Práctica 1. Análisis de eficiencia de algoritmos

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1. Introducción

2. Eficiencia empírica

2.1. Algoritmos de ordenación rápidos

Tamaño del vector	Tiempo con Quicksort	Tiempo con Mergesort	Tiempo con Heapsort
500	0.000125572	0.000185121	0.000192113
1000	0.000271314	0.000389135	0.000444516
1500	0.00041891	0.000760708	0.000705254
2000	0.000594146	0.00102568	0.00097424
2500	0.000740502	0.000482617	0.000443686
3000	0.000596825	0.000494674	0.000381796
3500	0.000343663	0.000452999	0.000429375
4000	0.000373585	0.000644118	0.00053697
4500	0.00042863	0.000694048	0.000605903
5000	0.000513286	0.000788472	0.000634107
5500	0.000557894	0.000948842	0.000715611
6000	0.000605284	0.00105457	0.000794382
6500	0.000657624	0.000926247	0.000862167
7000	0.000714435	0.00100227	0.000929307
7500	0.000757684	0.0011178	0.00100083
8000	0.000831217	0.00123515	0.00108477
8500	0.00087632	0.00131409	0.00114999
9000	0.000951436	0.00139895	0.00124178
9500	0.00100672	0.00153253	0.001302
10000	0.00104054	0.00163203	0.00136841
10500	0.00111741	0.00176789	0.00144557
11000	0.0011769	0.00188453	0.00152554
11500	0.00124374	0.00208893	0.00161126

12000	0.00128353	0.00217296	0.00168296
12500	0.00134991	0.00229752	0.0017724
13000	0.00142095	0.00192418	0.00186281
13500	0.00144951	0.00202339	0.00193143
14000	0.00152673	0.00208988	0.00199139
14500	0.00158276	0.00219523	0.00207509
15000	0.0016307	0.00232089	0.00216104
15500	0.0016855	0.0024091	0.00223611
16000	0.00175315	0.00251567	0.00231843
16500	0.00180967	0.00262037	0.00240901
17000	0.00187919	0.0027362	0.00250793
17500	0.00192917	0.00287752	0.00256264
18000	0.0020248	0.00300007	0.00263882
18500	0.00204495	0.00310153	0.00272534
19000	0.00211357	0.00325465	0.00280503
19500	0.00218022	0.00338002	0.00289392
20000	0.00223461	0.00350399	0.00304415
20500	0.00232654	0.00358945	0.00314781
21000	0.0023512	0.00372468	0.00322618
21500	0.0024141	0.00385273	0.00330935
22000	0.00248485	0.00398946	0.00339943
22500	0.00255673	0.00411845	0.00348261
23000	0.00264539	0.00433311	0.00357741
23500	0.00272772	0.00445179	0.00366066
24000	0.00270691	0.00454967	0.00373309
24500	0.00285553	0.00466454	0.00382896
25000	0.00282962	0.0048426	0.00392208

Tabla comparativa de tiempos

2.2. Algoritmos de ordenación lentos

Tamaño del vector	Tiempo con Burbuja	Tiempo con Selección	Tiempo con Inserción
500	0.00178596	0.00147628	0.00114028
1000	0.0028655	0.0022588	0.00172961
1500	0.00448784	0.00309903	0.00230721
2000	0.00786624	0.00525987	0.00405115
2500	0.0124692	0.00811555	0.00630397
3000	0.0181514	0.0116717	0.00910679
3500	0.0252785	0.0157854	0.0125022
4000	0.0337448	0.0205625	0.0158871

4500	0.0436306	0.0268227	0.0201791
5000	0.0551609	0.0331552	0.026194
5500	0.0681233	0.0401148	0.030802
6000	0.0824843	0.0467118	0.035932
6500	0.0984357	0.0540054	0.042335
7000	0.11589	0.0626111	0.0497211
7500	0.135017	0.0717969	0.0573054
8000	0.155683	0.0817153	0.0657382
8500	0.176902	0.0921947	0.0768291
9000	0.199919	0.103297	0.0861508
9500	0.225075	0.115035	0.0981397
10000	0.251881	0.127486	0.103923
10500	0.279234	0.140492	0.122772
11000	0.309941	0.154166	0.131101
11500	0.34121	0.171219	0.142071
12000	0.371406	0.183355	0.158711
12500	0.405278	0.198969	0.168258
13000	0.441736	0.215243	0.178126
13500	0.478529	0.232051	0.195711
14000	0.517851	0.249406	0.215179
14500	0.557069	0.26754	0.223471
15000	0.623507	0.286271	0.245298
15500	0.64346	0.305662	0.257939
16000	0.693738	0.325702	0.277471
16500	0.734539	0.346204	0.297803
17000	0.778796	0.367458	0.311583
17500	0.829418	0.39475	0.322414
18000	0.880487	0.412826	0.352076
18500	0.933294	0.435126	0.360694
19000	0.986121	0.460939	0.379935
19500	1.07066	0.483263	0.396013
20000	1.09964	0.515923	0.421674
20500	1.15639	0.544332	0.447574
21000	1.22045	0.5604	0.471736
21500	1.32645	0.590167	0.483069
22000	1.39171	0.618805	0.504104
22500	1.55601	0.646724	0.53811
23000	1.52041	0.671924	0.56646
23500	1.60414	0.701547	0.596336
24000	1.6872	0.745452	0.613182
24500	1.7148	0.770377	0.635088
25000	1.78348	0.79409	0.638414

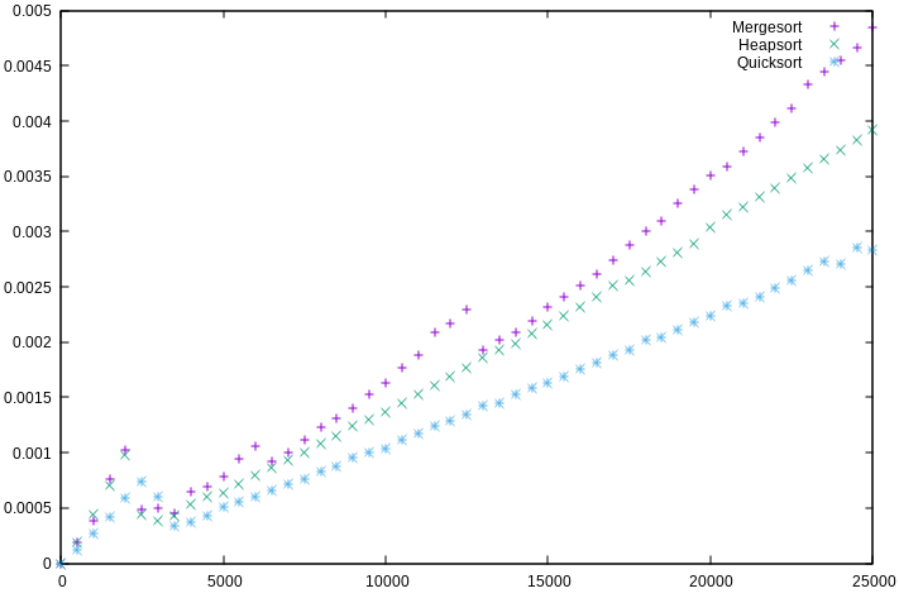

Figura 1: Comparación gráfica del rendimiento de los algoritmos de ordenación rápida

3. Eficiencia híbrida

Ajuste de las diferentes funciones de acuerdo a la eficiencia teórica de los algoritmos y los datos obtenidos en la eficiencia empírica.

