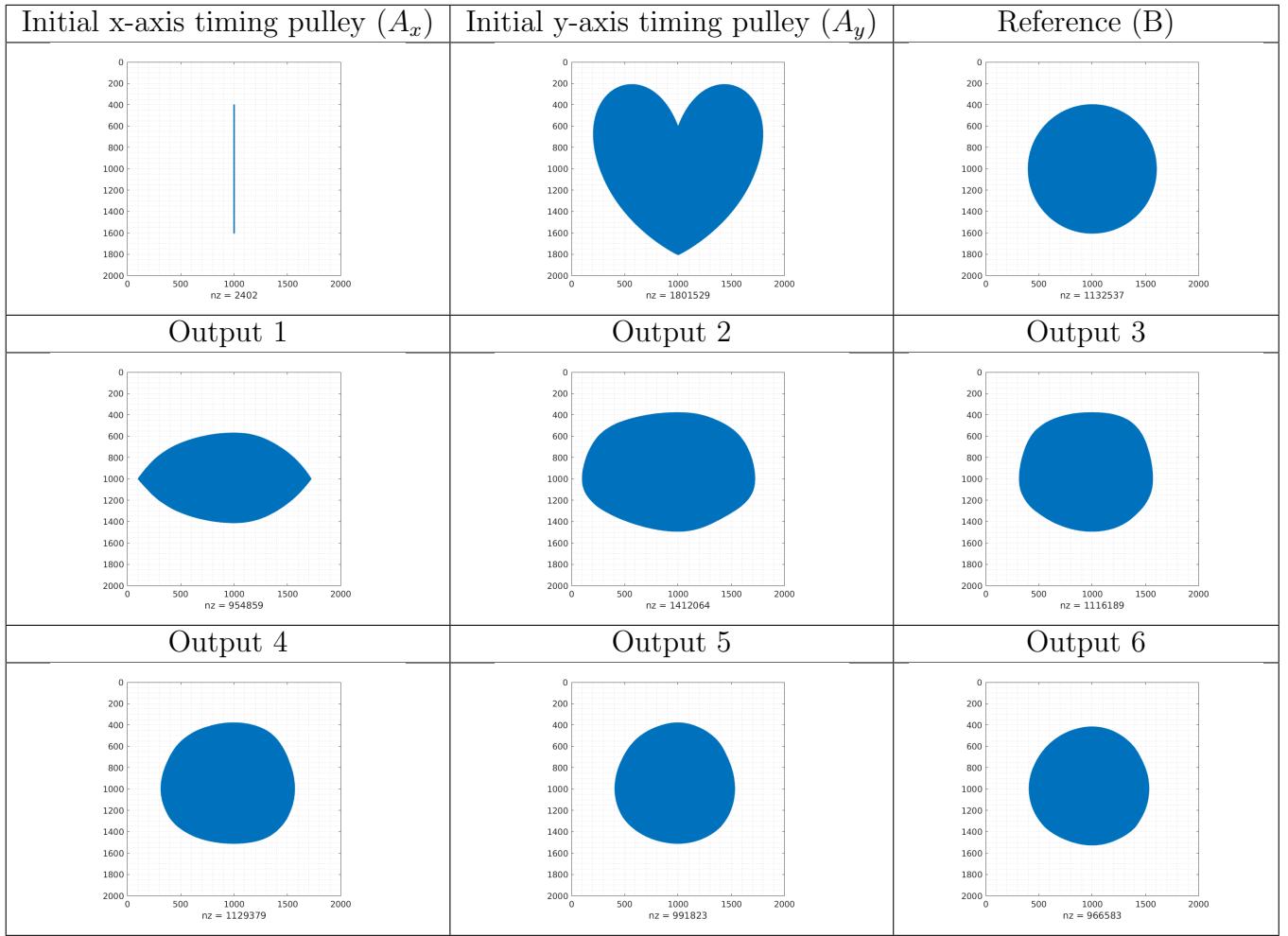


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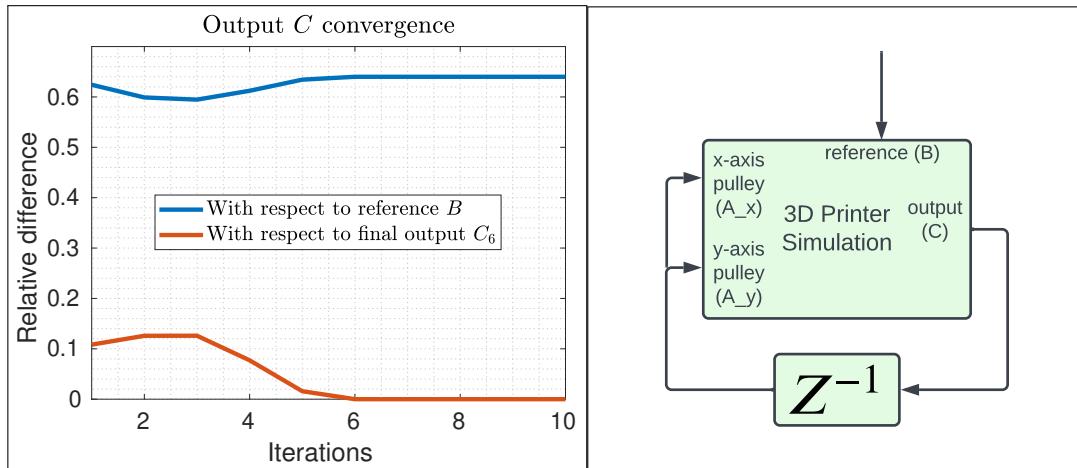
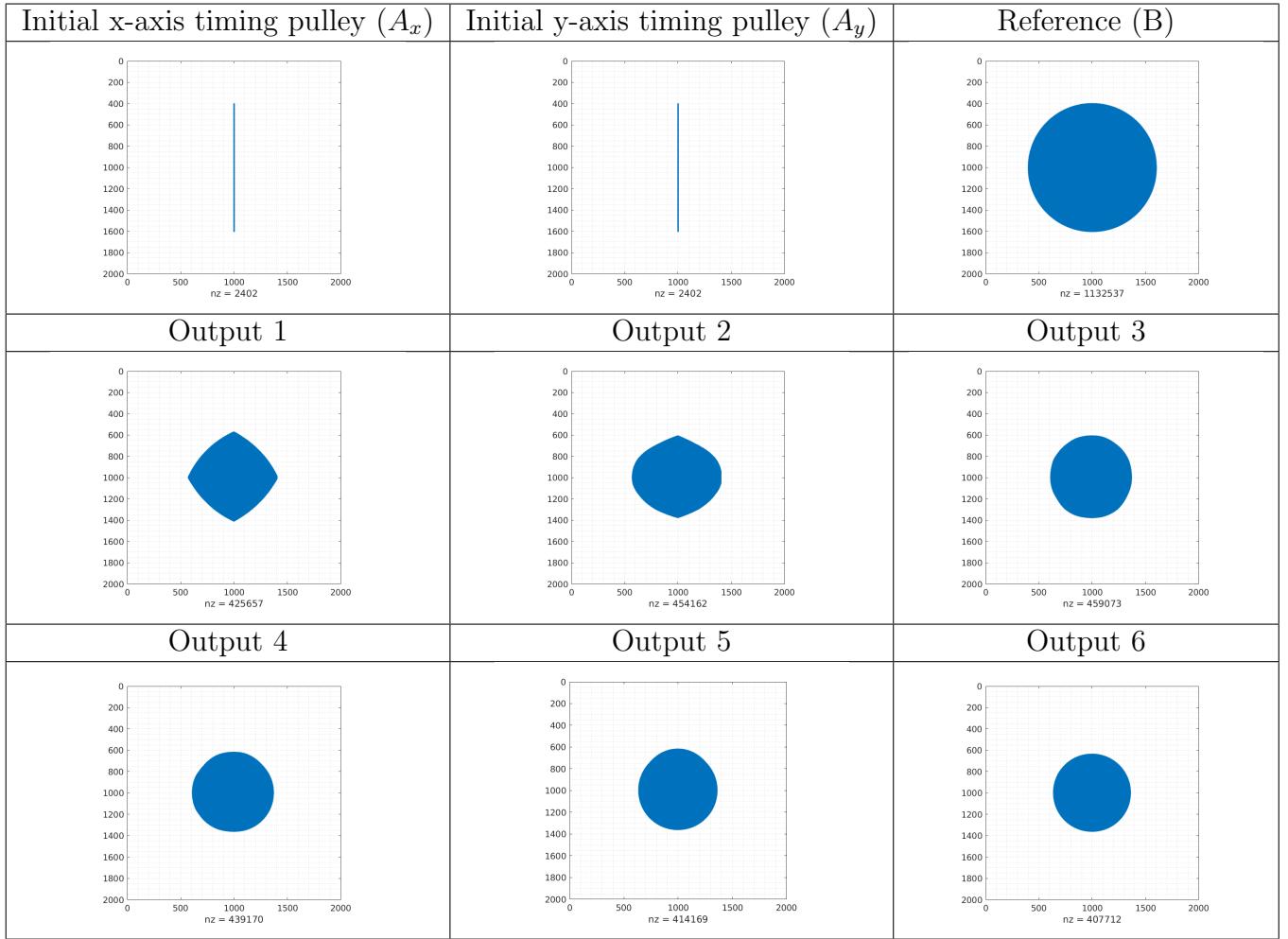


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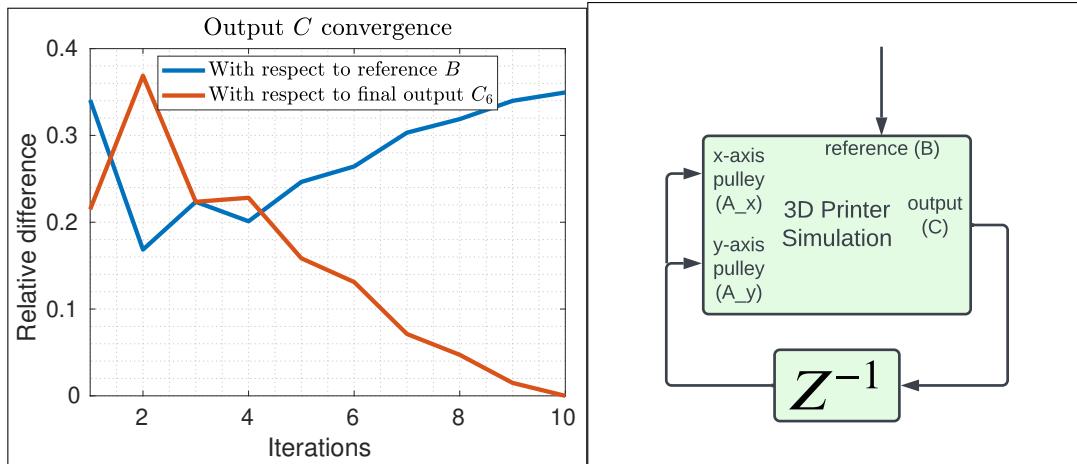
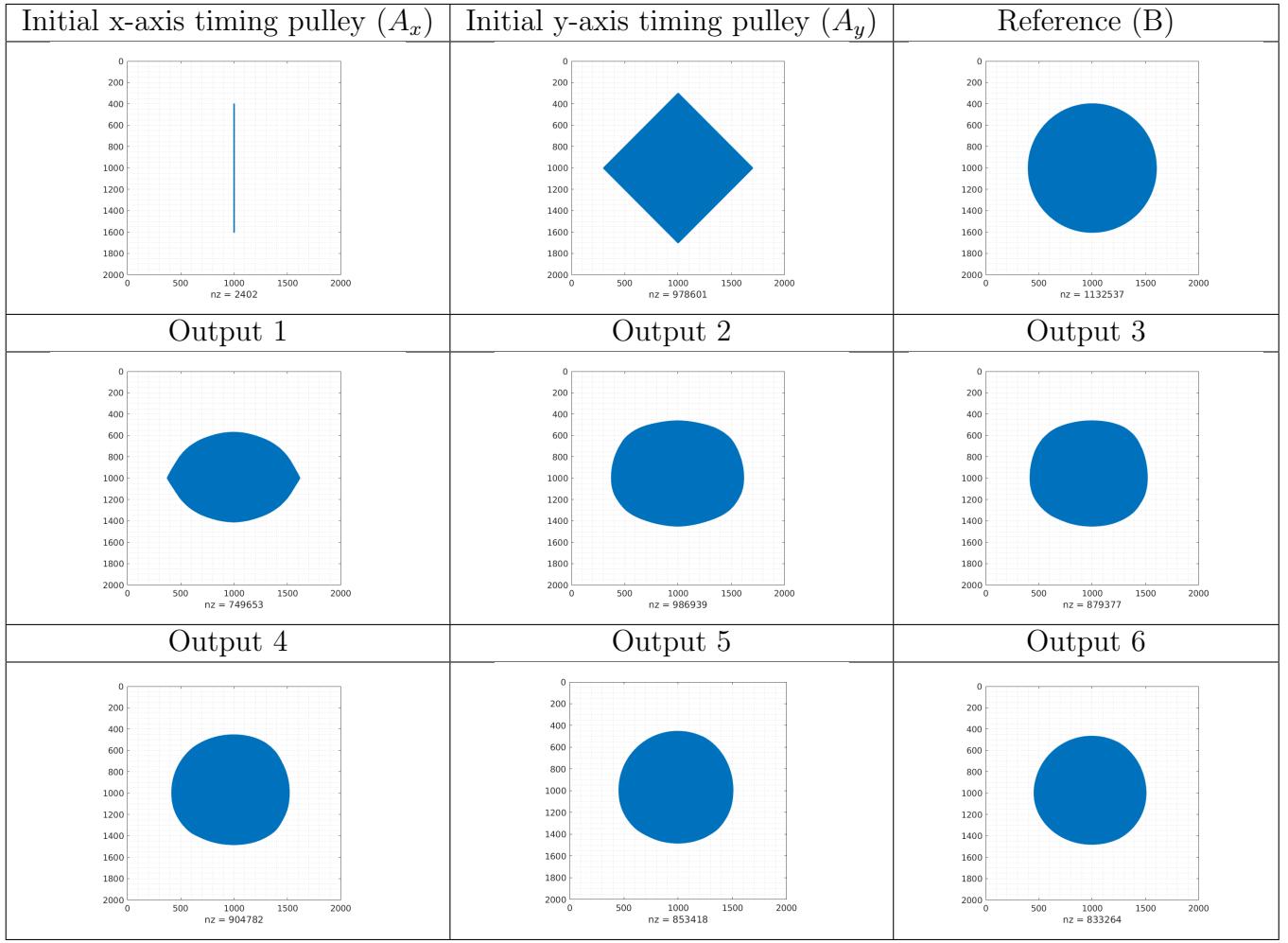


