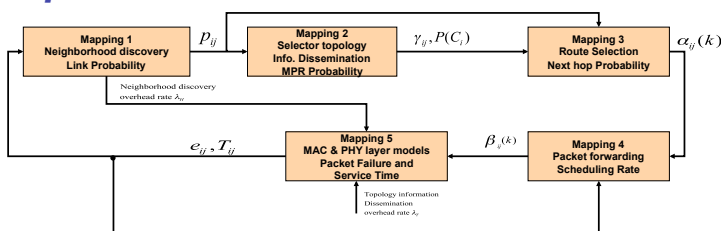


## Objective and Approach:

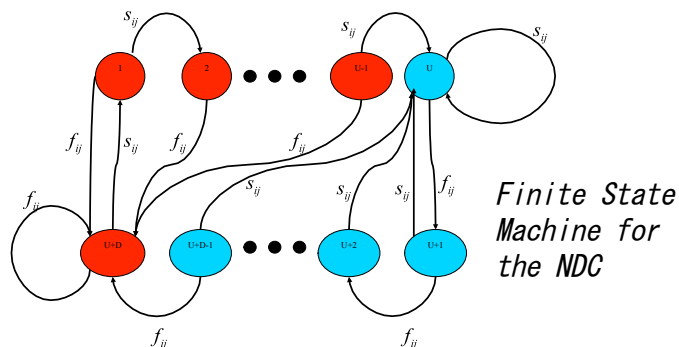
- A formal method for design and analysis of ad-hoc routing protocols.
- Specification of the main components of a routing protocol
- Specification of the performance metrics for each component.
- The main components are:
  - Neighborhood Discovery Component (NDC)
  - Selector of Topology Information to Disseminate
- Route Selection
- Design methodology for each component

## Implemented Fixed Point model:



## Neighborhood Discovery:

- Periodic HELLO messages to detect bidirectional links.
- Modelled as a finite state Markov Chain.
- Control parameters are U and D.
- Input is transmission success probability
- Performance metrics are computed: (1) Link detection probability, (2) Delay in detection of a link, (3) Life time of a link



## Selector of Topology Information (MPR) to Disseminate (STIDC):

- Every node selects a subset of its neighbors as its MPR nodes.
- Only links from selected MPR to the MPR sector are advertised.
- MPR nodes are selected to cover all second order neighbors of a node.
- MPR nodes will also be used for information broadcasting in network

## Proposed Design Methodology:

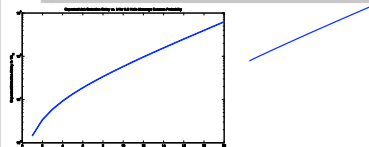
- The design objective is to design a network with predictable and robust performance
- NDC parameters should be selected to control timeliness of link detection.
- Low detection time for good links
- Short lifetime for bad links

• The STIDC objective is to select MPR from stable nodes to control the overhead of information broadcasting and route selection in the network.

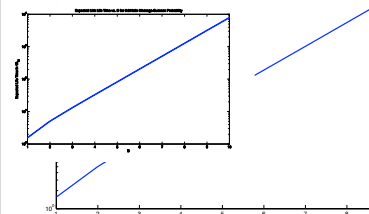
Let  $\lambda_{hj}$  denote the rate of the bidirectional ON-OFF process observed at host "h" for every neighbor "j" in  $N1(h)$ .

$$\min \sum_{j \in N^1(h)} \lambda_{hj} \text{ such that shortest paths from "h" to 2-hop neighbors are preserved.}$$

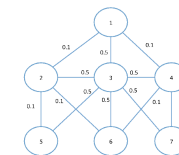
- We show that the problem is NP-Hard. Greedy Approximation Algorithm is used.



Good link detection delay



Bad link life time



Example Network

We set  $U=2$  and  $D=2$  to control delay of the NDC algorithm

Communication overhead of our algorithm vs MPR Heuristic

