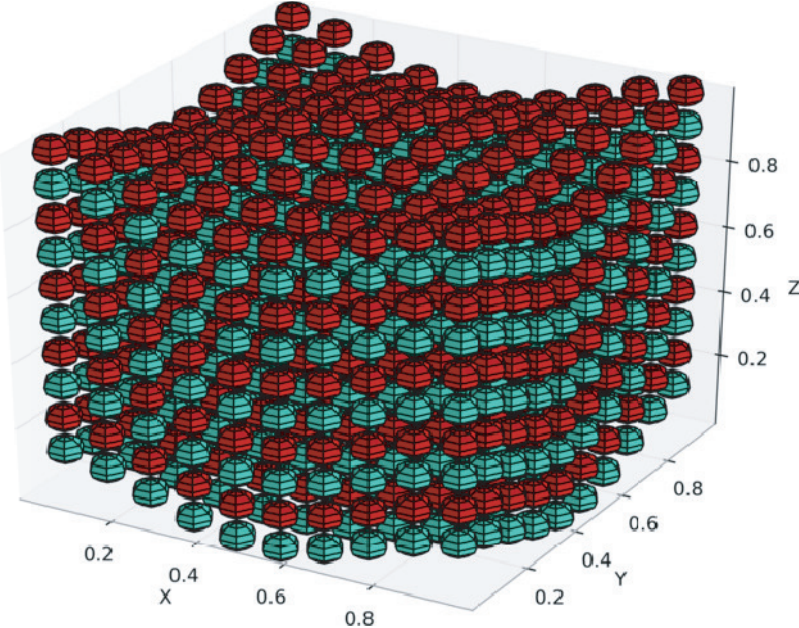(a) before applying the ripple operator   (b) after applying the ripple operator