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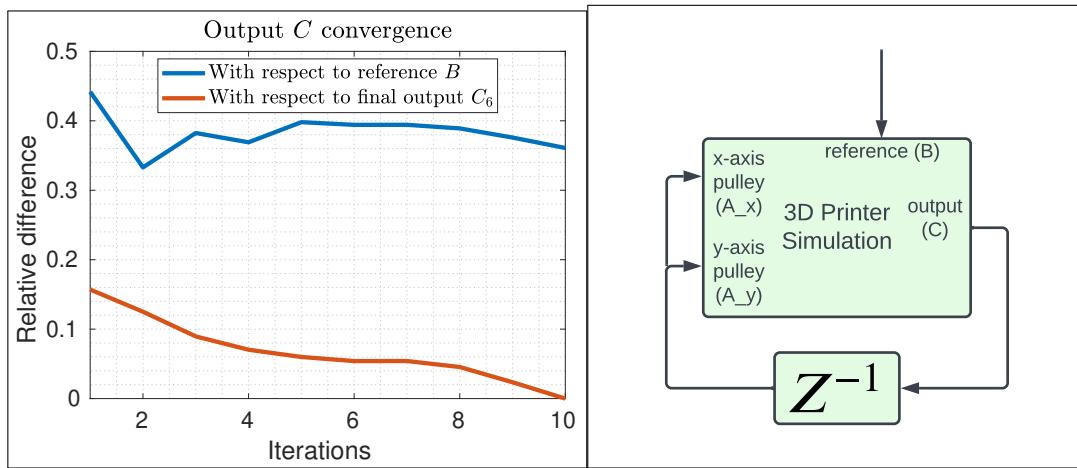
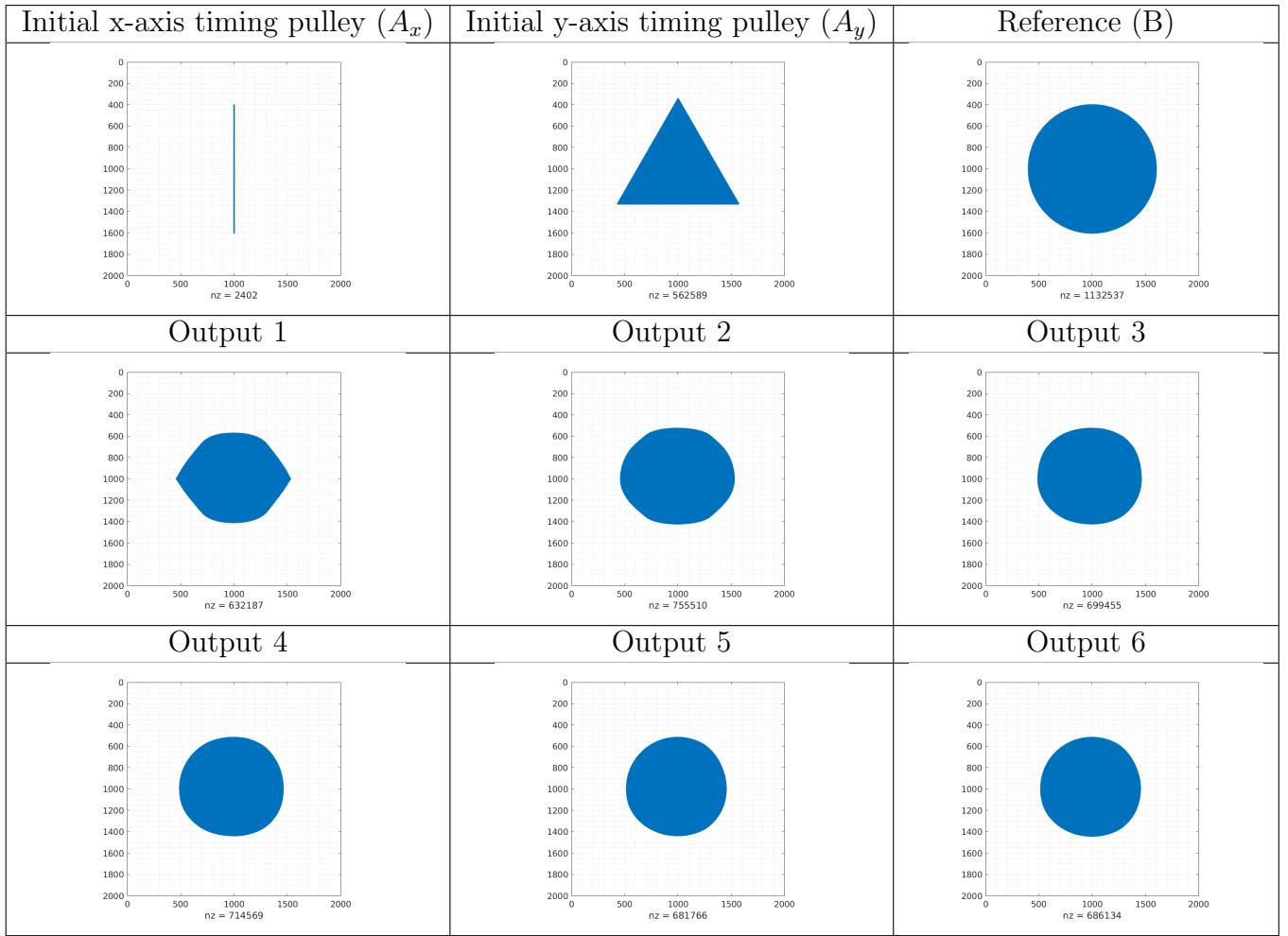


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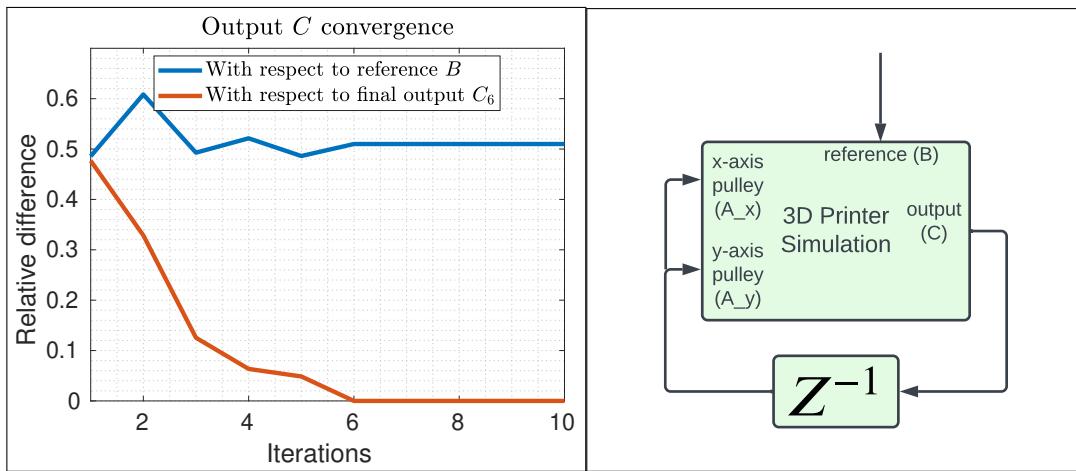
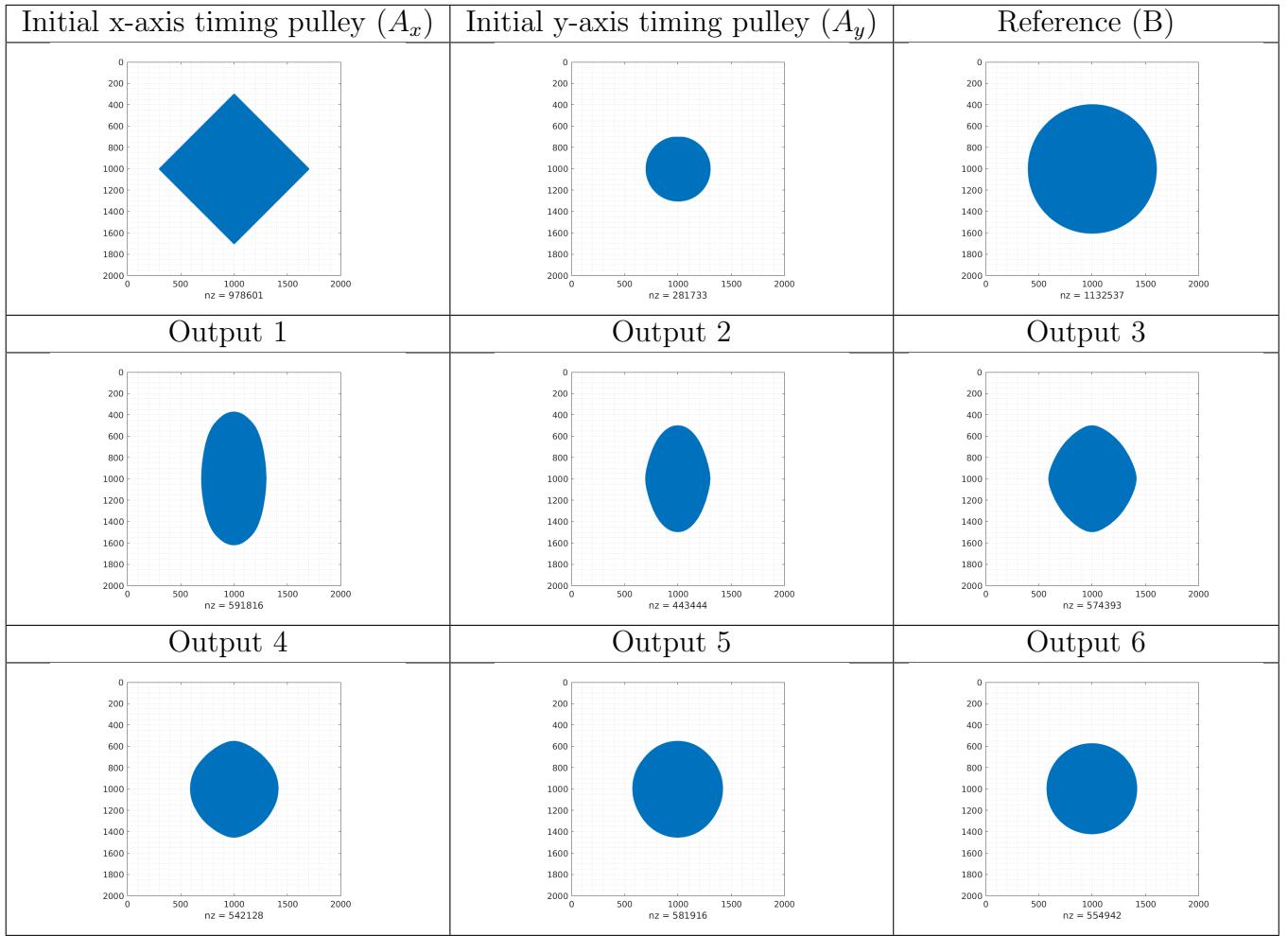


