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# DOSP\_Project2\_GossipAlgorithm

## Project 2 : Gossip Algorithm in Erlang

For computation and communication among groups we make use of gossip algorithms and push sum algorithm over various topologies. After various experiments our end goal is to find the convergence among these through simulations that are dependent on actors. The algorithms involved in this project are Gossip and push sum. Topologies used for testing are 2D grid, full, line and impartial 3D.

### Group Members

Names	UF-ID
Vamsi Pachamatla	1708-0059
Satya Venkata Sai Nirupam Yashas Kuchimanchi	5043-1189

### How to run

1. Create a node for the project from the project path using the command:  
erl -name username@IPAddress.

2. After node creation and erl environment opening compile the erlang files gossip.erl, main.erl, pushsum.erl and topology.erl using the command:  
`c(file)`.
3. Once the files are compiled and OK message is seen in the terminal, execute the project using  
`main:start(workercount,"TopologyType","AlgorithType")`.

## What's Working

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The project is working for the Gossip and Push Sum algorithms for the Full, line, 2D grid and impartial 3D topologies.

## Largest Network for various topologies and algorithms

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Alogorithm	Topology	Max Workers
gossip	line	5000
gossip	full	12000
gossip	2D	12000
gossip	imp3D	12000
pushsum	line	7000
pushsum	full	10000
pushsum	2D	5000
pushsum	imp3D	20000

Below screenshots are for reference indicating the maximum workers for every case.

## Gossip Algorithm - Line Topology

```
Neighbors of <0.118.0> are: [<0.117.0>,<0.119.0>]
Neighbors of <0.117.0> are: [<0.116.0>,<0.118.0>]
Neighbors of <0.116.0> are: [<0.115.0>,<0.117.0>]
Neighbors of <0.115.0> are: [<0.114.0>,<0.116.0>]
Neighbors of <0.114.0> are: [<0.113.0>,<0.115.0>]
Neighbors of <0.113.0> are: [<0.112.0>,<0.114.0>]
Neighbors of <0.112.0> are: [<0.111.0>,<0.113.0>]
Neighbors of <0.110.0> are: [<0.109.0>,<0.111.0>]
Neighbors of <0.109.0> are: [<0.108.0>,<0.110.0>]
Neighbors of <0.108.0> are: [<0.107.0>,<0.109.0>]
Neighbors of <0.107.0> are: [<0.106.0>,<0.108.0>]
Neighbors of <0.105.0> are: [<0.104.0>,<0.106.0>]
Neighbors of <0.104.0> are: [<0.103.0>,<0.105.0>]
Neighbors of <0.102.0> are: [<0.101.0>,<0.103.0>]
Neighbors of <0.99.0> are: [<0.98.0>,<0.100.0>]
Neighbors of <0.97.0> are: [<0.96.0>,<0.98.0>]
Neighbors of <0.96.0> are: [<0.95.0>,<0.97.0>]
Neighbors of <0.93.0> are: [<0.92.0>,<0.94.0>]
Neighbors of <0.103.0> are: [<0.102.0>,<0.104.0>]
Neighbors of <0.101.0> are: [<0.100.0>,<0.102.0>]
Neighbors of <0.100.0> are: [<0.99.0>,<0.101.0>]
Neighbors of <0.98.0> are: [<0.97.0>,<0.99.0>]
Neighbors of <0.106.0> are: [<0.105.0>,<0.107.0>]
Neighbors of <0.95.0> are: [<0.94.0>,<0.96.0>]
Neighbors of <0.94.0> are: [<0.93.0>,<0.95.0>]
Neighbors of <0.91.0> are: [<0.92.0>]
Neighbors of <0.92.0> are: [<0.91.0>,<0.93.0>]
Gossip Converged
Time Elapsed is 447303
(vamsi@192.168.0.55)2> █
```

