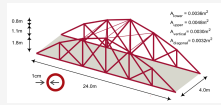
Traditional Strategy: Heuristic Decision Making
Modeling with predefined parameter
$w = (p_{repair}^{threshold}, p_{inspect}^{threshold}, \Delta T_{insp})$

Deterioration Model — Damage Information from Structural Health Monitoring (SHM) → Utility Theorem Decision Making Modeling



Time

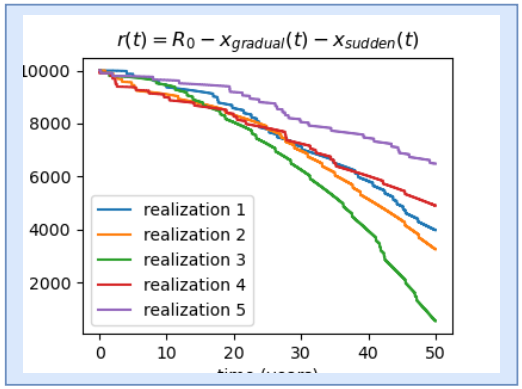
Structural Integration Management (SIM)

Value of SHM Infomation?
Total Cost Minimization

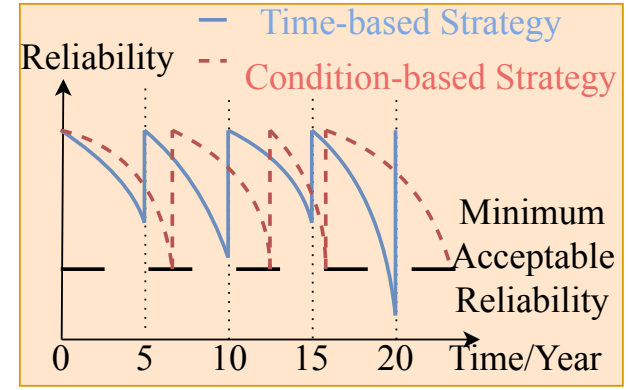
Bridges In Operation

Bridges failure

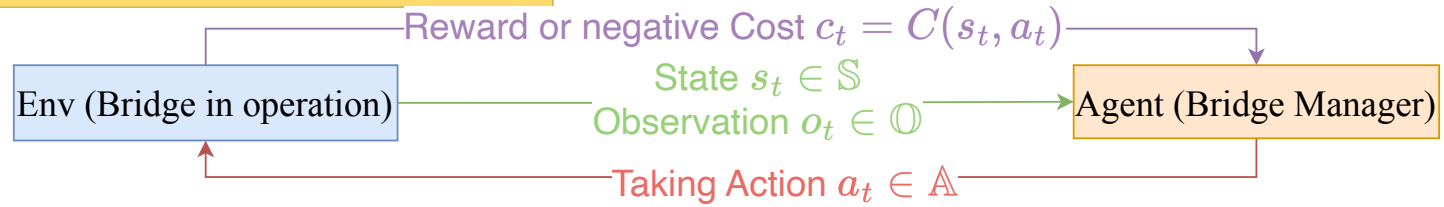
Bridge Manager



Structural Health Monitoring
Damage Identification:
Damage Existence?
Damage Localisation?
Damage Classification?
Damage Quantification?
Life Time Prognosis



Partially Observable Markov Decision Process
Modeling (POMDP) $(\mathbb{S}, \mathbb{O}, \mathbb{A}, \mathbf{T}, \mathbf{O}, \mathbf{R}, \gamma)$



The key is to minimize the expected total cost: $\pi^\star = arg\max_\pi Q^\pi(s_t, a_t); Q^\star(s_t, a_t) = \max_\pi Q^\pi(s_t, a_t)$