Introduction To Algorithms
HomeWork 3 Solutions

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1.

Size	RT(ms)	RT Ratio	nlog(n)	nlog(n) Ratio	Error
$2.5*10^7$	291		$2.5*10^7*21.25$		
$5*10^7$	591	$\frac{591}{291}=2.03$	$5*10^7*22.25$	$\frac{5*10^7*22.25}{2.5*10^7*21.25}=2.09$	$\frac{2.03-2.09}{2.09}=-2.87\%$
$1*10^8$	1235	$\frac{1235}{591}=2.09$	$1*10^8*23.25$	$\frac{1*10^8*23.25}{5*10^7*22.25}=2.09$	$\frac{2.09-2.09}{2.09}=0.00\%$
$2*10^8$	2567	$\frac{2576}{1235}=2.09$	$2*10^8*24.25$	$\frac{2*10^8*24.25}{1*10^8*23.25}=2.09$	$\frac{2.09-2.09}{2.09}=0.00\%$
$4*10^8$	5416	$\frac{5416}{2567}=2.11$	$4*10^8*25.25$	$\frac{4*10^8*25.25}{2*10^8*24.25}=2.08$	$\frac{2.11-2.08}{2.08}=1.44\%$
$8*10^8$	11073	$\frac{11073}{5416}=2.04$	$8*10^8*26.25$	$\frac{8*10^8*26.25}{4*10^8*25.25}=2.08$	$\frac{2.04-2.08}{2.08}=-1.92\%$

Let n be a list of integer number,$n_1 < n_2 < n_3 < n_4 < n_5 < n_6$.
Define:

$$RT\ Ratio\ =\ \frac{n_{i+1}}{n_i}$$

$$nlog(n)\ Ratio\ =\ \frac{n_{i+1}*log(n_{i+1})}{n_i*log(n_i)}$$

$$Error\ =\ \frac{RT\ Ratio\ -\ nlog(n)\ Ratio}{nlog(n)\ Ratio}$$

From above table, we can notice that the Error are small, which indicate that time complexity of Quicksort is based on n*log(n).