All pair shortest path using Rkleene algorithm

-Abhyodaya
All pair shortest path

- Floyd Warshall Algorithm.
- Dijkstra.
- Recursive Kleene Algorithm.
(exploits data locality).

(source: R-Kleene: A High-Performance Divide-and-Conquer Algorithm for the All-Pair Shortest Path for Densely Connected Networks)
RKleene

- It is a divide and conquer algorithm.
- Based on matrix multiplication.

Replaced operations

**Multiply** with **Add**
**Addition** with **Min**

(Source : R-Kleene: A High-Performance Divide-and-Conquer Algorithm for the All-Pair Shortest Path for Densely Connected Networks)
Rkleene

**Steps**

a) Division of adj mat to 4 components
b) Call Rkleene on all 4 parts.
c) Perform MM on results of 4 parts.

**MM operation explained**

Consider Example for . B += A*B

Initial (a,d) = INFINITE

\[(a,d) = \min((a,d), ((a,c) + (c,d)))\]

\[= \min(\text{INFINITE} + (2+8)) = 10\]
Assumption: all nodes have access to input graph data.

- MPI_Send to send matrix indexes to work on.
- MPI_Recv to receive data from process.
- Partition algorithm needed for MPI process as number of process is fixed.

Source: Shared Memory, Message Passing, and Hybrid Merge Sorts Standalone and Clustered SMPs.

```c
int helper_rank = my_rank + pow(2, level);
```
Initial test MPI Rkleene.

- Initial test with 1024 graph nodes on silo.cs.indiana.edu.
Thanks