Brass Instrument Simulation

The sound propagation in wind instruments can be modeled with PDEs. The paper [1] shows how to apply the Finite Difference Time Domain (FDTD) method [2] to approximate the sound pressure deviation and particle velocity within the profile of the brass instrument [4]. The goal of this project is to build a performance-optimized brass instrument sound engine based on this method.

Steps:
1) Create a basic version of the algorithm in [1]. The needed Finite Difference Time Domain (FDTD) method can be obtained by adapting the FDTD Matlab code in [3]. You could also create the first version in Matlab and then port. Testing can be done by playing the obtained sound files (see [4]).
2) Apply the performance analysis and optimization techniques presented in the lectures to optimize your FDTD C code.

References:
[1] Bilbao S., Time Domain Simulation of Brass Instruments
https://www.pure.ed.ac.uk/ws/portalfiles/portal/12472754/Time_Domain_Simulation_of_Brass_Instruments.pdf
[2] FDTD method https://en.wikipedia.org/wiki/Finite-difference_time-domain_method
[3] Matlab examples https://www2.ph.ed.ac.uk/~sbilbao/matlabpage.html
[4] Simulated brass sound examples https://www2.ph.ed.ac.uk/~sbilbao/brasspage.html