## Gossip Algorithm - Full Topology

```
<0.11953.0>,<0.11954.0>,<0.11955.0>,<0.11956.0>,<0.11957.0>,<0.11958.0>,<0.11959.0>,<0.11960.0>,<0.11961.0>,<0.11962.0>,<0.11963.0>,<0.11964.0>,<0.11965.0>,<0.11966.0>,<0.11967.0>,<0.11968.0>,<0.11969.0>,<0.11970.0>,<0.11971.0>,<0.11972.0>,<0.11973.0>,<0.11974.0>,<0.11975.0>,<0.11976.0>,<0.11977.0>,<0.11978.0>,<0.11979.0>,<0.11980.0>,<0.11981.0>,<0.11982.0>,<0.11983.0>,<0.11984.0>,<0.11985.0>,<0.11986.0>,<0.11987.0>,<0.11988.0>,<0.11989.0>,<0.11990.0>,<0.11991.0>,<0.11992.0>,<0.11993.0>,<0.11994.0>,<0.11995.0>,<0.11996.0>,<0.11997.0>,<0.11998.0>,<0.11999.0>,<0.12000.0>,<0.12001.0>,<0.12002.0>,<0.12003.0>,<0.12004.0>,<0.12005.0>,<0.12006.0>,<0.12007.0>,<0.12008.0>,<0.12009.0>,<0.12010.0>,<0.12011.0>,<0.12012.0>,<0.12013.0>,<0.12014.0>,<0.12015.0>,<0.12016.0>,<0.12017.0>,<0.12018.0>,<0.12019.0>,<0.12020.0>,<0.12021.0>,<0.12022.0>,<0.12023.0>,<0.12024.0>,<0.12025.0>,<0.12026.0>,<0.12027.0>,<0.12028.0>,<0.12029.0>,<0.12030.0>,<0.12031.0>,<0.12032.0>,<0.12033.0>,<0.12034.0>,<0.12035.0>,<0.12036.0>,<0.12037.0>,<0.12038.0>,<0.12039.0>,<0.12040.0>,<0.12041.0>,<0.12042.0>,<0.12043.0>,<0.12044.0>,<0.12045.0>,<0.12046.0>,<0.12047.0>,<0.12048.0>,<0.12049.0>,<0.12050.0>,<0.12051.0>,<0.12052.0>,<0.12053.0>,<0.12054.0>,<0.12055.0>,<0.12056.0>,<0.12057.0>,<0.12058.0>,<0.12059.0>,<0.12060.0>,<0.12061.0>,<0.12062.0>,<0.12063.0>,<0.12064.0>,<0.12065.0>,<0.12066.0>,<0.12067.0>,<0.12068.0>,<0.12069.0>,<0.12070.0>,<0.12071.0>,<0.12072.0>,<0.12073.0>,<0.12074.0>,<0.12075.0>,<0.12076.0>,<0.12077.0>,<0.12078.0>,<0.12079.0>,<0.12080.0>,<0.12081.0>,<0.12082.0>,<0.12083.0>,<0.12084.0>,<0.12085.0>,<0.12086.0>,<0.12087.0>,<0.12088.0>,<0.12089.0>,<0.12090.0>,<0.12091.0>]
```

Gossip Converged

Time Elapsed is 10450

(vamsi@192.168.0.55)2> █

## Gossip Algorithm - 2D Grid Topology

```
<0.12078.0>,<0.12079.0>,<0.12080.0>,<0.12081.0>,<0.12082.0>,<0.12083.0>,<0.12084.0>,<0.12085.0>,<0.12086.0>,<0.12087.0>,<0.12088.0>,<0.12089.0>,<0.12090.0>,<0.12091.0>,<0.12092.0>,<0.12093.0>,<0.12094.0>,<0.12095.0>,<0.12096.0>,<0.12097.0>,<0.12098.0>,<0.12099.0>,<0.12100.0>,<0.12101.0>,<0.12102.0>,<0.12103.0>,<0.12104.0>,<0.12105.0>,<0.12106.0>,<0.12107.0>,<0.12108.0>,<0.12109.0>,<0.12110.0>,<0.12111.0>,<0.12112.0>,<0.12113.0>,<0.12114.0>,<0.12115.0>,<0.12116.0>,<0.12117.0>,<0.12118.0>,<0.12119.0>,<0.12120.0>,<0.12121.0>,<0.12122.0>,<0.12123.0>,<0.12124.0>,<0.12125.0>,<0.12126.0>,<0.12127.0>,<0.12128.0>,<0.12129.0>,<0.12130.0>,<0.12131.0>,<0.12132.0>,<0.12133.0>,<0.12134.0>,<0.12135.0>,<0.12136.0>,<0.12137.0>,<0.12138.0>,<0.12139.0>,<0.12140.0>,<0.12141.0>,<0.12142.0>,<0.12143.0>,<0.12144.0>,<0.12145.0>,<0.12146.0>,<0.12147.0>,<0.12148.0>,<0.12149.0>,<0.12150.0>,<0.12151.0>,<0.12152.0>,<0.12153.0>,<0.12154.0>,<0.12155.0>,<0.12156.0>,<0.12157.0>,<0.12158.0>,<0.12159.0>,<0.12160.0>,<0.12161.0>,<0.12162.0>,<0.12163.0>,<0.12164.0>,<0.12165.0>,<0.12166.0>,<0.12167.0>,<0.12168.0>,<0.12169.0>,<0.12170.0>,<0.12171.0>,<0.12172.0>,<0.12173.0>,<0.12174.0>,<0.12175.0>,<0.12176.0>,<0.12177.0>,<0.12178.0>,<0.12179.0>,<0.12180.0>,<0.12181.0>,<0.12182.0>,<0.12183.0>,<0.12184.0>,<0.12185.0>,<0.12186.0>,<0.12187.0>,<0.12188.0>,<0.12189.0>,<0.12190.0>,<0.12191.0>]
```

