## Homework 4 High Performance Computing 2015

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(a) Table 1 shows Pixels/s (Mp/s), the bandwidth (Gb/s), and the Flop/s (Gf/s) for image bike.ppm for 1000 iterations. On GeForce GTX TITAN Black performance gets better when we increase the work group size from  $16 \times 16$  to  $32 \times 32$ . AMD Cypress and Intel HD Graphics 4000 don't support work group size greater than 256 and 512 respectively.

Word	GeForce GTX TI-	GeForce GTX 750	AMD Cypress	Intel HD Graphics
group size	TAN Black	Ti		4000
8 × 8	1651.525701 Mp/s	857.079568 Mp/s	208.825297  Mp/s	$66.741965 \; \mathrm{Mp/s}$
	13.212206  Gb/s	$6.856637 \; \mathrm{Gb/s}$	$1.670602 \; \mathrm{Gb/s}$	$0.533936~\mathrm{Gb/s}$
	79.944226 Gf/s	41.488039 Gf/s	10.108457  Gf/s	$3.230731~\mathrm{Gf/s}$
$16 \times 16$	2514.559123 Mp/s	$911.011772 \; \mathrm{Mp/s}$	$284.079608 \; \mathrm{Mp/s}$	63.425241  Mp/s
	20.116473  Gb/s	$7.288094~\mathrm{Gb/s}$	$2.272637~\mathrm{Gb/s}$	$0.507402 \; \mathrm{Gb/s}$
	121.720468 Gf/s	$44.098697 \; \mathrm{Gf/s}$	$13.751239~\mathrm{Gf/s}$	$3.070180 \; \mathrm{Gf/s}$
$32 \times 32$	$2604.194548~{ m Mp/s}$	878.237898 Mp/s	-	-
	$20.833556~\mathrm{Gb/s}$	$7.025903 \; \mathrm{Gb/s}$	-	-
	$126.059387 \; \mathrm{Gf/s}$	42.512235 Gf/s	-	-

Table 1: Runtime information for smoothing kernel on different devices

(b) Figure 1, 2, 3 shows bike.ppm after 1, 100 and 1000 iterations respectively. I just copy the output image of the kernel to back to input image using clEnqueueCopyBuffer() function within each iteration.



Figure 1: bike.ppm after 1 iteration



Figure 2: bike.ppm after 100 iterations

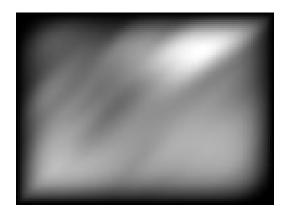


Figure 3: bike.ppm after 1000 iterations