A. \( \mathbf{u} \) are a stationary, random process with
\[ \langle \mathbf{u} \rangle = 0, \quad \text{and covariance} \]
\[ C_{ij} = \int \mathbf{u}_i \mathbf{u}_j P(\mathbf{u}) \, d\mathbf{u} \]

B. Interpolate with formula
\[ u_{i+1} = \lambda_{ij} u_j \]

C. Find \( \lambda_{ij} \) by minimizing \( \langle [u_{i+1} - u_i]^2 \rangle \) at every \( i \)
\[ \frac{\partial}{\partial \lambda_{ij}} \int \left[ \sum_j \lambda_{ij} u_j - u_i \right]^2 P(\mathbf{u}) \, d\mathbf{u} = 0 \]
\[ \int \left[ \sum_j \lambda_{ij} u_j \right] \left[ \sum_k \lambda_{ik} u_k - u_i \right] P(\mathbf{u}) \, d\mathbf{u} = 0 \]
\[ \int \left( \sum_k \lambda_{ik} u_k - u_i \right) \lambda_{ij} u_i P(\mathbf{u}) \, d\mathbf{u} = 0 \]
\[ \sum_k C(q - k) \lambda_{ik} = C(q - i) \]
which can be solved for \( \lambda_{ik} \) if \( C(i,j) \) is known.

D. Note that the Wiener–Khinchin relation relates \( C(\Delta x) \) to \( P(kx) \); where \( P = \) power spectrum.
\[ C(\Delta x) = \mathcal{F}^{-1} P(kx) \]
\[ \mathcal{F} = \text{inverse Fourier transform} \]