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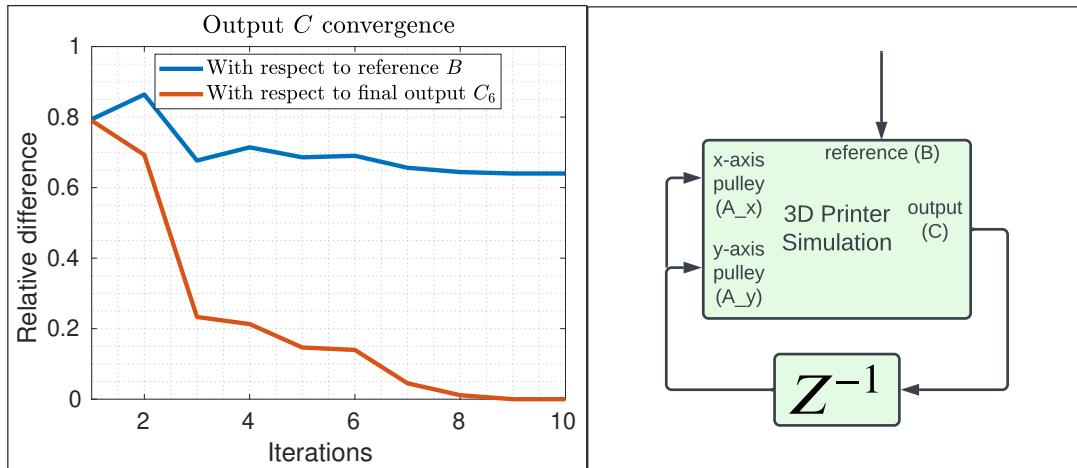
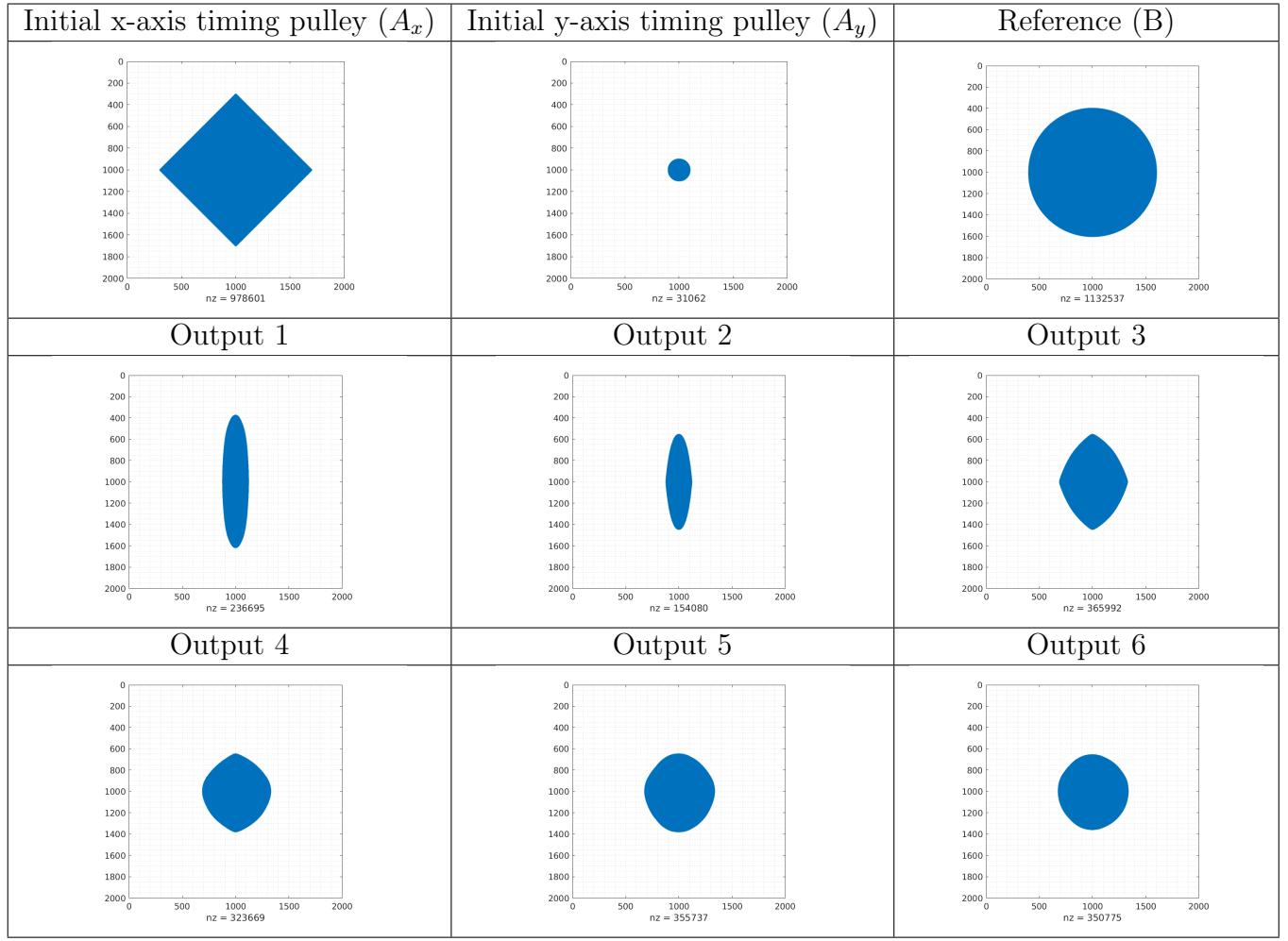


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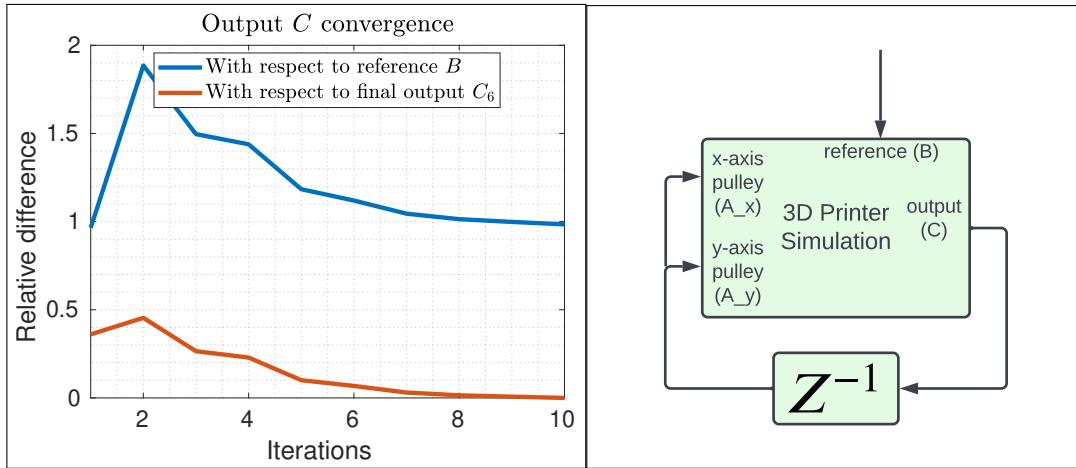
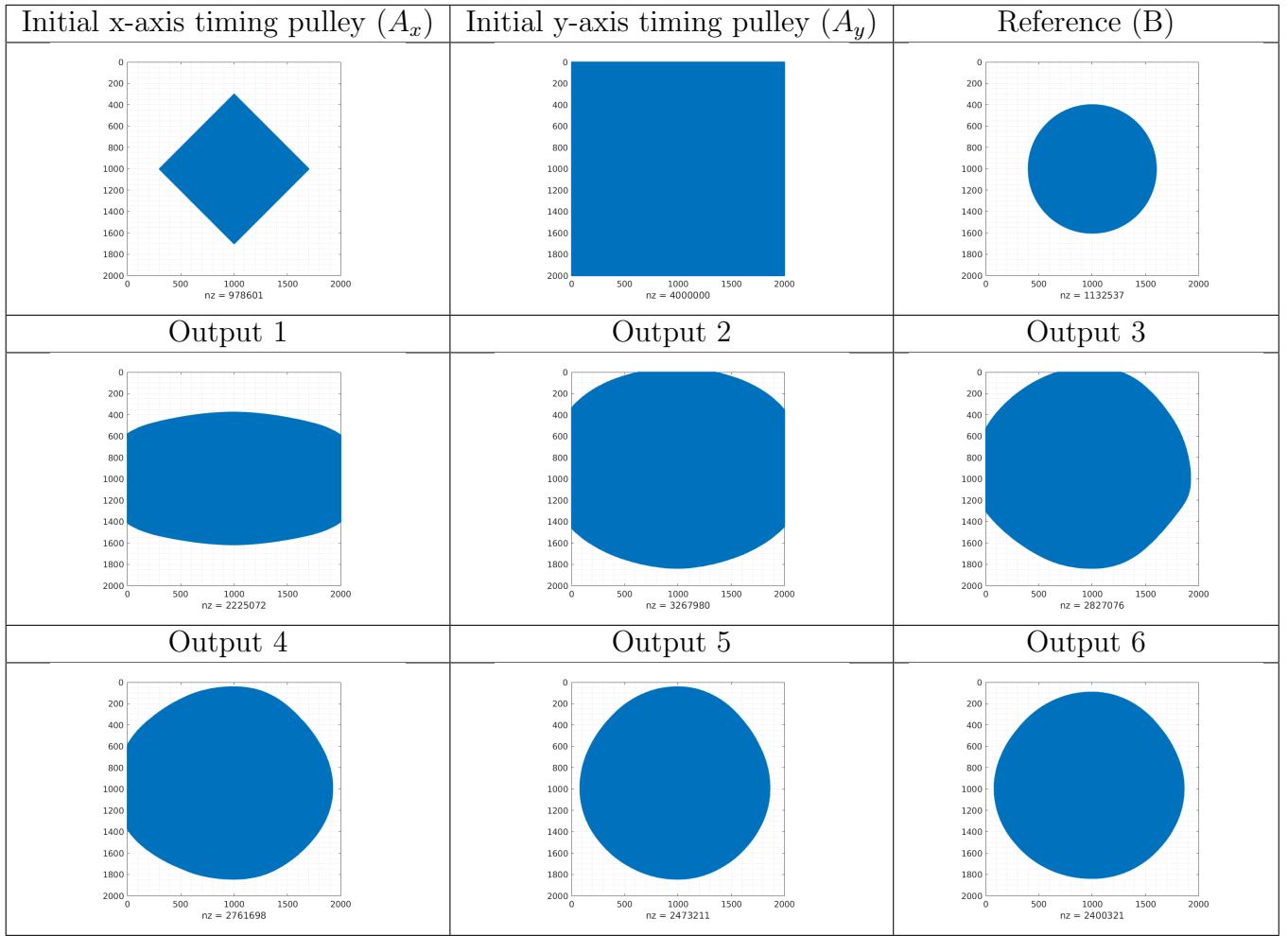


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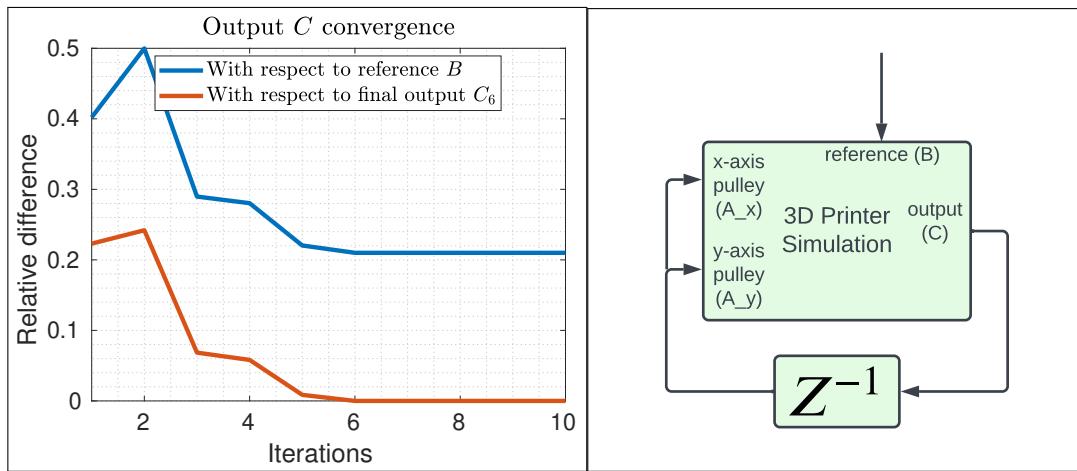
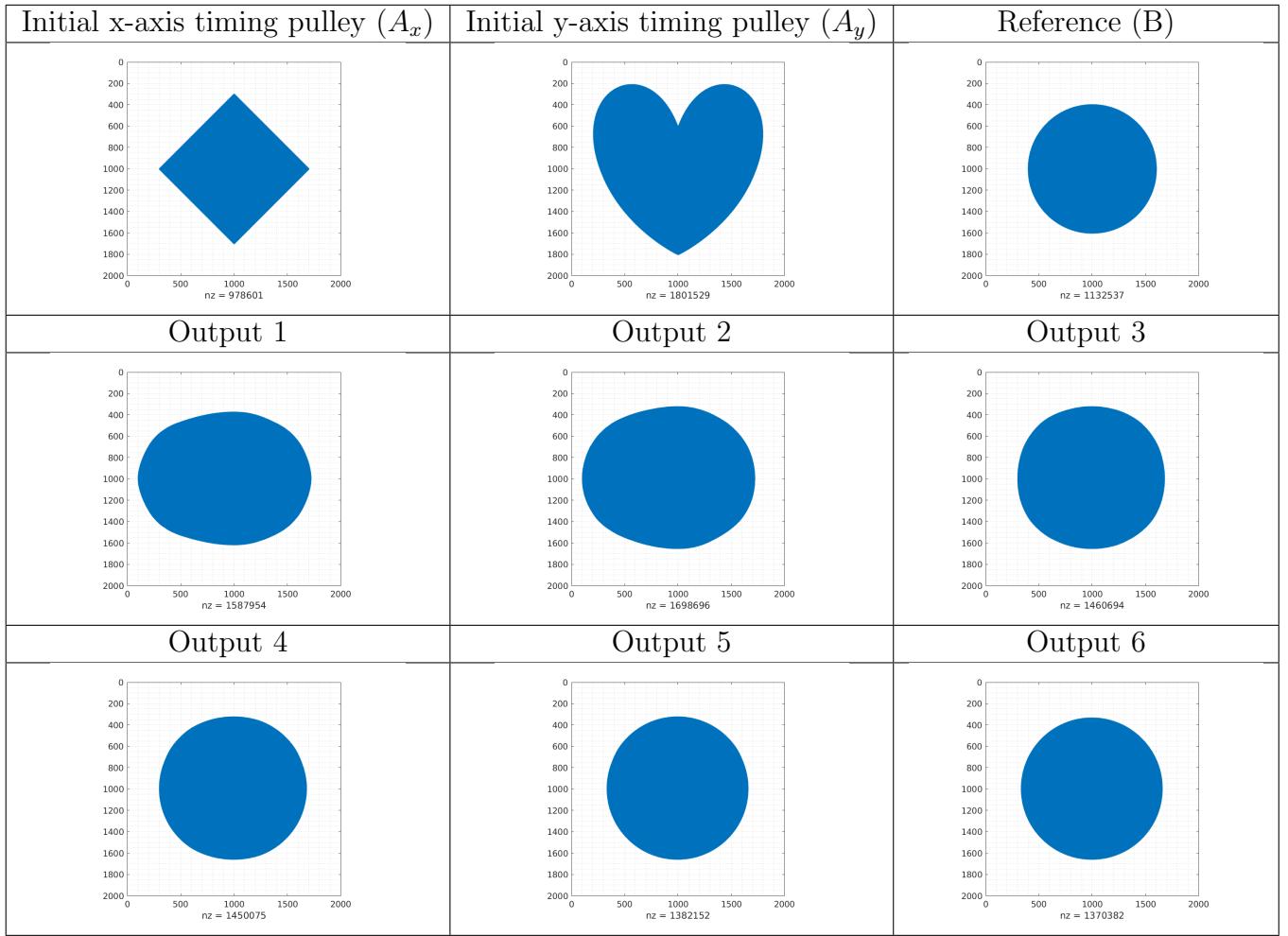


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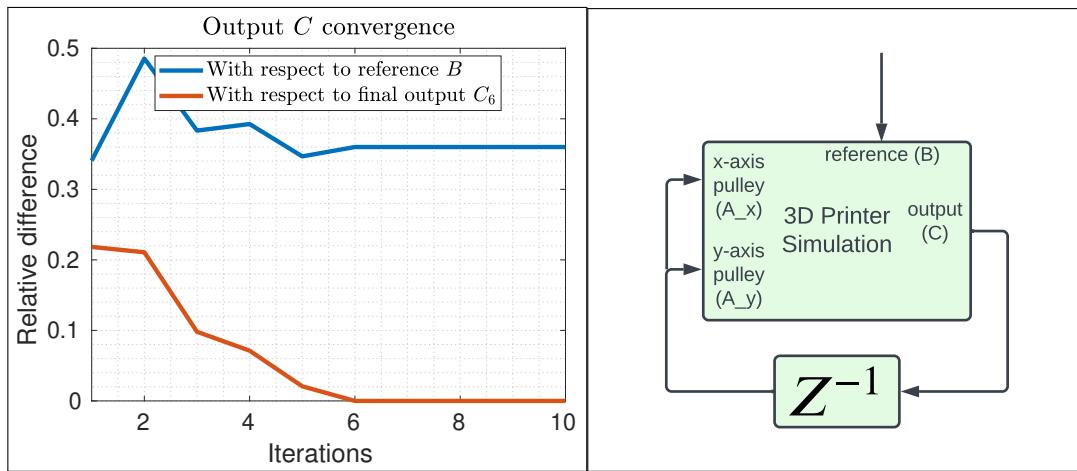
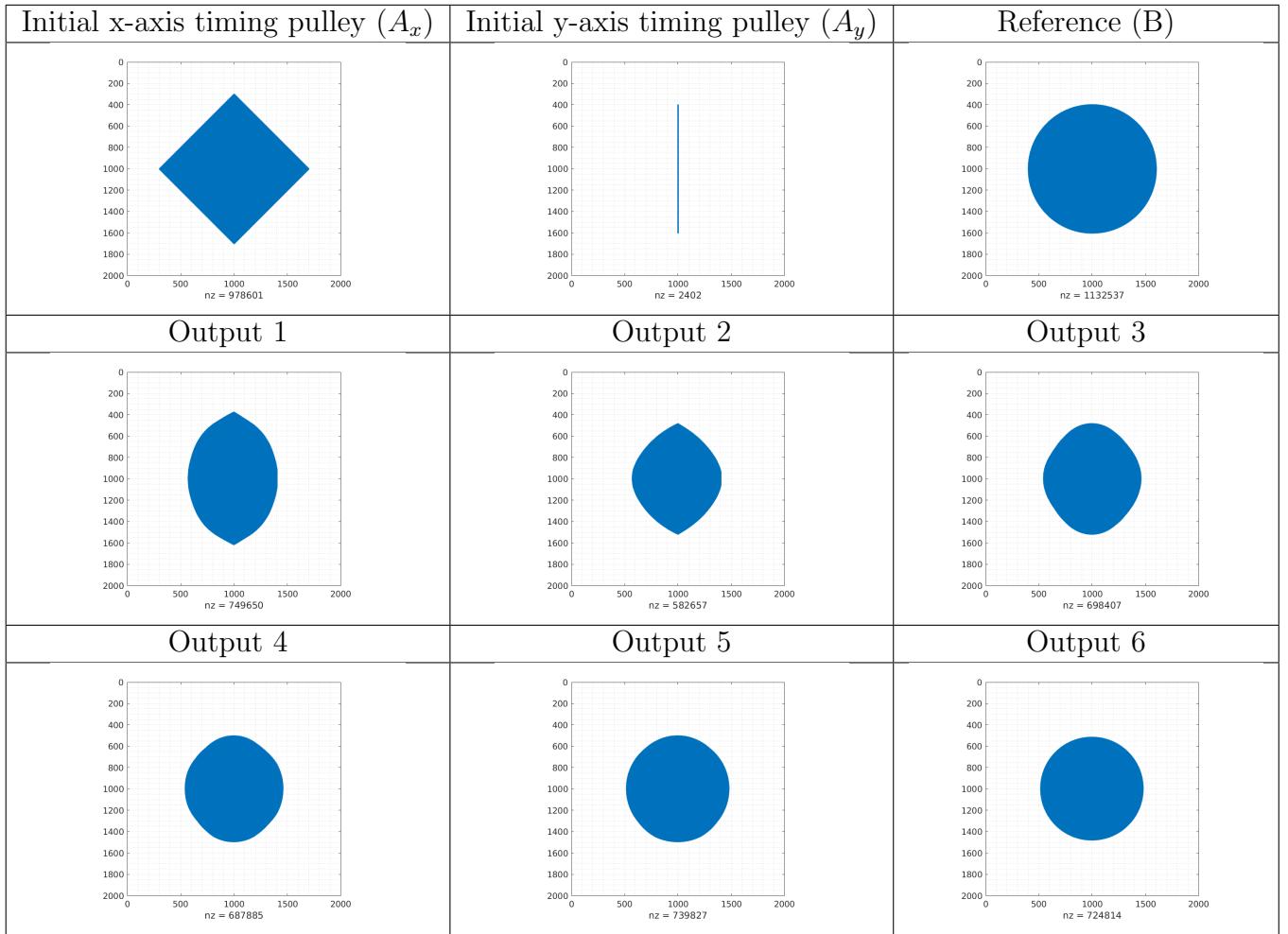