3.1. Algoritmos de ordenación rápidos

Para el algoritmo Mergesort:

Constante	Valor	Error estándar
a0	3.66473e-12	12.16
a1	8.67345e-08	13.28
a2	0.000308646	20.18

Para el algoritmo Heapsort:

Constante	Valor	Error estándar
a0	2.32227e-12	14.09
a1	9.24005e-08	9.152
a2	0.000224702	20.34

Para el algoritmo Quicksort:

Constante	Valor	Error estándar
a0	1.37793e-12	18.84
a1	7.47827e-08	8.974
a2	0.000181972	19.93

3.2. Algoritmos de ordenación lentos

Para el algoritmo Burbuja:

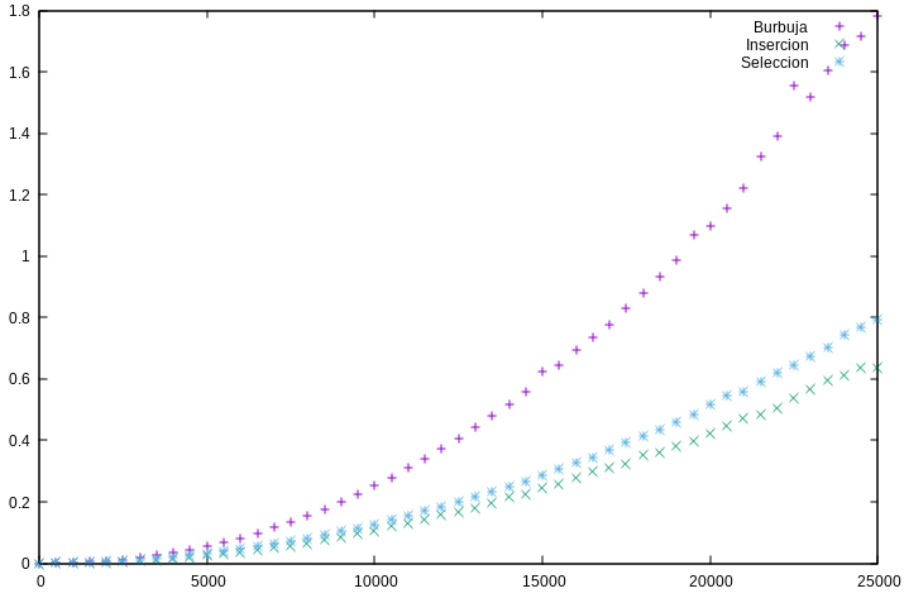

Figura 2: Comparación gráfica del rendimiento de los algoritmos de ordenación lenta

Para el algoritmo de Seleccion:

Constante	Valor	Error estándar
a0	1.28478e-09	0.5517
a1	-1.91843e-07	95.52
a2	0.00095162	104.1

3.3. Algoritmo de Fibonacci

Constante	Valor	Error estándar
a0	2.9613e-09	0.2375

3.4. Algoritmo de Floyd

Constante	Valor	Error estándar
a0	4.5232e-09	12.19
a1	1.64e-06	51.27
a2	-0.000541551	66.61
a3	0.0340052	121.6

