

Finite-Difference Time-Domain method (FDTD) is based on numerical solution of Maxwell's equations, nowadays widely used for simulating optical response of photonic structures. This paper provides brief introduction to the FDTD method and several important extensions which make the basic code much more versatile. In order to broaden analysis of photonic structures, transfer matrix method (TMM) is also involved. The code is firstly tested using simple model structures which optical response might be compared with different numerical or even analytical approaches. Debugged code is used to improve photonic crystals for enhanced sensitivity of biosensing devices based on refractive index changes of sensed medium. Last but not the least, properties (sensitivity and Q-factor of resonant peak) of holey waveguide are investigated in one-, two- and three-dimensional simulation. It is shown here, that even this simple structure may compete with complex photonic crystals in the field of biosensors.