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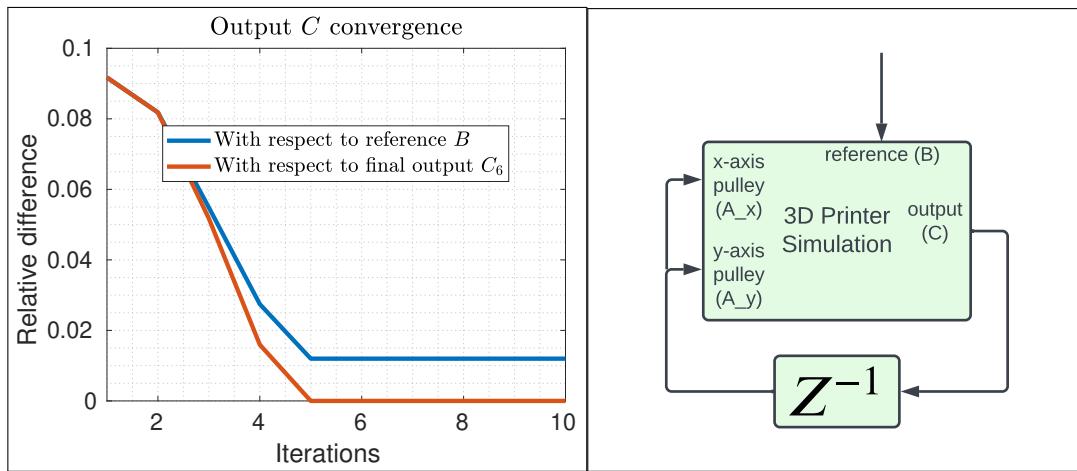
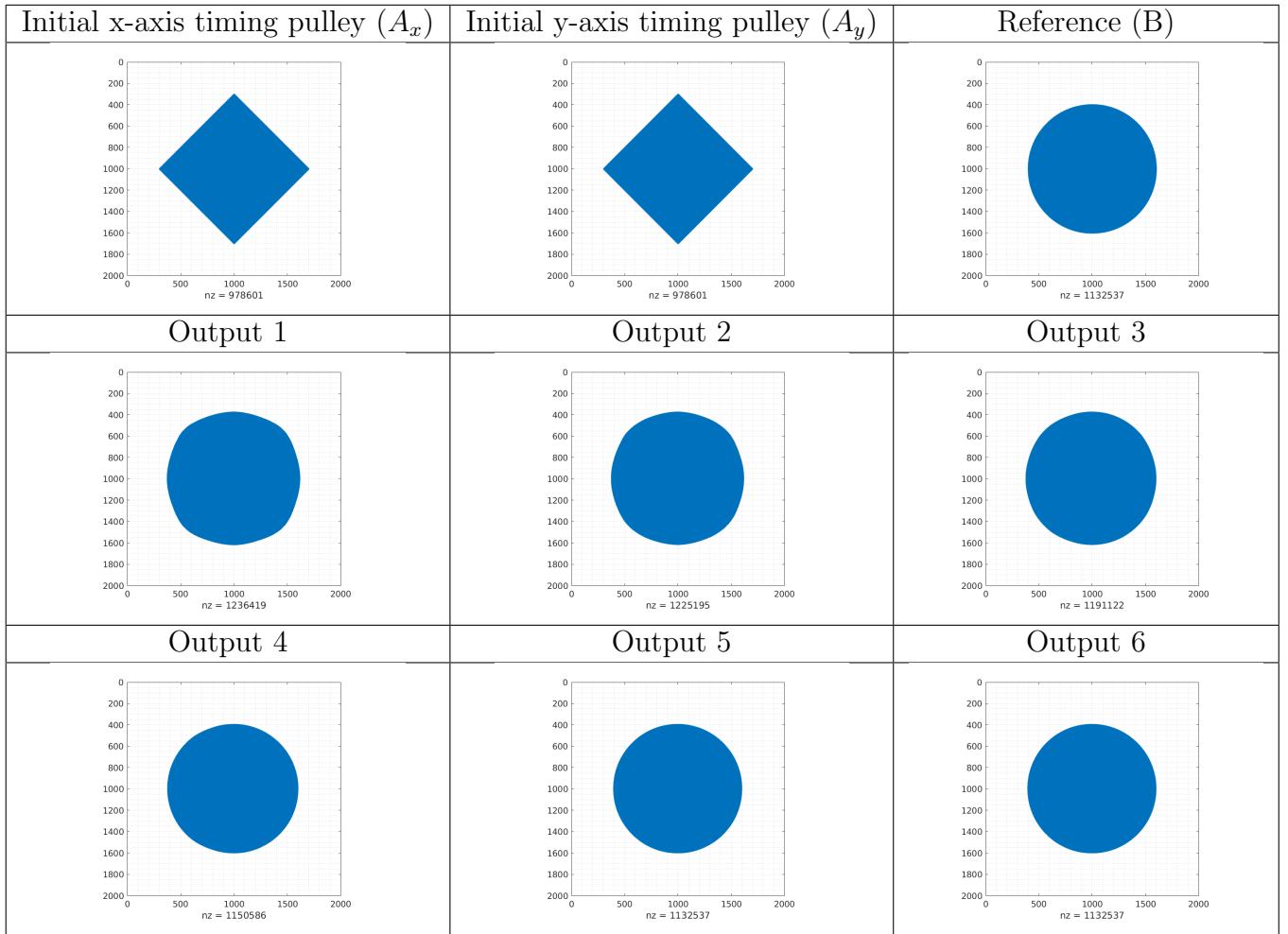


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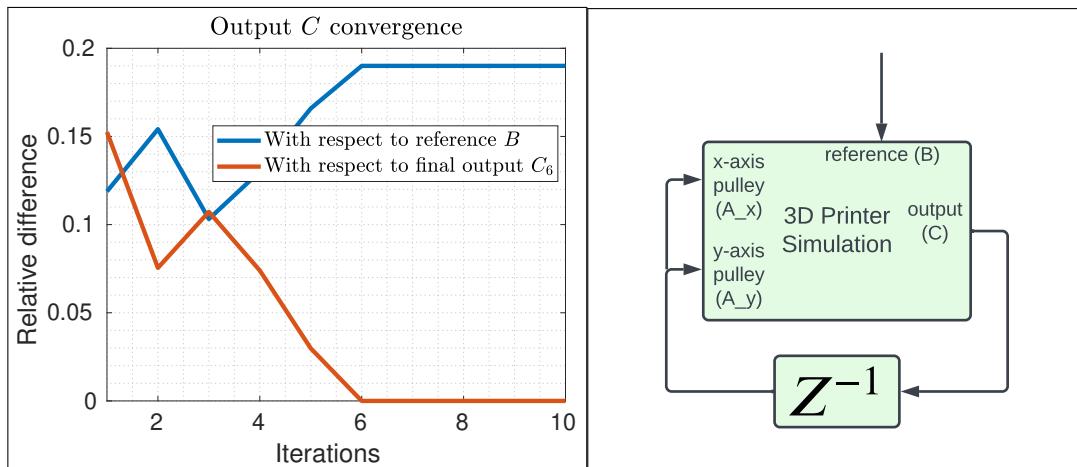
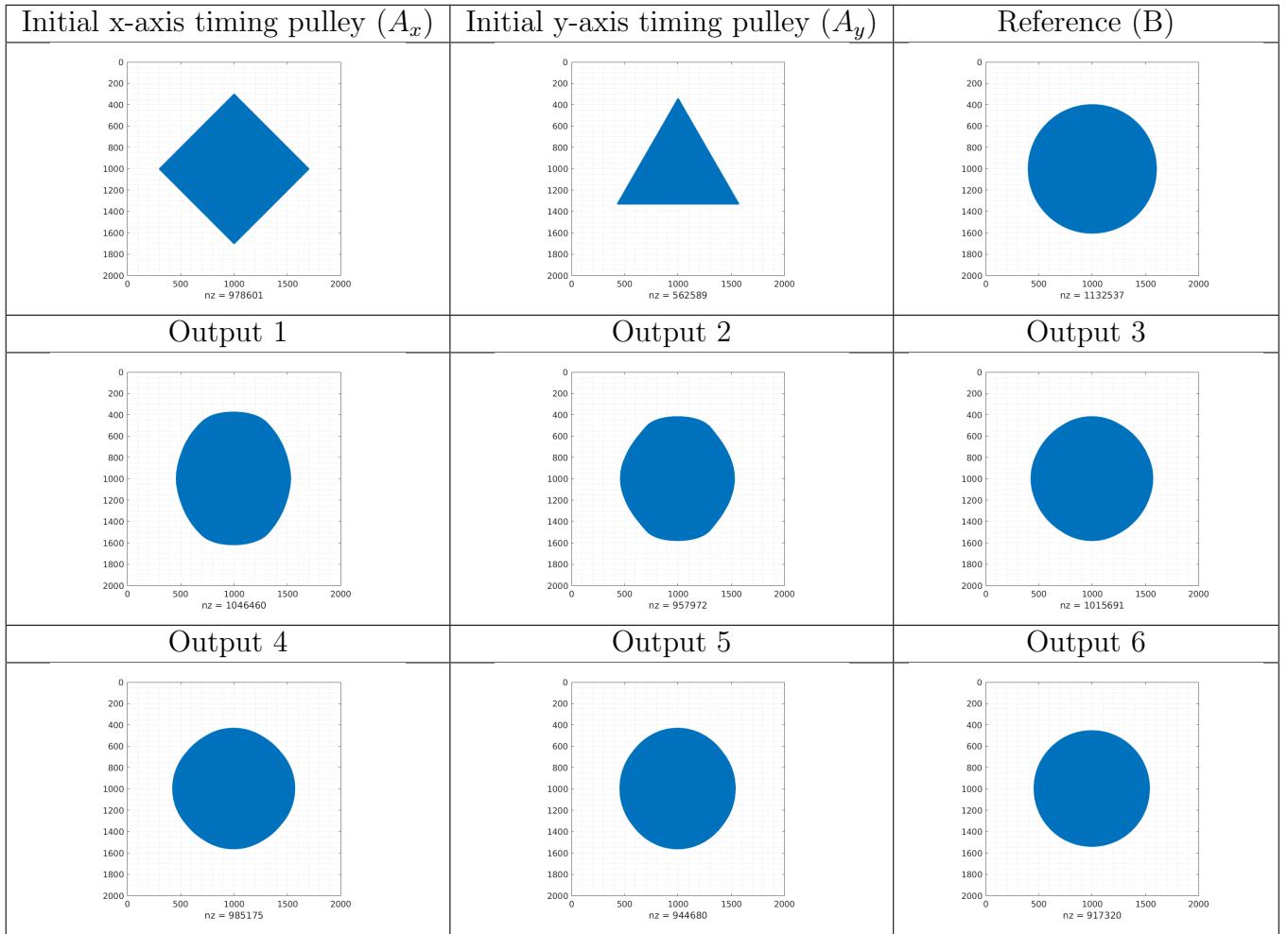