3.5. Ajustes de tiempos con funciones no correspondientes

4. Comparacion tiempos distintos computadores

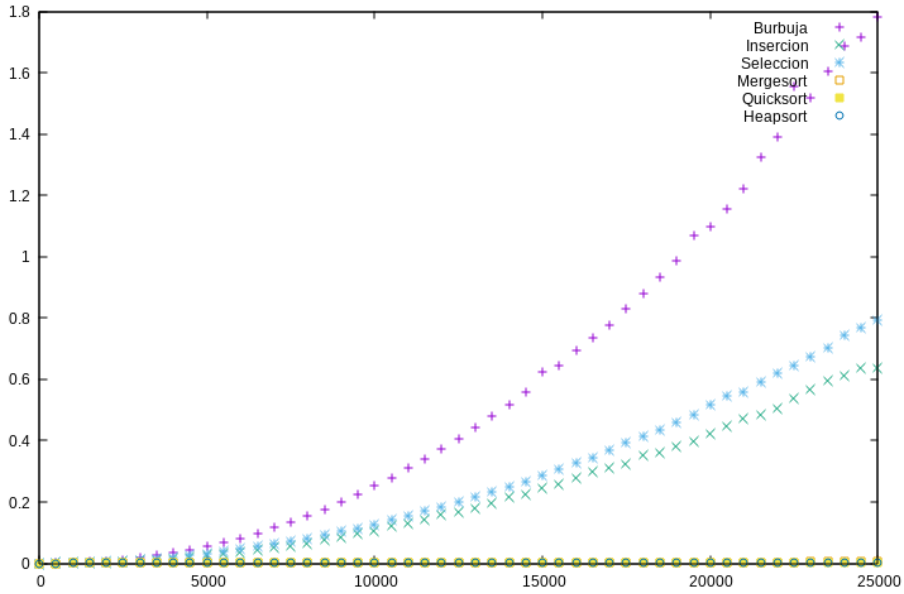

Figura 3: Comparación gráfica del rendimiento de los algoritmos de ordenación

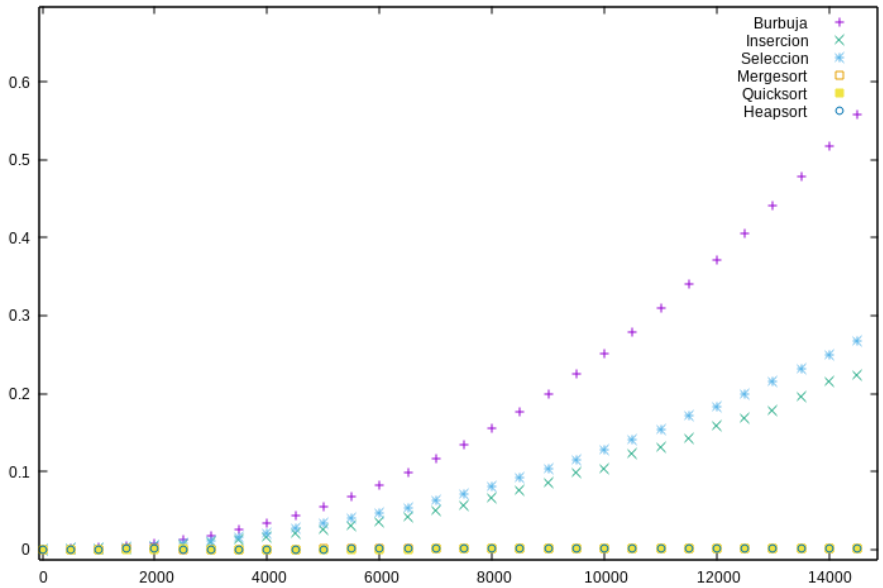

Figura 4: Zoom en el intervalo [0-15000] de la figura 3

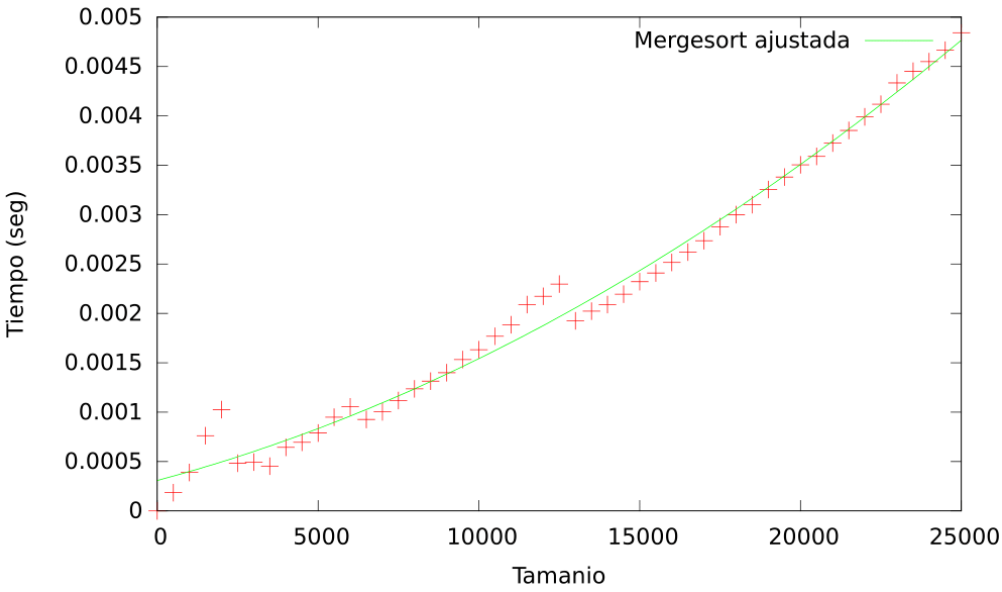

Figura 5: Ajuste función Mergesort

