# Codes

## #bnb\_implemetation.m

The main body of branch and bound algorithm. Please refer to fig. 5 of Paper G for pseudo code description of this part.

## #PQ.m

A class storing all nodes, it can store nodes, insert new nodes, sort nodes according to UBC

## #Cost.m

Which calculates the communication cost, it has two modes, 'UBC' and 'LBC'

Also, you can run with ‘mm’,’mu’ or ‘uu’ to investigate the communication energy among mapped/unmapped tasks of a node

## #LeafNode\_generate.m

Aggressively mapping, output is a leaf node of a given node

## #minimal\_dis\_mu.m

Find minimal distance between mapped and unmapped

## #minimal\_dis\_uu.m

Find minimal distance among unmapped

## #CTG.m

Stores all examples of communication matrix

## #CTG.sort.m

Sort a matrix, so that all tasks rank in descending communication demand.

# Nodes format

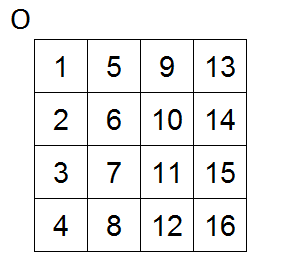
A node is formatted as [LBC UBC x x x x…x].

For example, for a 9 tasks CTG, a node is formatted as [188 299 3 6 4 5 0 0 0 0 0].

It means that the task 1 is mapped to tile 3, task 2 is mapped to tile 6 and so on. The numbering of a tile is default in the format below.

Y

X



# How to run codes

To run, follow this sequence

1. Input a communication matrix to **comm\_vol**,
2. Specify NoC tile size, number of tasks, **n**, **nt**
3. Set up **symmetry check level, termination strategy, insertion strategy**, please follow the instruction in bnb\_implementation.m

## Cost.m

The input nodes should have no LBC and UBC.

For this node [188 299 3 6 4 5 0 0 0 0 0], Cost.m only accepts [3 6 4 5 0 0 0 0 0], specify ‘LBC’ or ‘UBC’

## LeafNode\_generate.m

Same as Cost.m in terms of node input.

# How to read Running Results

Below is a running sample

*############################################*

*############################################*

*Running Report*

*nt=9 n=3*

*Symmetry Check level=2*

*Insertion\_Strategy=Off*

*Manual\_Termination=Off Threshold=469.7632*

*Best Mapping Cost= 248*

*Best Mapping(Tile)=2 4 5 3 6 1 9 7 8*

*Best Mapping(Task)=4 8 5 2 1 6 3 9 7*

*nodes visited 1263*

*nodes pruned 1002*

*running time 0.96461 sec*

*############################################*

So the best mapping from original CTG to tiles is: 4->2, 8->4,……,7->8

Communication Cost is 248.

# Features

## Symmetry Check

Line 36 in bnb\_implementation.m

Choose from 0, 1, 2 for level

## Termination Strategy

bnb\_implementation.m

Line 7 : change threshold value

Line 44: switch ‘On’ or ‘Off’

Line 187-192: codes for termination

## Insertion Strategy

bnb\_implementation.m

Line 40: switch ‘On’ or ‘Off’

Line 154-179: codes

## UBC Estimation Improvement

LeafNode\_geneartion.m

Line 32-36

# Terminology

## PQueue

A class of PQ.m, it stores all nodes to be analyzed.

## best\_mapping

the leaf node that has the lowest communication cost

## best\_mapping\_cost

the cost of best\_mapping

## nodes visited

when a node is sub-branched and LBC/UBC is calculated, we refer it to a ‘nodes visited’. Because calculating LBC/UBC is the most time consuming part in the algorithm, the number of nodes visited is an important factor related to execution time of entire algorithm

## min\_UBC

the minimum Upper Bound Cost, it is initialized as infinity, and will be updated to a new value if the new value is lower than min\_UBC.