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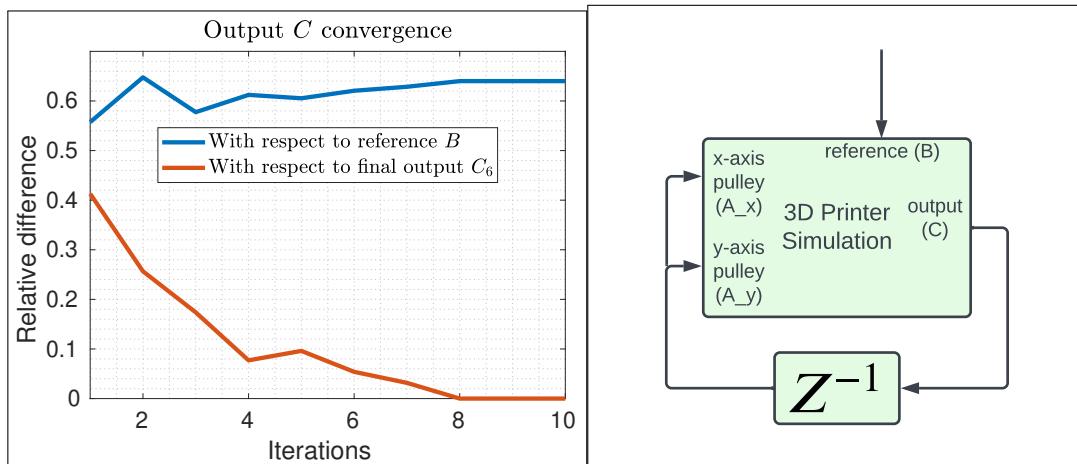
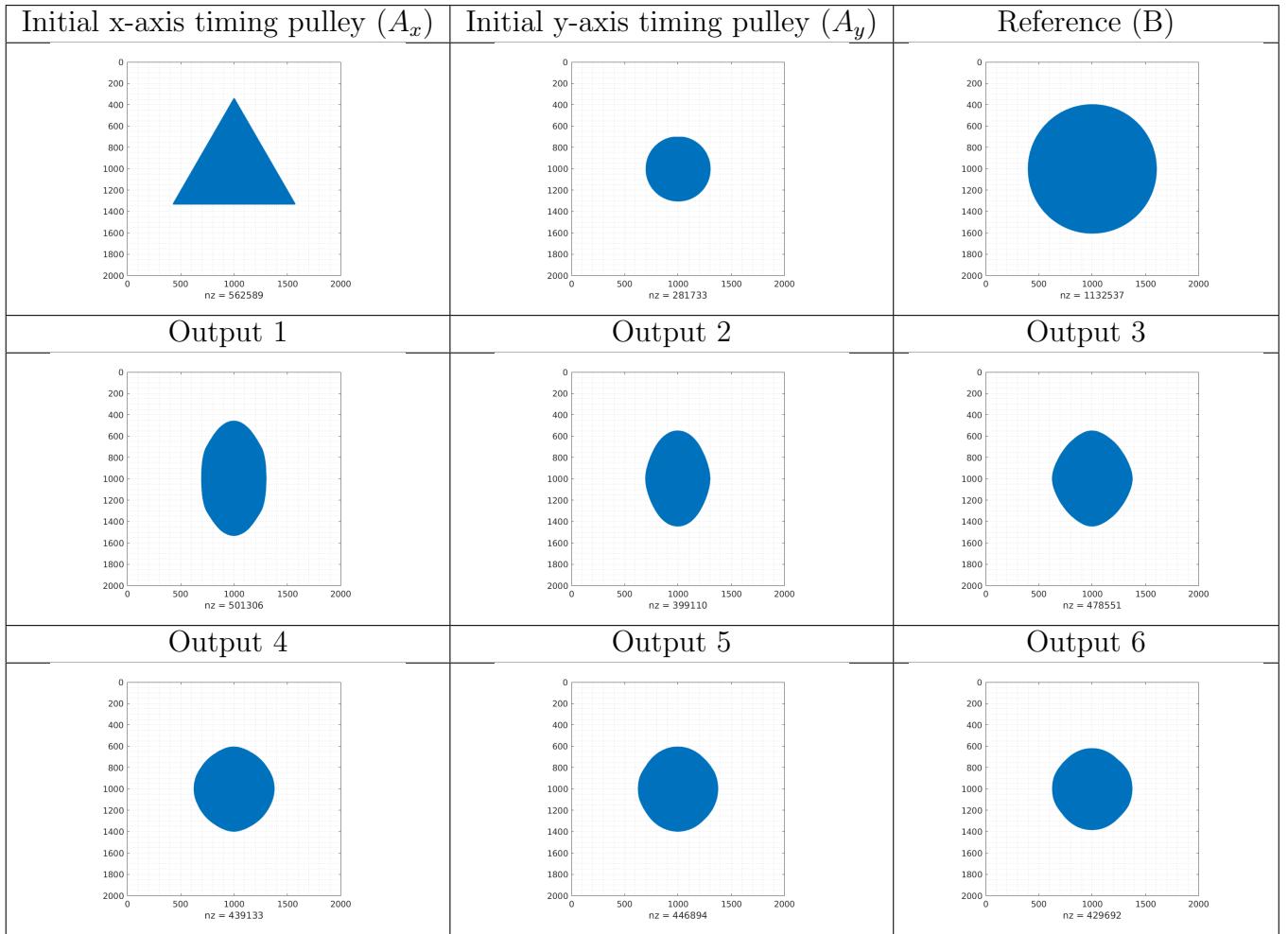


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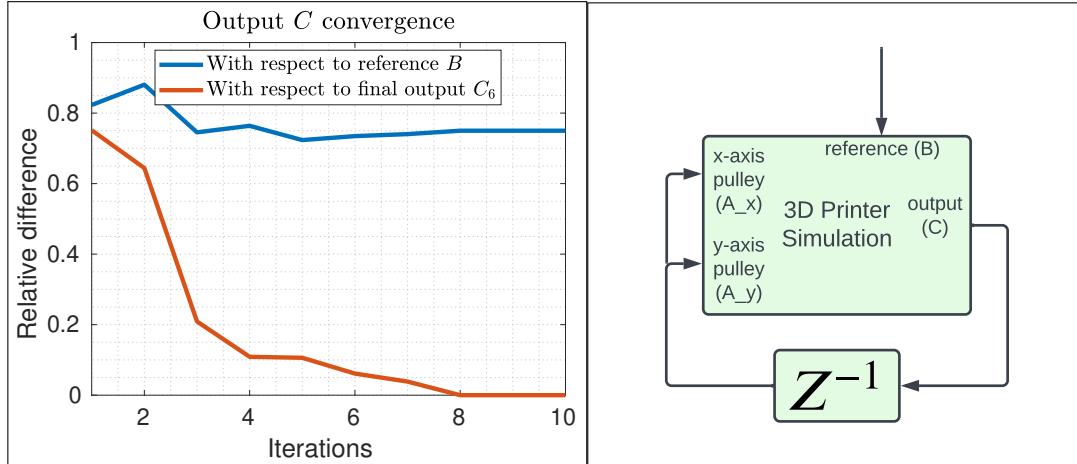
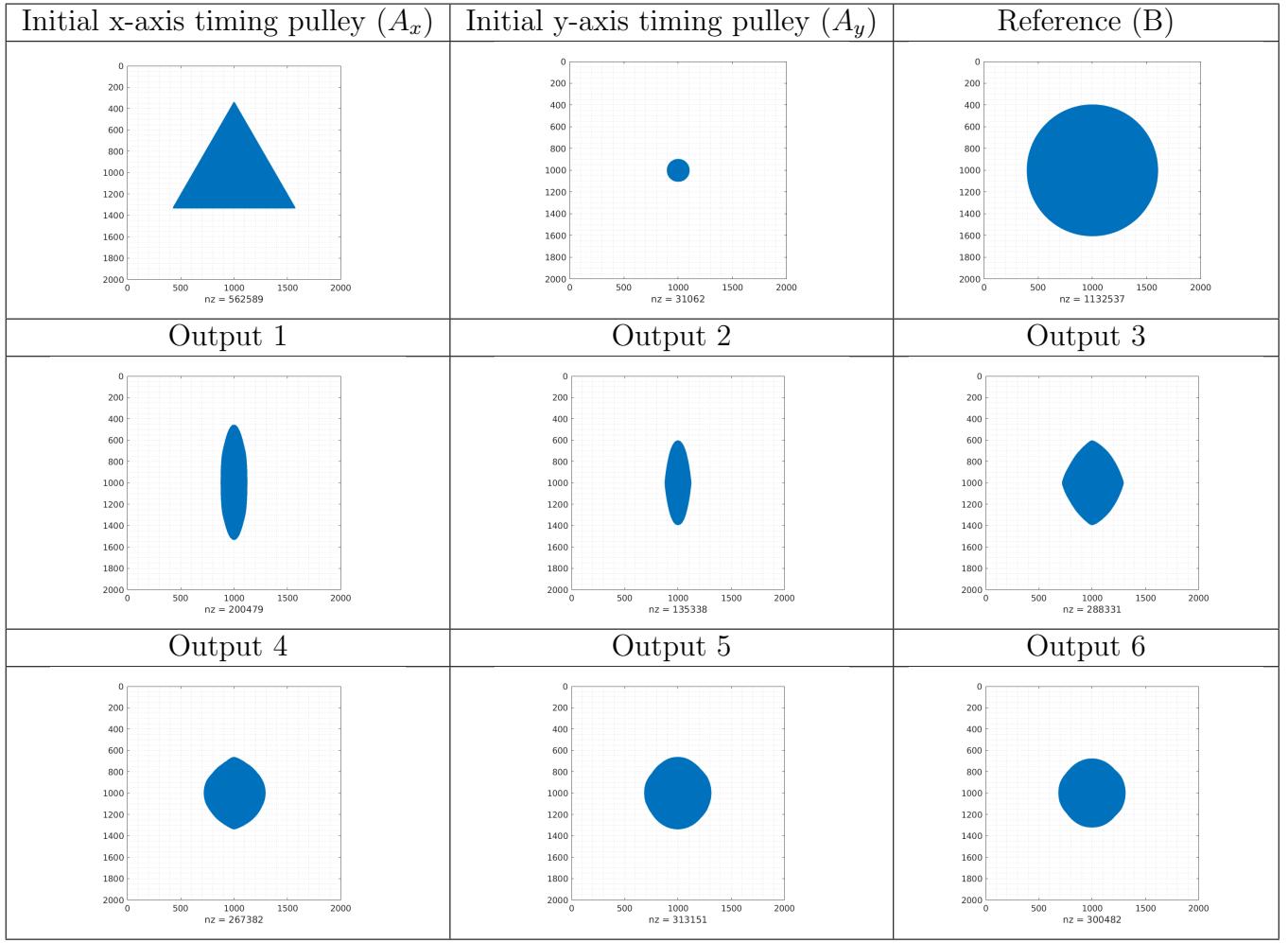


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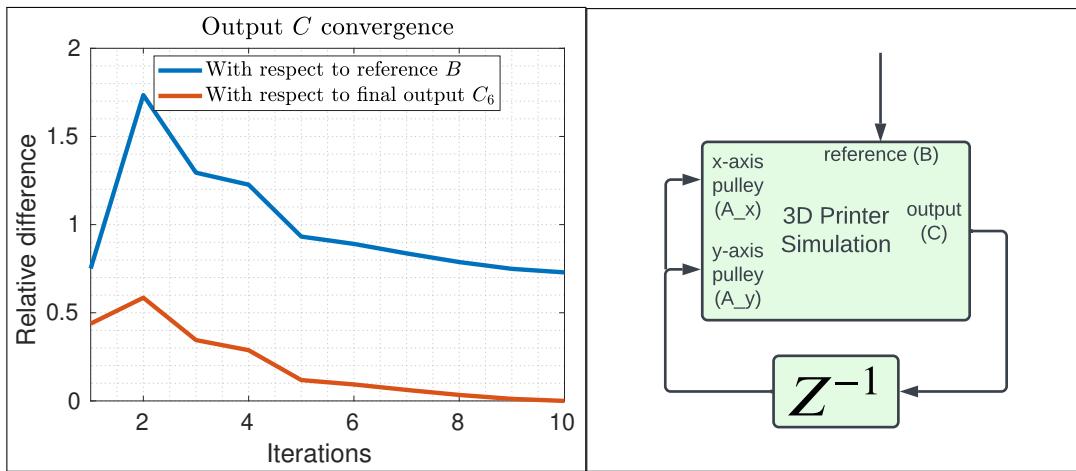
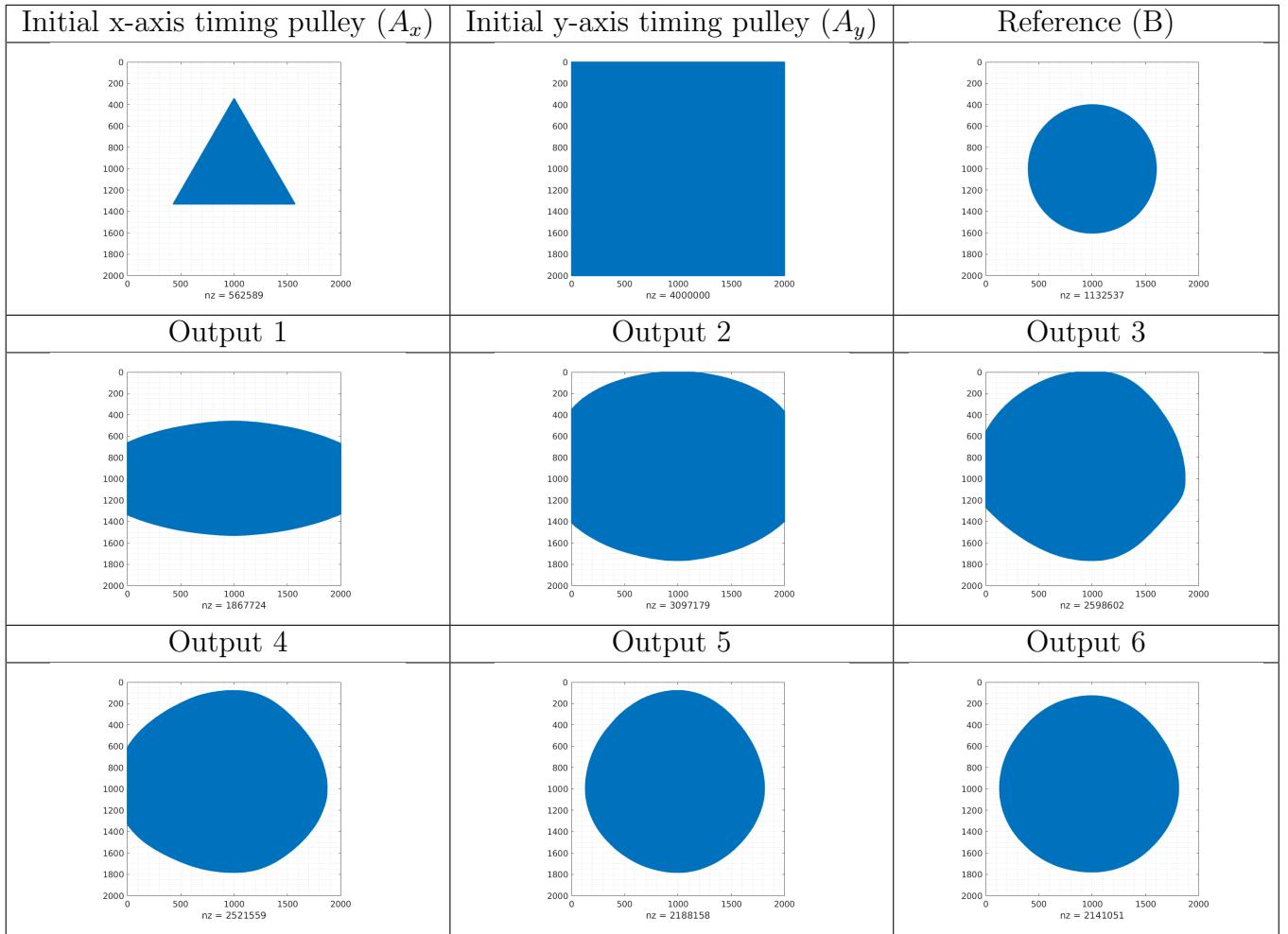