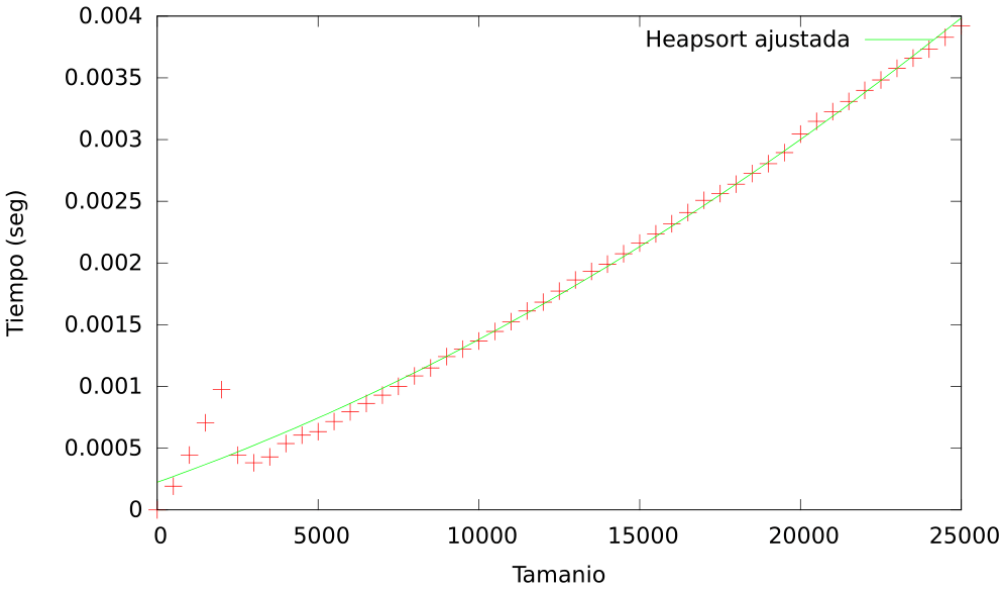

Figura 6: Ajuste función Heapsort

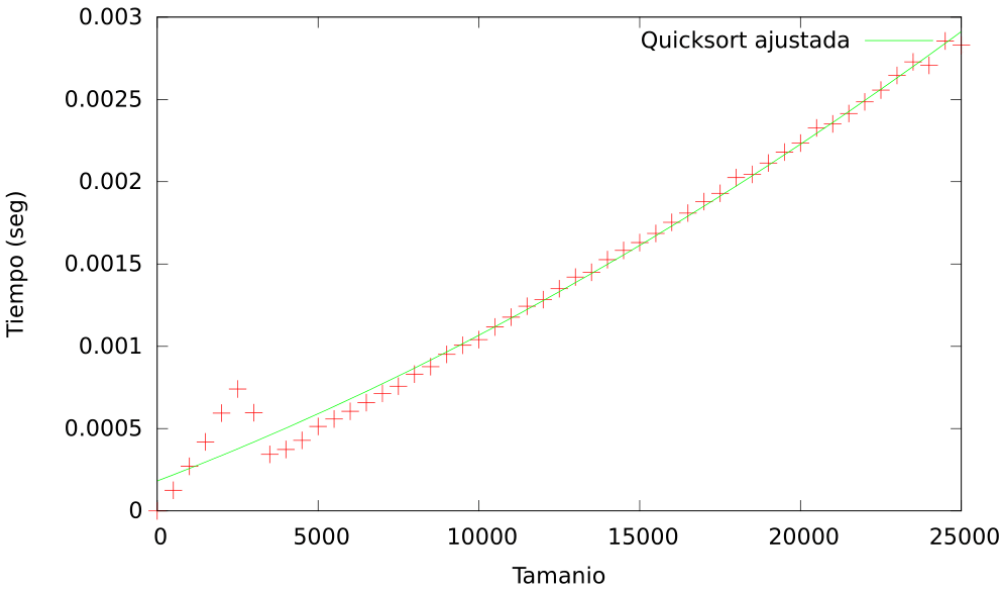

Figura 7: Ajuste función Quicksort

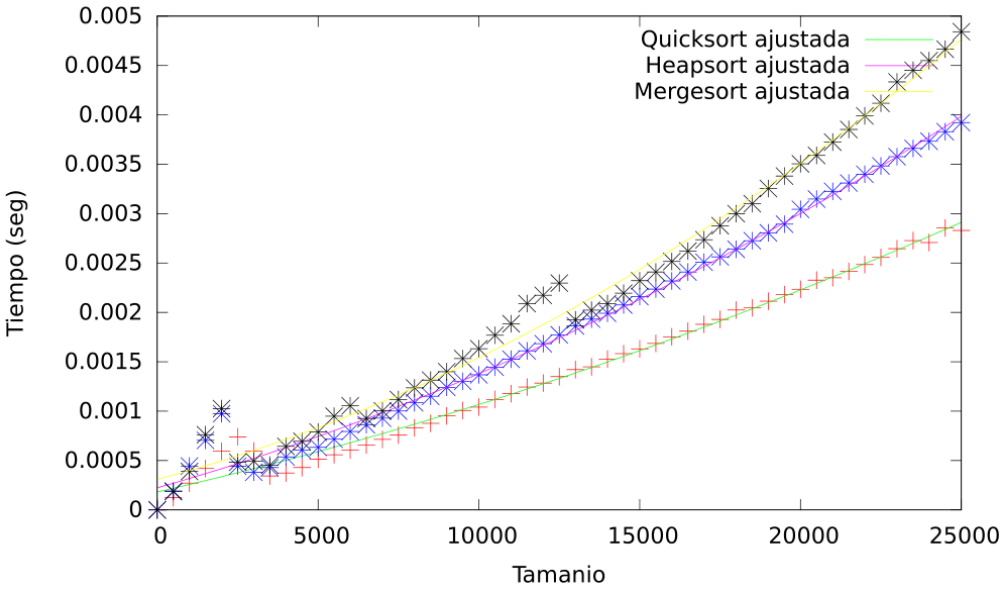

Figura 8: Comparativa ajuste para algoritmos de ordenación rápidos

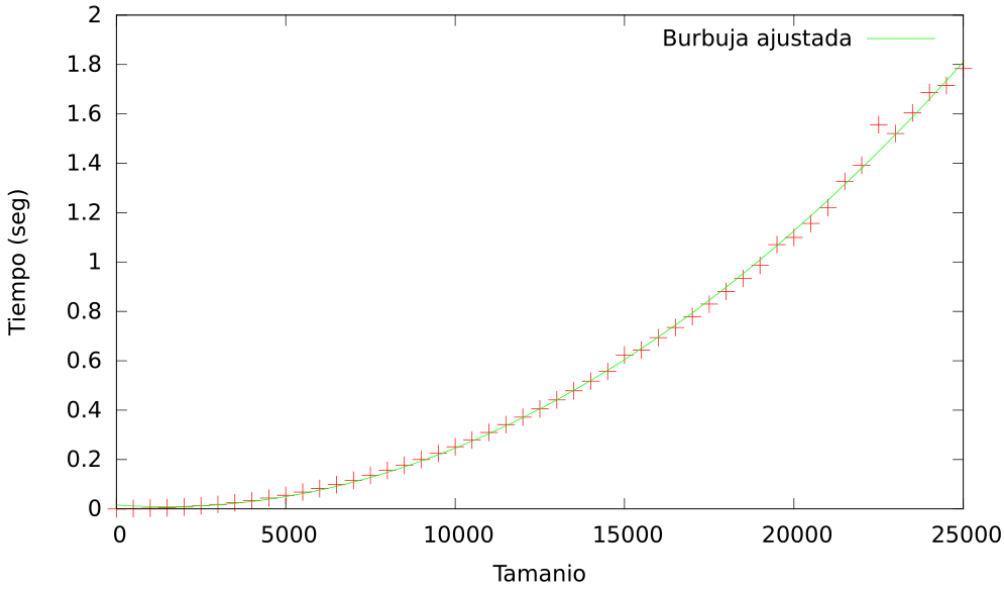

Figura 9: Ajuste función Burbuja

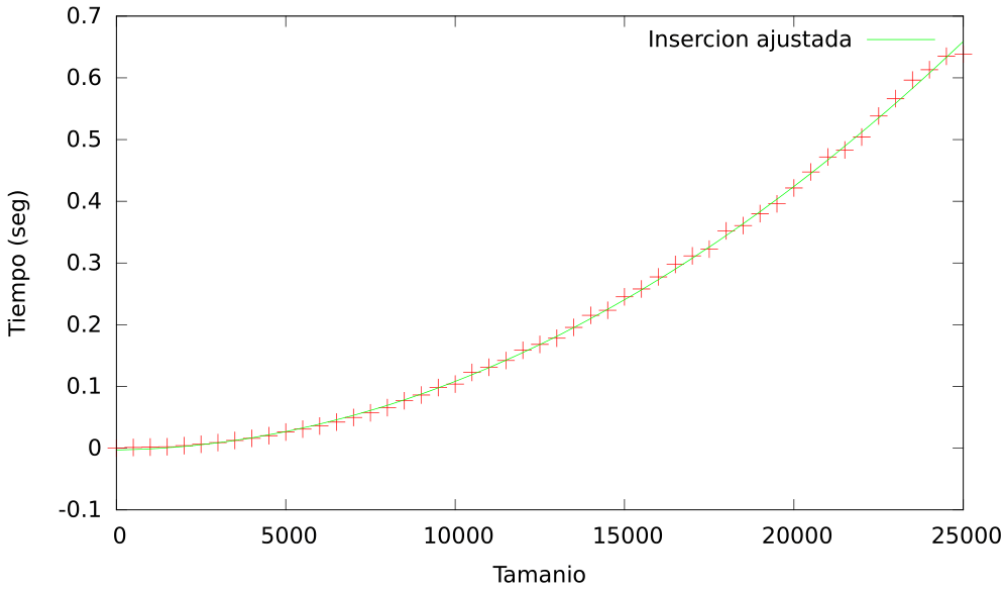

