Wallace Multiplier Example

James E. Stine
Electrical and Computer Engineering Department
Oklahoma State University
Stillwater, OK 74078, USA

1. Wallace Multiplier

This document is meant to show the in-class example of a 6-bit by 6-bit Wallace Multiplier. Figure 2 shows usually how industry documents it. The reorganization of the partial product matrix into an inverted triangle is also usually eliminated for industrial documents, but I kept it in mainly because I did not want to waste time deleting it. Here is a table documenting the area where the final iteration has an 8-bit CPA:

Iteration	Number of $(3,2)$ Counters	Number of $(2,2)$ Counters	Row Height
1	8	4	6
2	5	4	4
3	3	5	3
Total	16	13	-

Please note that the major difference between Figure 2 and Figure 1 is that Figure 2 does not contain the ovals that I utilized in class. The ovals are something I use to help me figure out where the $(3,2)$ and $(2,2)$ counters go. You are welcome to use your own method to help you in creating Wallace multipliers. The methodology for creating Wallace trees, or so they are called, can be organized into the following steps listed below. Usually, Wallace trees or diagrams do not contain the final CPA, because it is implied.

1. Reorganize matrix into inverted triangle (optional)
2. Group the rows into sets of 3.
3. Starting at far right column, use $(2,2)$ and $(3,2)$ counters as long each subset of 3, has at least 3 rows.
4. Repeat step (3) until the final height is 2.

