Introduction

The included algorithms describe the basic coupling scheme for computing the steady-state coolant density distribution in nuclear systems. The identical algorithm can include a calculation of the steady-state distribution of any other quantity that depends on the power distribution and represents a reactivity feedback, such as the fuel temperature, distribution of ^{135}Xe, etc.

The included algorithms represent the basic scheme that has been originally described as the Optimal Process in Sec. IV.C. in [1]. For simplicity, the quantity d in [1] is set at 1, which is reasonable when the solution cannot be guessed to a known accuracy before the calculation.

This scheme increases the number of neutrons (cycles) simulated at each step to accelerate the convergence, and to lower the time needed to load the XS data by MC codes.

The following sections contain descriptions of two algorithms. They are identical. The second one is more suitable to work with when implementing in a script.

Declared quantities

The following quantities are declared:

i - the index of an iteration step of the coupling scheme,

s_i - number of neutron histories simulated by a Monte Carlo criticality code in ith iteration step,

S_i - combined number of neutron histories simulated in all iteration steps $1, \ldots, i$,

$\vec{\rho}^{(i)}$ - distribution of the coolant density computed according to relaxed power distribution $\vec{P}^{(i)}$ (see below),

$\vec{p}^{(i)}$ - power distribution computed by the MC criticality code in ith step

α - stepsize for the relaxation scheme,

$\vec{P}^{(i)}$ - relaxed power distribution, computed in ith step,

c_i - the number of active cycles (generations) simulated by the MC code at ith iteration step.