Figura 10: Ajuste función Inserción

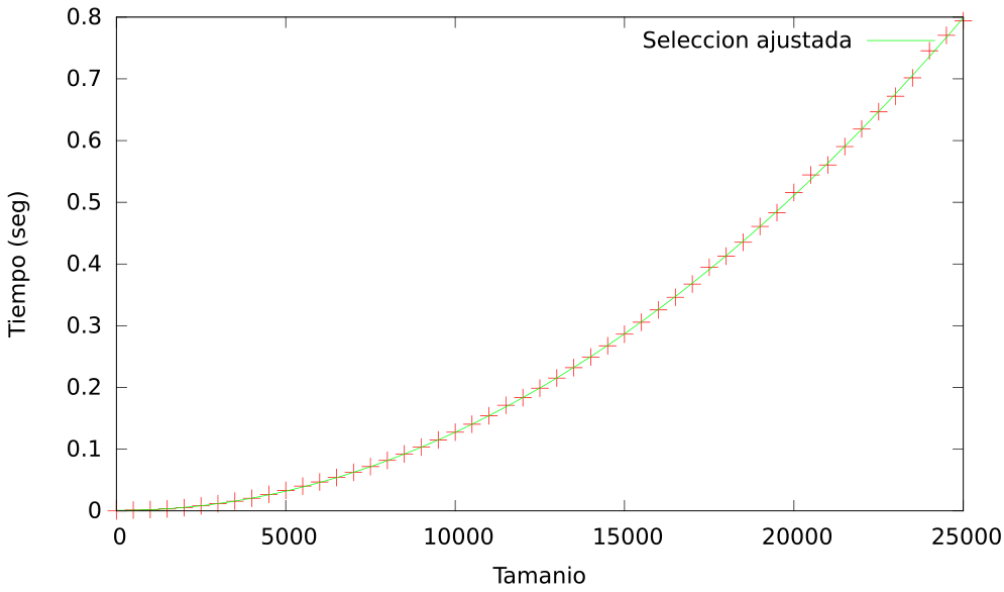

Figura 11: Ajuste función Selección

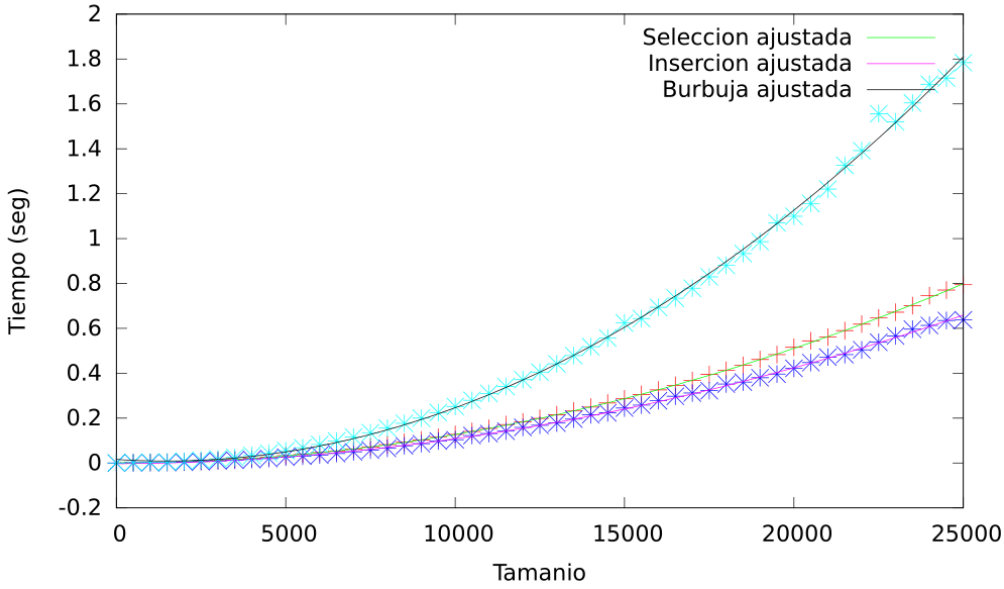

Figura 12: Comparativa ajuste para algoritmos de ordenación lentos

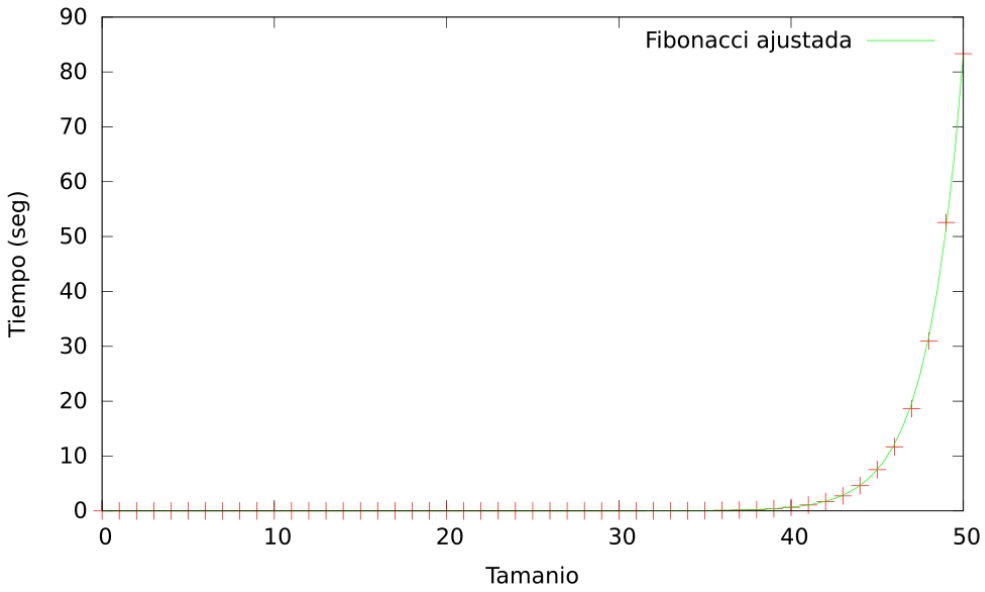

Figura 13: Ajuste función de Fibonacci

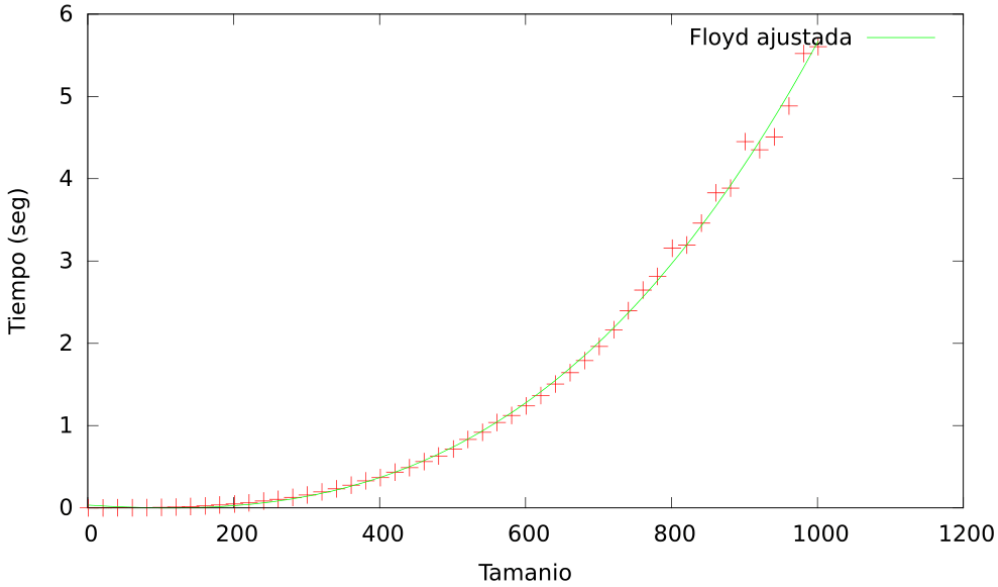

Figura 14: Ajuste función de Floyd

