

Wave and Traversal Algorithms

1 Tree Diameter (15 points)

Design a distributed algorithm for a tree network that terminates properly, and such that upon termination each process knows the diameter of the network.

2 Asynchronous Algorithm (25 points)

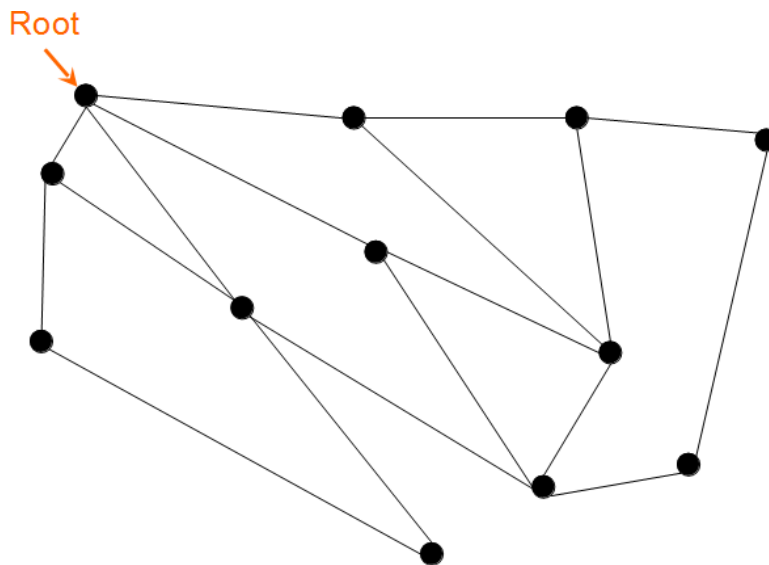
Assume a collection of processes \mathbb{P} such that initially each process $p \in \mathbb{P}$ holds a value v_p . Design a distributed algorithm for a tree network that realizes postcondition

$$\forall q \in \mathbb{P} : avg_q = \frac{1}{|\mathbb{P}|} (\sum_{p \in \mathbb{P}} v_p)$$

Assume that there are one or more initiators, but that not necessarily all of the leaves are initiators.

3 Network Traversal (15 points / 5 points each)

Consider the following graph:



Show the steps to create a spanning tree based on the graph starting from the indicated root using the following algorithms:

- Tarry's Algorithm where the result is not a depth-first search spanning tree
- Classical Depth First Search Algorithm
- Awerbuch's Depth First Search Algorithm (with a final spanning tree which is different than the result you arrived at using the Classical Depth First Search Algorithm)

Show the steps followed using the algorithms in a manner similar to what was shown in class:

Tarry's Algorithm Show messages from father to child in **red**, messages from child to father in **green**, and frond (non-tree) messages in **yellow**.

Classical Depth First Search Show messages from father to child in **red**, messages from child to father in **green**, and frond (non-tree bounced) messages in **yellow**.

Awerbuch's Algorithm Show messages from father to child in **red**, messages from child to father in **green**, and vis/ack messages in **yellow**.

What to turn in by 25 May 2011

Turn in the above work:

- via Telem
- by hand
- via email to `ise435@gmail`

Draw your graphs and spanning trees using any graphical tool of your choice. You may also submit hand drawings if they are sufficiently clear and understandable without outside help. I will accept submissions in the following formats:

- MS Powerpoint
- MS Word
- PDF
- HTML

I will not accept collections of image files which are not viewable in a single file and with unambiguous order and labeling. A copy of the original file used to create the above image is available on the course web page.

You may work in groups of two. I will approve one group of three if there is an odd number of students.