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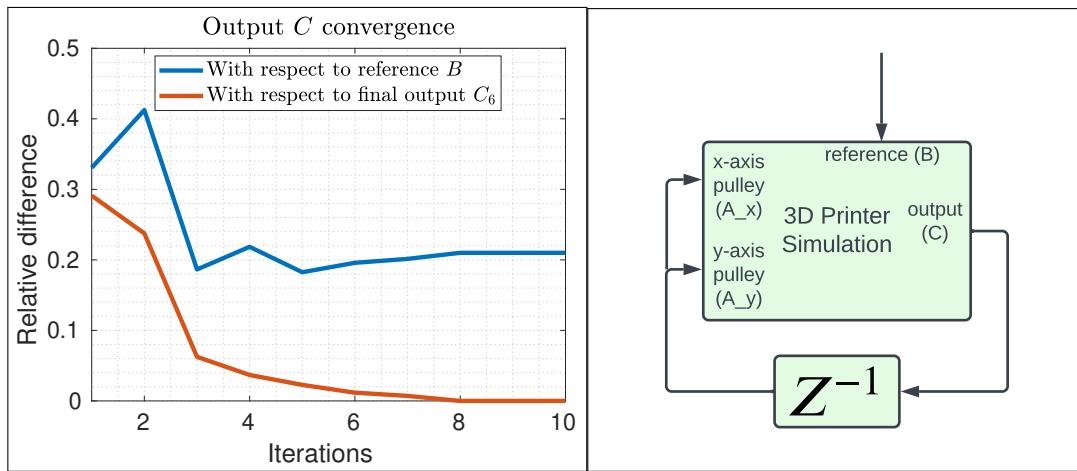
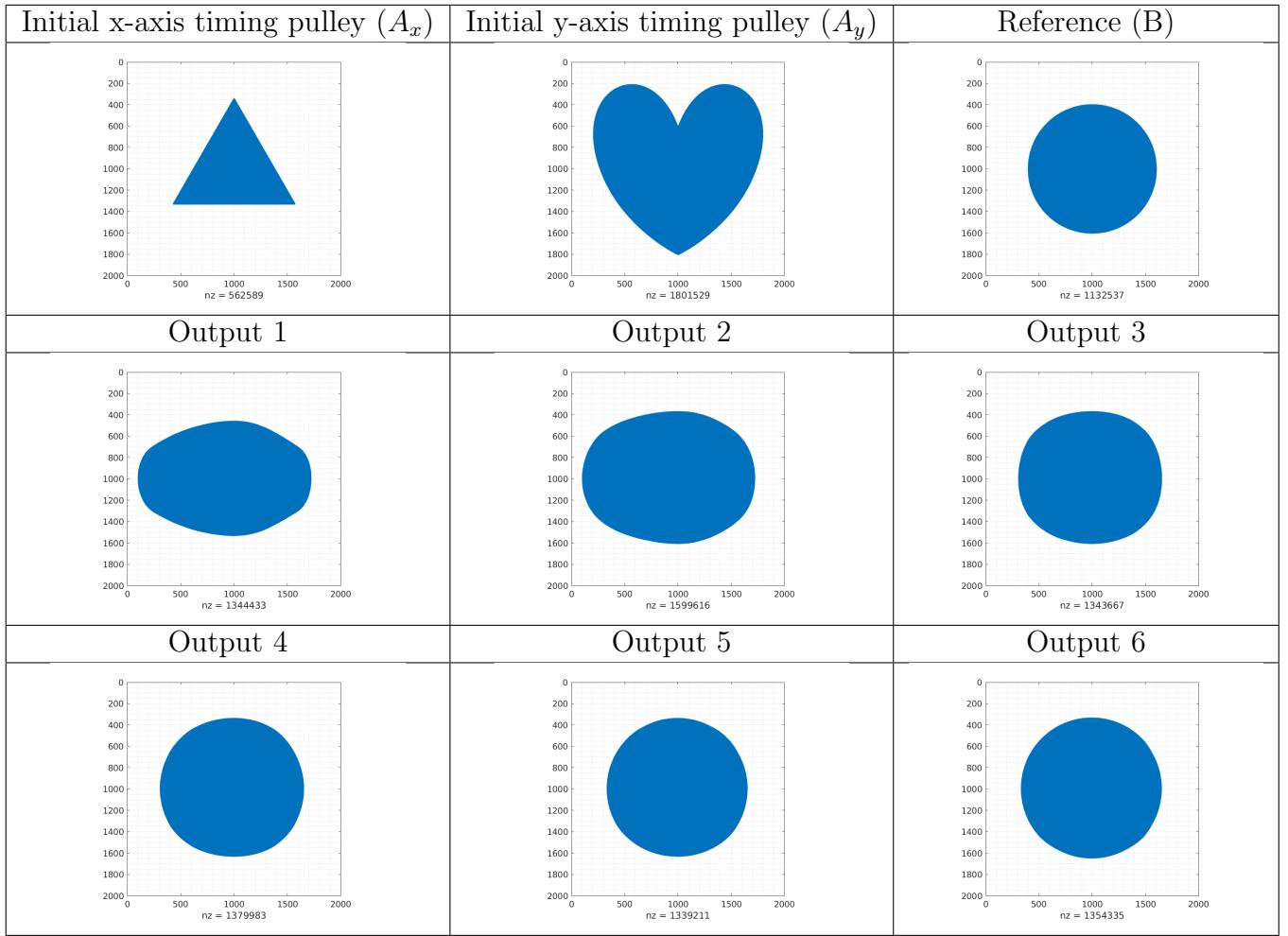


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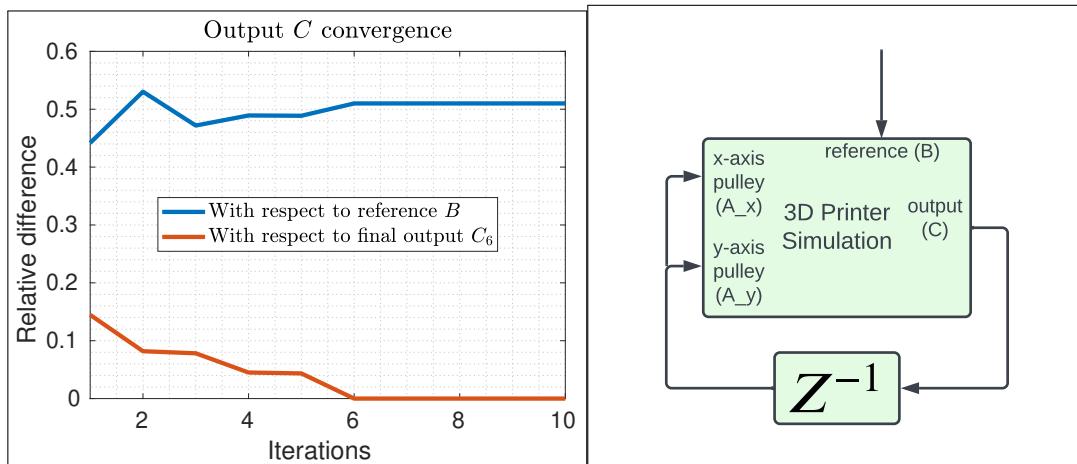
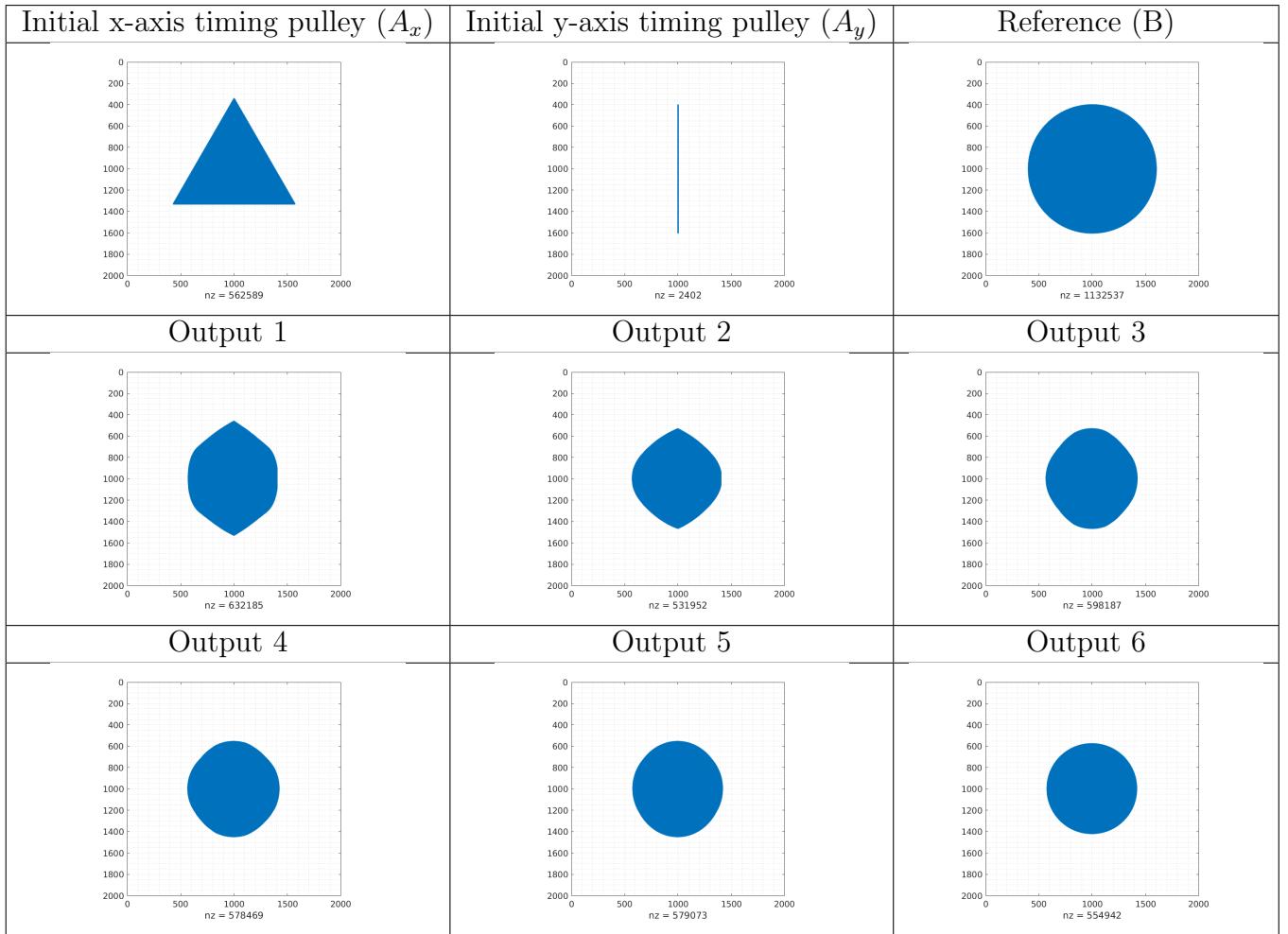