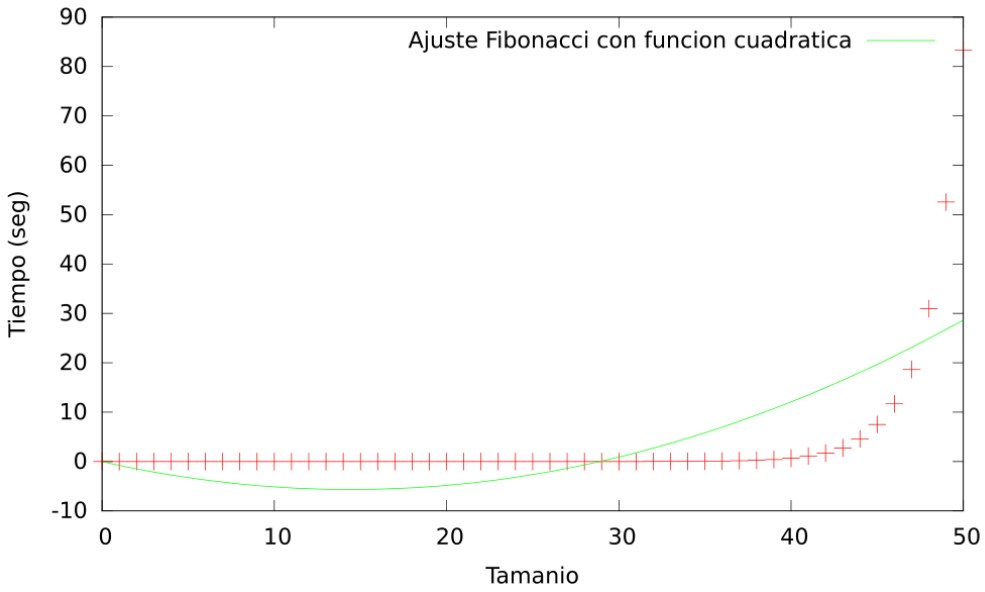

Figura 15: Ajuste Fibonacci con función cuadrática

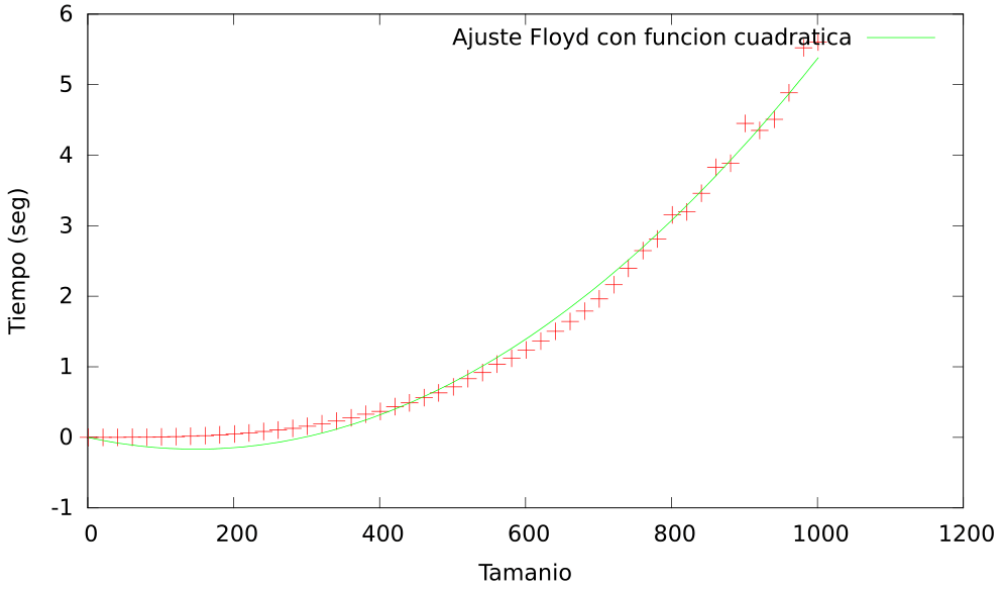

Figura 16: Ajuste Floyd con función cuadrática

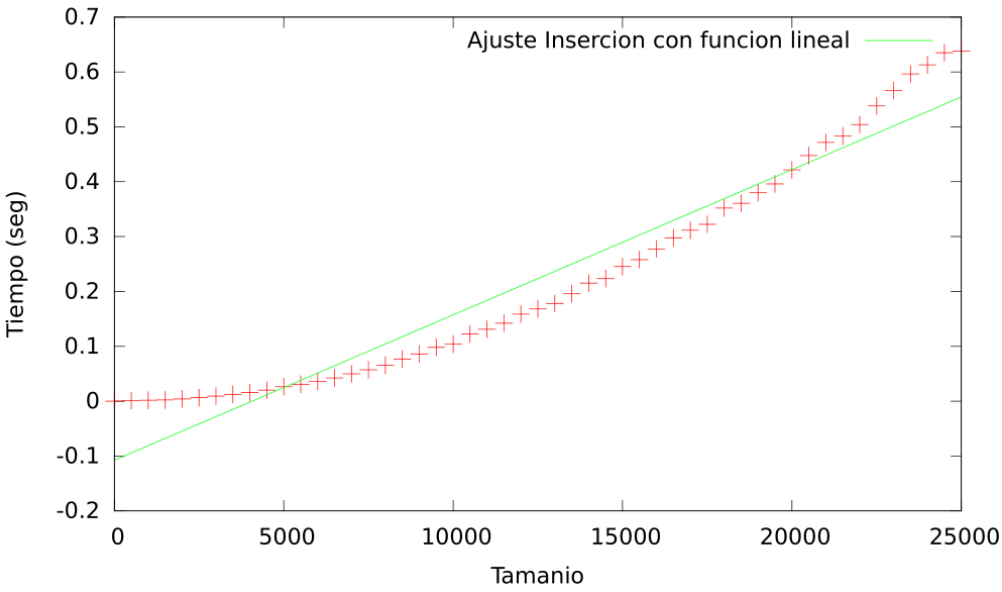

Figura 17: Ajuste Inserción con función lineal

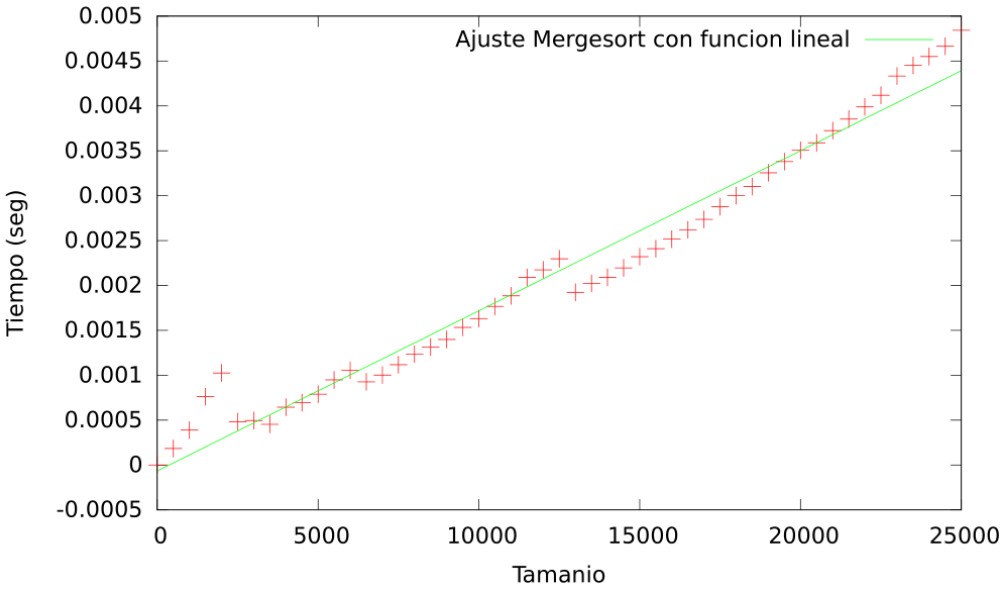

Figura 18: Ajuste Mergesort con función lineal

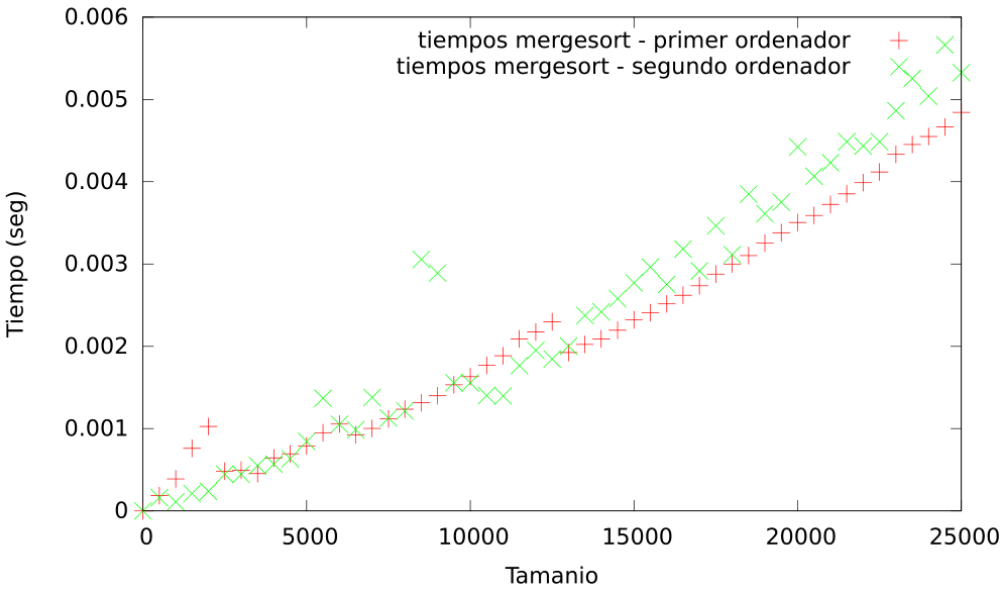