Gossip Converged

Time Elapsed is 22120

(vamsi@192.168.0.55)2> █



## Gossip Algorithm - impartial 3D Grid Topology

```
<0.12153.0>,<0.12154.0>,<0.12155.0>,<0.12156.0>,<0.12157.0>,<0.12158.0>,<0.12159.0>,<0.12160.0>,<0.12161.0>,<0.12162.0>,<0.12163.0>,<0.12164.0>,<0.12165.0>,<0.12166.0>,<0.12167.0>,<0.12168.0>,<0.12169.0>,<0.12170.0>,<0.12171.0>,<0.12172.0>,<0.12173.0>,<0.12174.0>,<0.12175.0>,<0.12176.0>,<0.12177.0>,<0.12178.0>,<0.12179.0>,<0.12180.0>,<0.12181.0>,<0.12182.0>,<0.12183.0>,<0.12184.0>,<0.12185.0>,<0.12186.0>,<0.12187.0>,<0.12188.0>,<0.12189.0>,<0.12190.0>,<0.12191.0>]
```

Gossip Converged

Time Elapsed is 2781

(vamsi@192.168.0.55)2> █

## Pushsum Algorithm - Line Topology

```
<0.7028.0>,<0.7029.0>,<0.7030.0>,<0.7031.0>,<0.7032.0>,<0.7033.0>,<0.7034.0>,<0.7035.0>,<0.7036.0>,<0.7037.0>,<0.7038.0>,<0.7039.0>,<0.7040.0>,<0.7041.0>,<0.7042.0>,<0.7043.0>,<0.7044.0>,<0.7045.0>,<0.7046.0>,<0.7047.0>,<0.7048.0>,<0.7049.0>,<0.7050.0>,<0.7051.0>,<0.7052.0>,<0.7053.0>,<0.7054.0>,<0.7055.0>,<0.7056.0>,<0.7057.0>,<0.7058.0>,<0.7059.0>,<0.7060.0>,<0.7061.0>,<0.7062.0>,<0.7063.0>,<0.7064.0>,<0.7065.0>,<0.7066.0>,<0.7067.0>,<0.7068.0>,<0.7069.0>,<0.7070.0>,<0.7071.0>,<0.7072.0>,<0.7073.0>,<0.7074.0>,<0.7075.0>,<0.7076.0>,<0.7077.0>,<0.7078.0>,<0.7079.0>,<0.7080.0>,<0.7081.0>,<0.7082.0>,<0.7083.0>,<0.7084.0>,<0.7085.0>,<0.7086.0>,<0.7087.0>,<0.7088.0>,<0.7089.0>,<0.7090.0>,<0.7091.0>]
```

