

Course ISE 435: Distributed Algorithms in Network
Communication
Recitation 6 Exercise Answers

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April 21, 2010

1 Sum Calculation

Assume n nodes are connected in an undirected graph. Each node has a single variable x_n . Adapt the *echo algorithm* to compute the sum of all the x_n in the network.

1.1 Answer

```
var  $rec_p$  : int init 0;
var  $father_p$  : node init undef;
var  $sum$  : int init 0;

if  $p$  is initiator then
  begin
     $sum := x$ 
    for all  $q \in Neigh_p$  do send <tok, 0> to  $q$ ;
    while  $rec_p < \#Neigh_p$  do
      begin receive <tok,  $x$ >;  $rec_p := rec_p + 1$ ;  $sum := sum + x$ ; end;
    print "Sum is  $sum$ "
  end
else
  begin
     $sum := x$ 
    receive <tok,  $n$ > from  $q$ ;
     $father_p := q$ ;  $rec_p := rec_p + 1$ ;
    for all  $q \in Neigh_p \wedge q \neq father_p$  do send <tok, 0> to  $q$ ;
    while  $rec_p < \#Neigh_p$  do
      begin receive <tok,  $x$ >;  $rec_p := rec_p + 1$ ;  $sum := sum + x$ ; end;
    send <tok,  $sum$ > to  $father_p$ 
  end
end
```

2 Mean (Average) Calculation

Assume n nodes are connected in a tree. Each node has a single variable x_n . Adapt the *tree algorithm* to compute the mean (average) of all the x_n in the network.

2.1 Answer