Figura 19: Comparación Mergesort entre distintos computadores

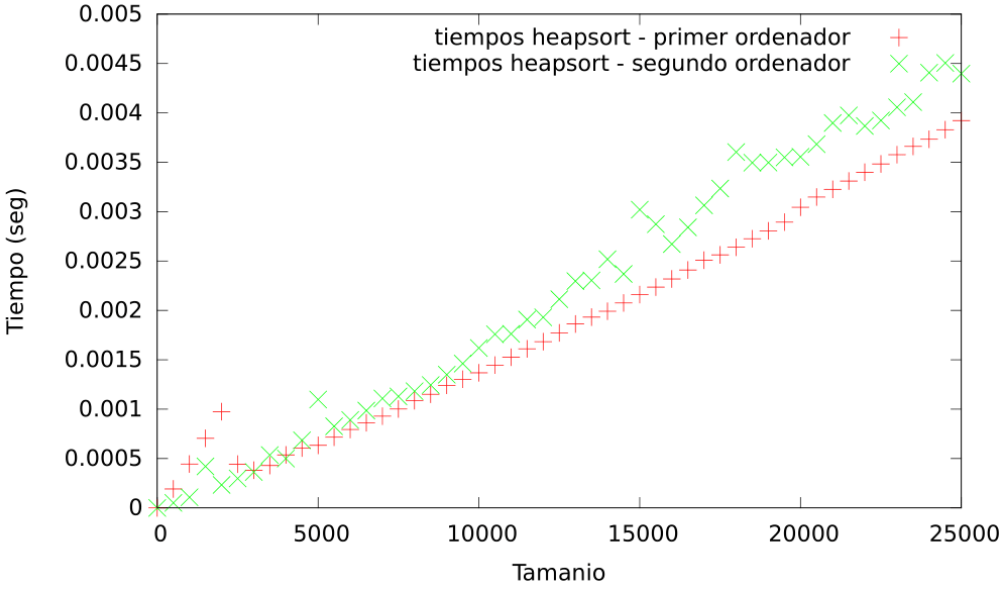

Figura 20: Comparación Heapsort entre distintos computadores

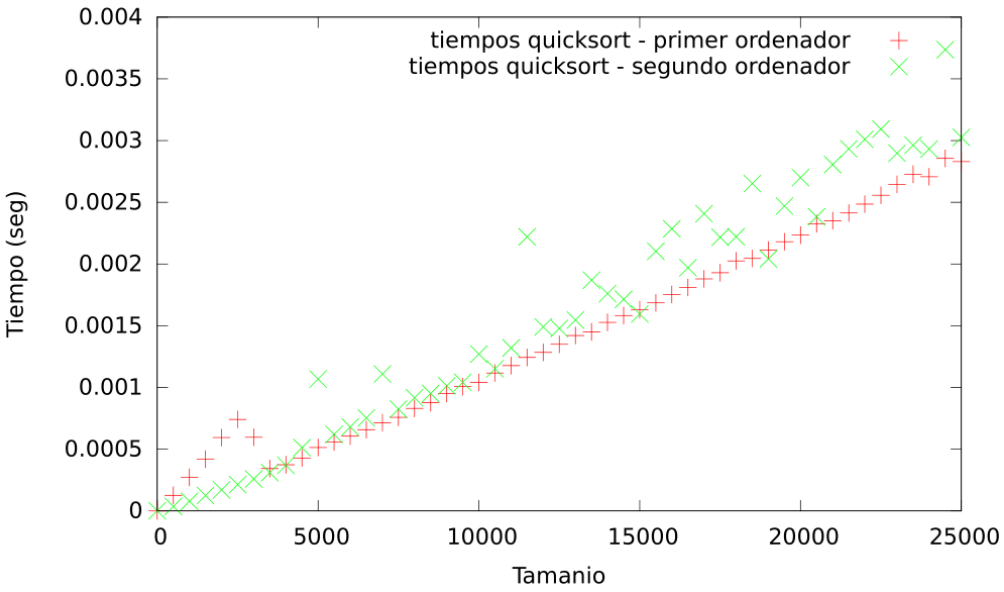

Figura 21: Comparación Quicksort entre distintos computadores

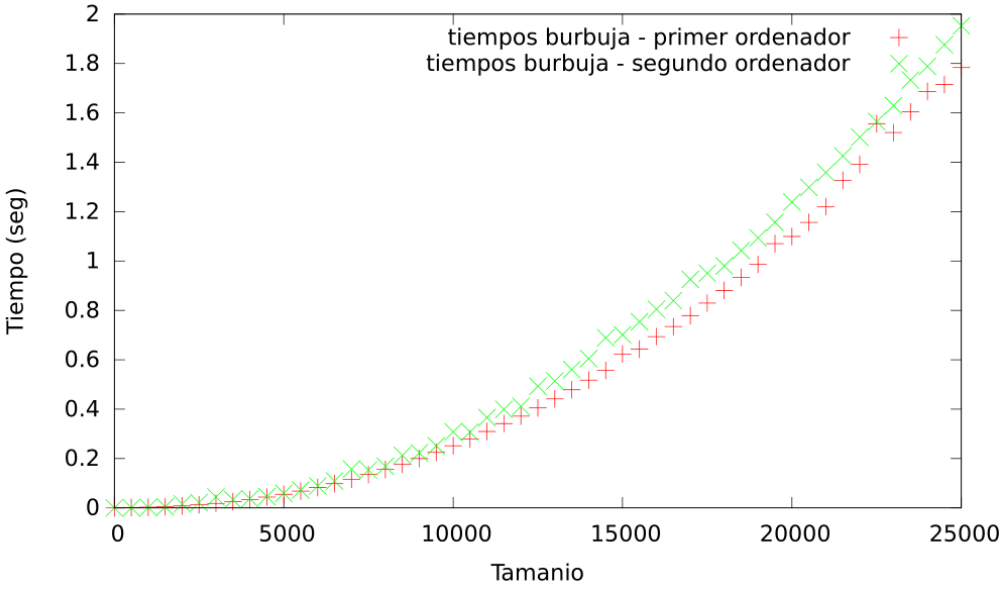

Figura 22: Comparación Burbuja entre distintos computadores