Pushsum Converged and ratio is 6791.492302432279

Time Elapsed is 113997

(yashas@192.168.0.73)2> █

## Pushsum Algorithm - Full Topology

```
<0.10033.0>,<0.10034.0>,<0.10035.0>,<0.10036.0>,<0.10037.0>,<0.10038.0>,<0.10039.0>,<0.10040.0>,<0.10041.0>,<0.10042.0>,<0.10043.0>,<0.10044.0>,<0.10045.0>,<0.10046.0>,<0.10047.0>,<0.10048.0>,<0.10049.0>,<0.10050.0>,<0.10051.0>,<0.10052.0>,<0.10053.0>,<0.10054.0>,<0.10055.0>,<0.10056.0>,<0.10057.0>,<0.10058.0>,<0.10059.0>,<0.10060.0>,<0.10061.0>,<0.10062.0>,<0.10063.0>,<0.10064.0>,<0.10065.0>,<0.10066.0>,<0.10067.0>,<0.10068.0>,<0.10069.0>,<0.10070.0>,<0.10071.0>,<0.10072.0>,<0.10073.0>,<0.10074.0>,<0.10075.0>,<0.10076.0>,<0.10077.0>,<0.10078.0>,<0.10079.0>,<0.10080.0>,<0.10081.0>,<0.10082.0>,<0.10083.0>,<0.10084.0>,<0.10085.0>,<0.10086.0>,<0.10087.0>,<0.10088.0>,<0.10089.0>,<0.10090.0>,<0.10091.0>]
```

Pushsum Converged and ratio is 9840.12306934142

Time Elapsed is 163566

(yashas@192.168.0.73)2> █

## Pushsum Algorithm - 2D Topology

```
<0.5068.0>,<0.5069.0>,<0.5070.0>,<0.5071.0>,<0.5072.0>,  
<0.5073.0>,<0.5074.0>,<0.5075.0>,<0.5076.0>,<0.5077.0>,  
<0.5078.0>,<0.5079.0>,<0.5080.0>,<0.5081.0>,<0.5082.0>,  
<0.5083.0>,<0.5084.0>,<0.5085.0>,<0.5086.0>,<0.5087.0>,  
<0.5088.0>,<0.5089.0>,<0.5090.0>,<0.5091.0>,<0.5092.0>,  
<0.5093.0>,<0.5094.0>,<0.5095.0>,<0.5096.0>,<0.5097.0>,  
<0.5098.0>,<0.5099.0>,<0.5100.0>,<0.5101.0>,<0.5102.0>,  
<0.5103.0>,<0.5104.0>,<0.5105.0>,<0.5106.0>,<0.5107.0>,  
<0.5108.0>,<0.5109.0>,<0.5110.0>,<0.5111.0>,<0.5112.0>,  
<0.5113.0>,<0.5114.0>,<0.5115.0>,<0.5116.0>,<0.5117.0>,  
<0.5118.0>,<0.5119.0>,<0.5120.0>,<0.5121.0>,<0.5122.0>,  
<0.5123.0>,<0.5124.0>,<0.5125.0>,<0.5126.0>,<0.5127.0>,  
<0.5128.0>,<0.5129.0>,<0.5130.0>,<0.5131.0>,<0.5132.0>]
```

Pushsum Converged and ratio is 2520.5000035231105

Time Elapsed is 58748

(yashas@192.168.0.73)2> █

## Pushsum Algorithm - impartial 3D Topology

```
<0.20198.0>,<0.20199.0>,<0.20200.0>,<0.20201.0>,<0.20202.0>,  
<0.20203.0>,<0.20204.0>,<0.20205.0>,<0.20206.0>,<0.20207.0>,  
<0.20208.0>,<0.20209.0>,<0.20210.0>,<0.20211.0>,<0.20212.0>,  
<0.20213.0>,<0.20214.0>,<0.20215.0>,<0.20216.0>,<0.20217.0>,  
<0.20218.0>,<0.20219.0>,<0.20220.0>,<0.20221.0>,<0.20222.0>,  
<0.20223.0>,<0.20224.0>,<0.20225.0>,<0.20226.0>,<0.20227.0>,  
<0.20228.0>,<0.20229.0>,<0.20230.0>,<0.20231.0>,<0.20232.0>,  
<0.20233.0>,<0.20234.0>,<0.20235.0>,<0.20236.0>,<0.20237.0>,  
<0.20238.0>,<0.20239.0>,<0.20240.0>,<0.20241.0>,<0.20242.0>,  
<0.20243.0>,<0.20244.0>,<0.20245.0>,<0.20246.0>,<0.20247.0>,  
<0.20248.0>,<0.20249.0>,<0.20250.0>,<0.20251.0>,<0.20252.0>,  
<0.20253.0>,<0.20254.0>,<0.20255.0>]
```

Pushsum Converged and ratio is 10081.999999997974

Time Elapsed is 5114

(yashas@192.168.0.73)2> █