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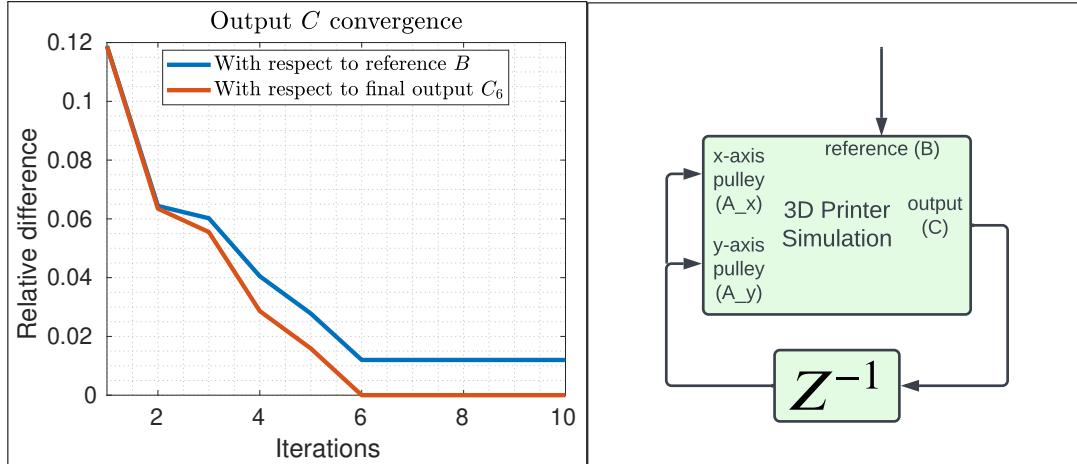
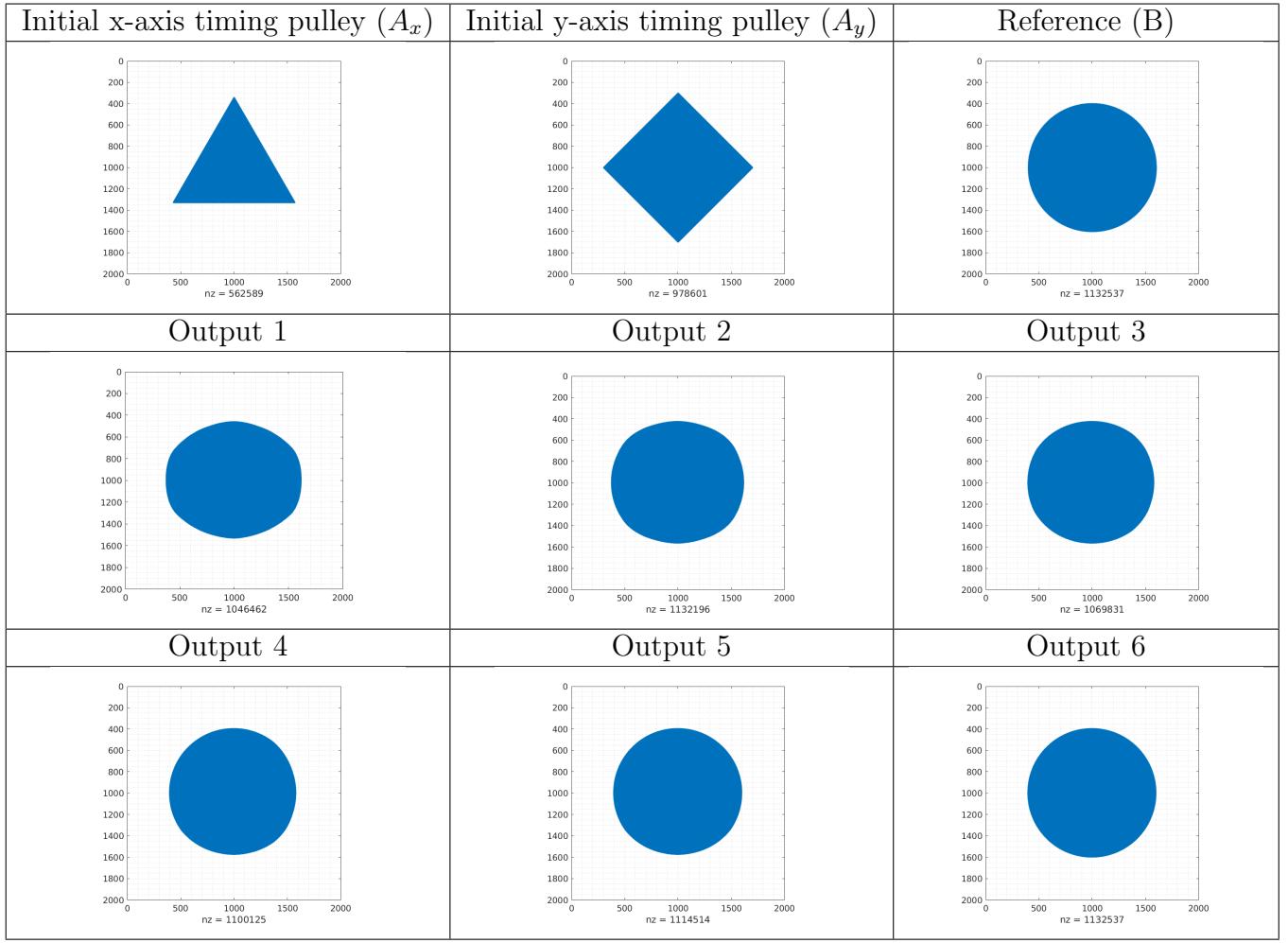


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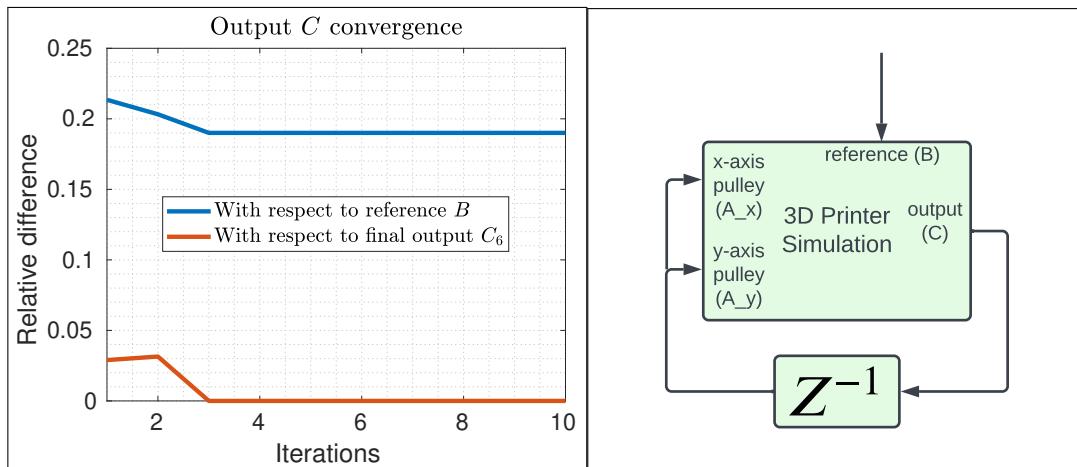
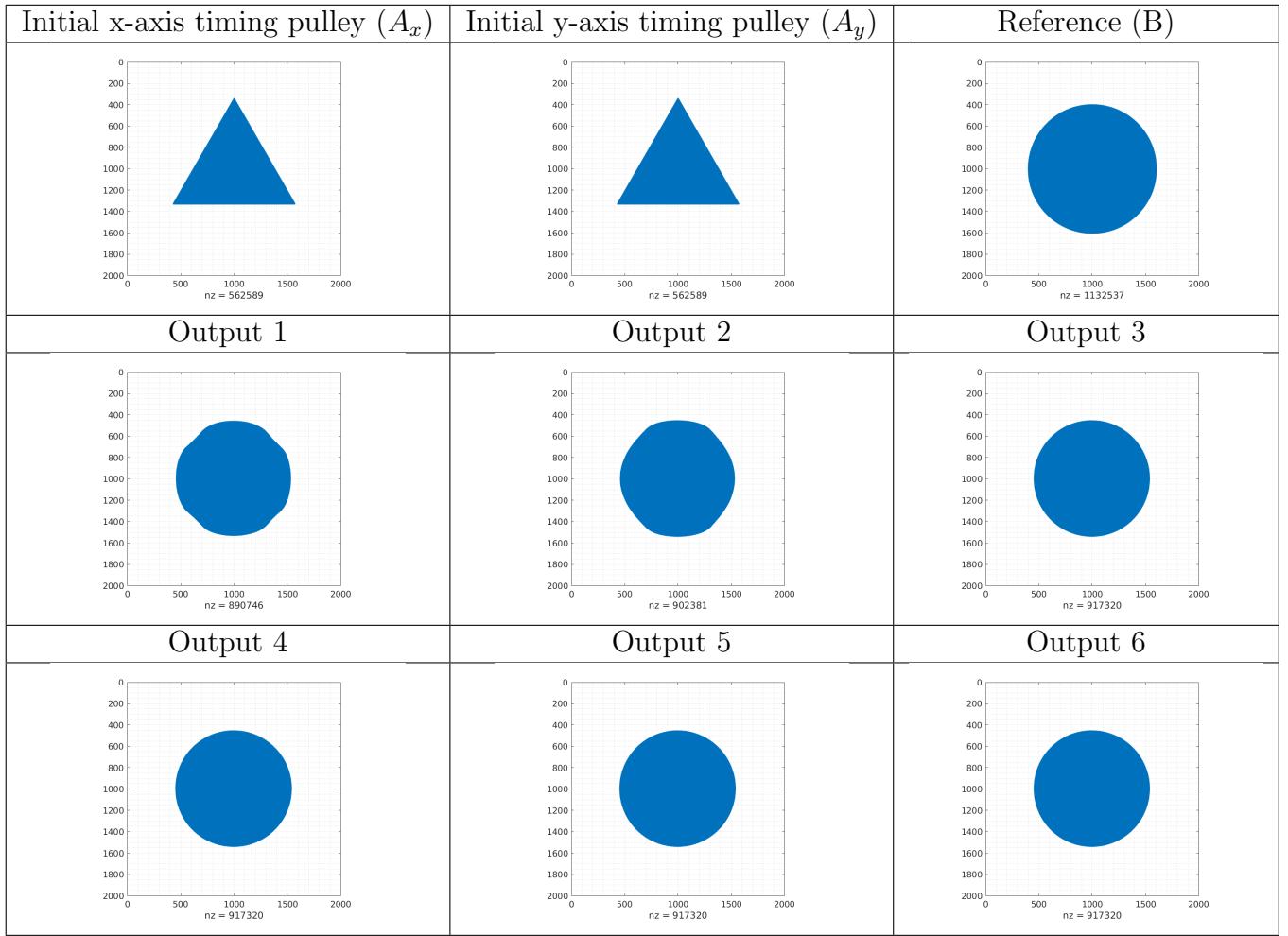


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