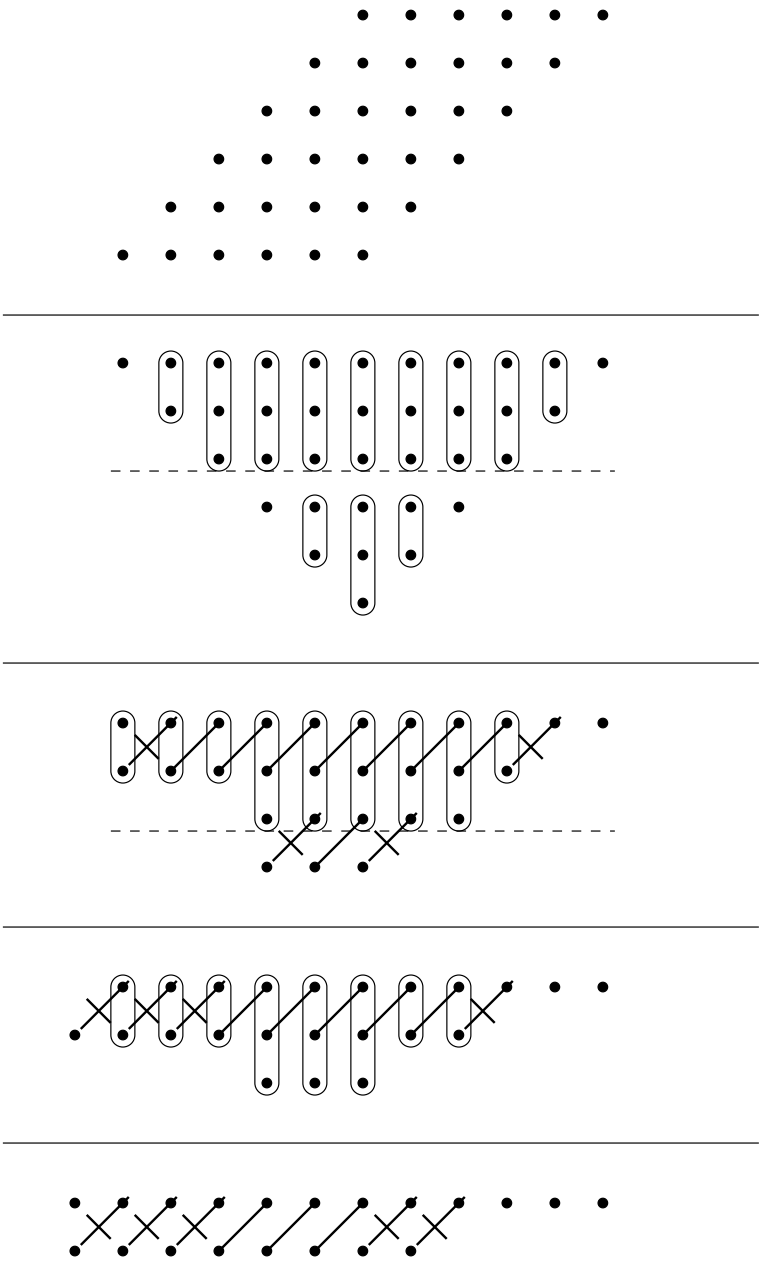

Figure 1: In-class Example of 6×6 Wallace Multiplier.

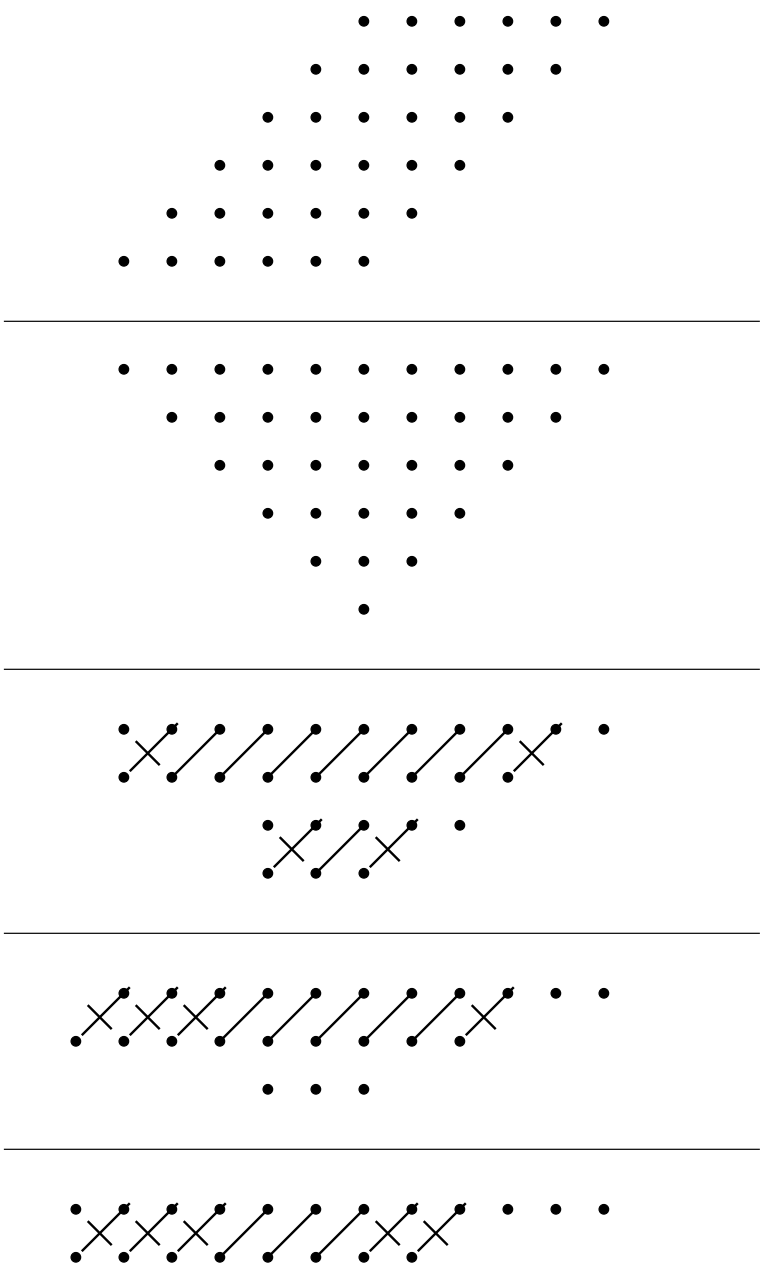

Figure 2: In-class Example of 6×6 Wallace Multiplier (how usually described in literature).