**Theory of Network Communication**
Fall 2004
**Assignment 7**

**Problem 16** (10 points):
The task of this assignment is to implement a dynamic wheel network.
Consider the space $U = [0, 1)$ and let $F$ just consist of the function $f(x) = x + 1/2 \ (\text{mod} \ 1)$. Suppose that we use the consistent hashing strategy to place nodes in the $[0, 1)$ interval and to assign regions to them.
Implement a dynamic overlay network that keeps the nodes organized in a doubly-linked cycle and that contains an edge $(v, w)$ for any two nodes $v$ and $w$ for which there are points $x \in R(v)$ and $y \in R(w)$ so that $(x, y) \in \mathcal{E}_F$. Three operations have to be implemented for this:

- **JOIN($q$):** this allows a new peer $p$ to join the wheel network by contacting a peer $q$ already in the network. It requires the ROUTE operation to forward a join request to the closest successor of $h(p)$ so that $p$ can be integrated.

- **LEAVE():** this allows a peer to leave the wheel network.

- **ROUTE($y, msg$):** this allows to route a message $msg$ to the peer $q$ whose region contains point $y$. In our context, the only relevant message is a join request.