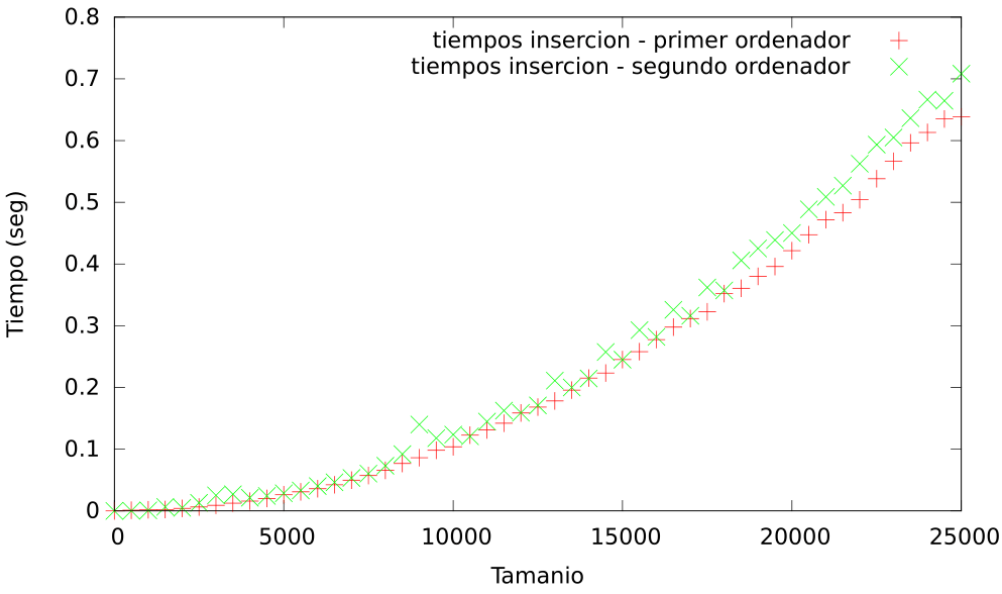

Figura 23: Comparación Inserción entre distintos computadores

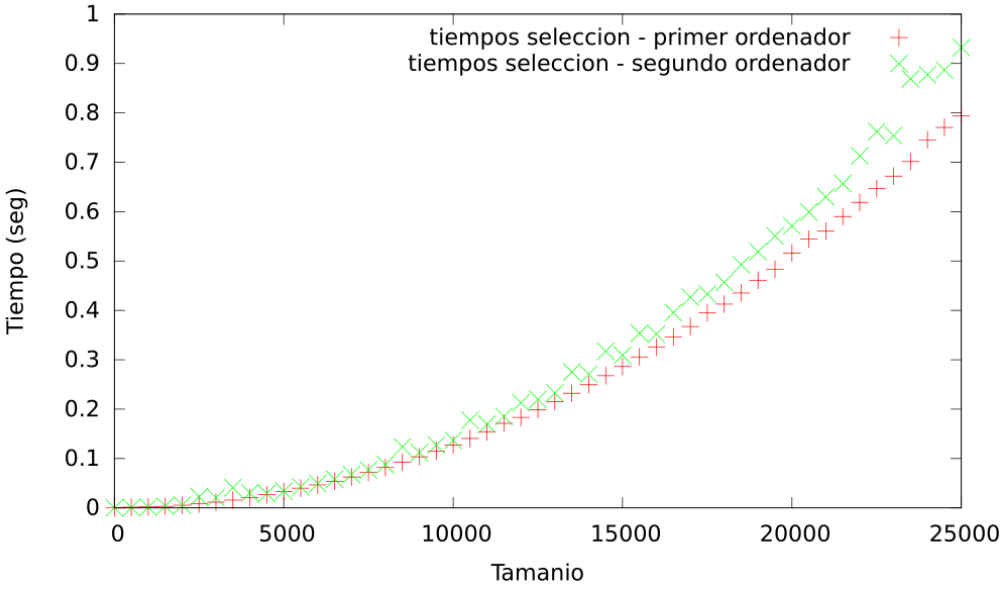

Figura 24: Comparación Selección entre distintos computadores

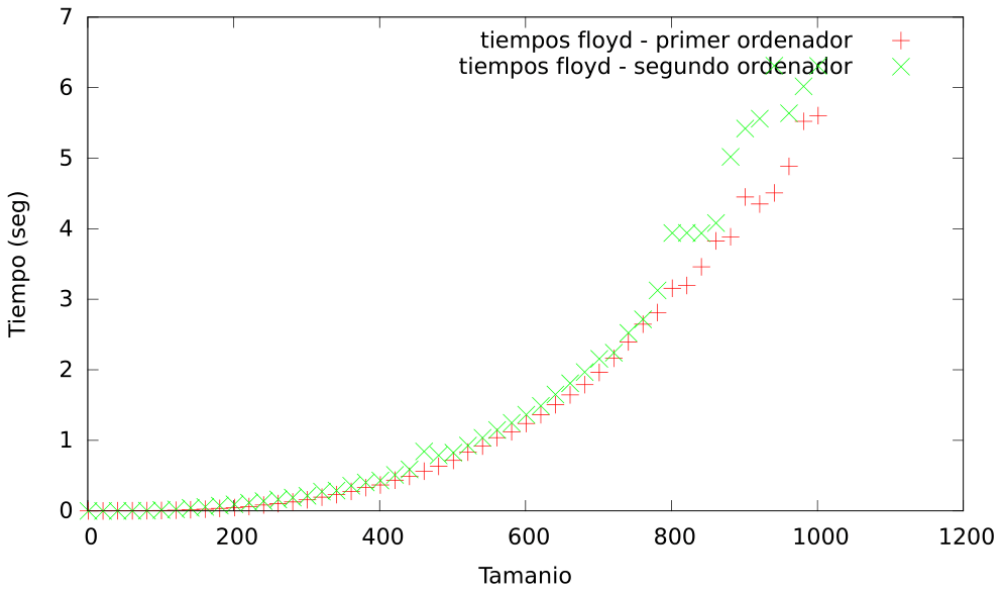

Figura 25: Comparación Floyd entre distintos computadores

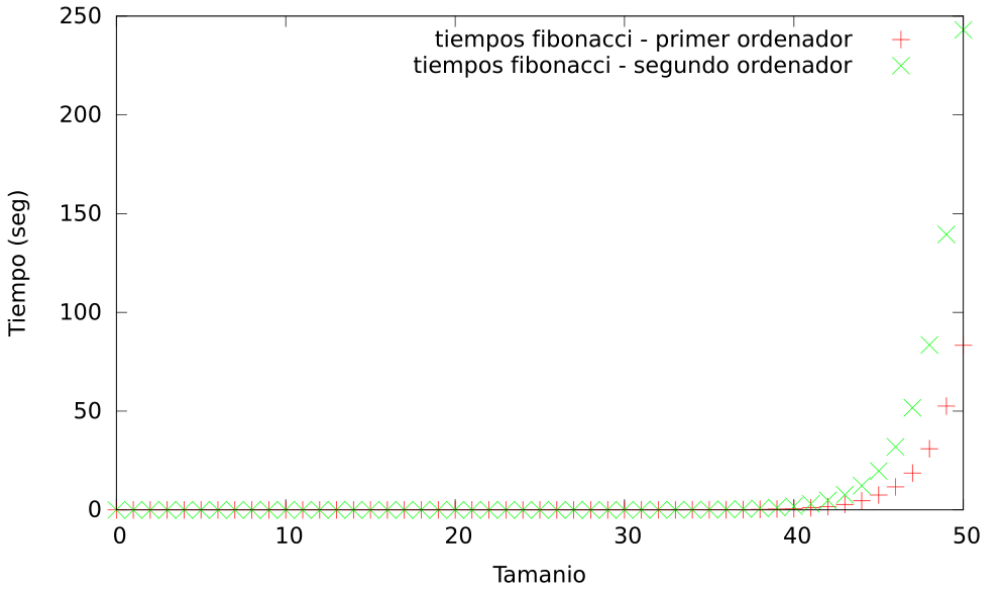

Figura 26: Comparación Fibonacci entre distintos computadores