Lattice $L \times L$ with Periodic Boundary Conditions (PBCs).

Since we have an $L \times L$ spin matrix, in order to impose PBCs but most important taking into account the Von-Neumann neighbors then in order to calculate the neighbors sum $S_\sigma(\vec{x})$ we create an extended spin matrix "e_spins" which is $(L+2) \times (L+2)$ where at the corners is zero and has the following structure: