

Program Helm - a Fortran Benchmark Program.

Helm is a program written in Fortran. It solves a Helmholtz partial differential equation on a finite-difference grid by the method of successive over-relaxation, using red-black ordering (sometimes called Sheldon's version).

The bulk of the computation is concentrated in a single do loop, which contains

- 6 floating point additions or subtractions
- 2 floating point multiplications
- 8 references to two-dimensional real arrays
- 2 real assignment statements
- 1 three-branch arithmetic IF statement, testing an integer variable
- 1 logical IF containing 2 floating point comparisons, and an assignment of an integer constant to an integer variable.

Date	Site	Machine	Operating system	Compiler and options	Compile time/s	Solution time/s	Total time/s	Cost
1973	Melb.Uni.	CDC Cyber 73	Scope 3.3	308-05 FTN V3.0-P336 OPT=2	2.429	21.539	24.538	\$ 1.01
1973	Monash.	B 6700	MCP	FORTTRAN 2.4.031 LONG OPT=1	4.222	54.95	59.967	\$ 1.67
				OWNARRAYS VECTORMODE				
1973	Monash.	CDC 3200	UNIMSOS/RTM 2.1	FORTTRAN (3.0)/MSOS	21.	80.756	105.	\$ 1.17
1977	CSIRO DCR	CDC Cyber 76	Scope 2.1.3-205	MNF 4.3 E=0,L,R=3	0.077	1.701	1.898	\$ 1.23
1977	CSIRO DCR	CDC Cyber 76	Scope 2.1.3-205	FTN 4.4+R401 EL=A,OPT=2,R=3,SL	0.313	1.126	1.545	\$ 1.23
1977	CSIRO DCR	CDC Cyber 76	Scope 2.1.3-205	FTN 4.4+R401 EL=A,OPT=2, R=3,SL,UO	0.314	1.127	1.547	\$ 1.05
1977	CSIRO DCR	CDC Cyber 76	Scope 2.1.3-205	FTN 4.6+420,EL=A,OPT=2,R=3,SL	0.310	1.131	1.562	\$ 1.10
1977	CSIRO DCR	CDC Cyber 76	Scope 2.1.3-205	FTN 4.6+420,EL=A,OPT=2, R=3,SL,UO	0.310	1.130	1.562	\$ 1.10
1977	CSIRO DCR	CDC Cyber 76	Scope 2.1.3-205	MNF 5.0 E=0,L,R=3	0.079	1.703	1.906	\$ 1.24
1978	CSIRO DCR	CDC Cyber 76	Scope 2.1.5-258	MNF 5.2 L	0.075	1.703	1.975	\$ 1.51
1978	CSIRO DCR	CDC Cyber 76	Scope 2.1.5-258	FTN 4.6+460 OPT=2,R=0,SL	0.297	1.132	1.554	\$ 1.27
1978	CSIRO DCR	CDC Cyber 76	Scope 2.1.5-258	FTN 4.6+460 OPT=2,R=0,SL,UO	0.296	1.131	1.552	\$ 1.27
1980	Prime	400		Fortran	-----	-----	41.	\$ ----
1980	Perkin Elmer	32		Fortran	-----	-----	21.	\$ ----
1980	HP	2100 F Series		Fortran	-----	-----	150.	\$ ----
1980	CSIRO DAP	HP 21MX	RTE IV	FTN4 HP92060-16092 REV. 1913	-----	-----	560.15	\$ ----
1980	CSIRO DCR	CDC Cyber 76	Scope 2.1.5-285	FTN 4.7+470 OPT=2,R=0,SL	0.298	1.131	1.566	\$ 1.54
1980	CSIRO DCR	CDC Cyber 76	Scope 2.1.5-285	FTN 4.7+470 OPT=2,R=0,SL,UO	0.298	1.132	1.566	\$ 1.54
1980	CSIRO DCR	CDC Cyber 76	Scope 2.1.5-285	FTN 5.0+508 ET=W,LO=S/-A,OPT=2	0.282	1.144	1.654	\$ 1.65
1980	CSIRO DCR	CDC Cyber 76	Scope 2.1.5-285	FTN 5.0+508 ET=W,LO=S/-A, OPT=2,DO=OT	0.274	1.129	1.632	\$ 1.62
1980	CSIRO DCR	CDC Cyber 76	Scope 2.1.5-285	FTN 5.0+508 ET=W,LO=S/-A, OPT=3,DO=OT	0.270	1.130	1.624	\$ 1.62
1980	CSIRO DCR	CDC Cyber 730	NOS/BE-1.4	508 FTN 4.8+508 OPT=2,R=0,SL	1.256	11.031	13.219	\$ 1.52
1980	CSIRO DCR	CDC Cyber 730	NOS/BE-1.4	508 FTN 5.0+508 ET=W,LO=S/-A,OPT=2	1.403	11.237	13.537	\$ 1.57

1980	CSIRO DCR CDC Cyber 730	NOS/BE-1.4 508	FTN 5.0+508 ET=W,LO=S/-A, OPT=2,DO=OT	1.326	11.184	13.406	\$ 1.55
1980	CSIRO DCR Facom M190	OSIV/F4 E30C V10L02	FORTTRAN IV (HE) V04L07 OPTIMIZE(2),SOURCE	0.48	1.749	2.580	\$ 1.26
1980	CSIRO DCR Facom M150F	OSIV/F4 E30C V10L02	FORTTRAN IV (HE) V04L14 OPTIMIZE(2),SOURCE	4.48	38.895	45.860	\$ 2.06
1982	CSIRO DCR Facom M180N	OSIV/F4 E30C V10L02	FORTTRAN IV (HE) V04L14 OPTIMIZE(2),SOURCE	1.12	3.961	5.960	\$ 1.54
1982	CSIRO DCR CDC Cyber 835	NOS/BE-1.5 538	FTN 4.8+538 OPT=2,R=0,SL	0.875	6.237	7.681	\$ 1.21
1982	CSIRO DCR CDC Cyber 835	NOS/BE-1.5 538	FTN 5.1+538 ET=W,LO=S/-A, OPT=2,DO=OT	0.898	7.216	8.785	\$ 1.38

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1983	U.K.MetO	CDC Cyber 205	VSOS Version 2.0	Fortran 2.0 BCO 64 bit	0.381	0.588	1.760	
1983	U.K.MetO	CDC Cyber 205	VSOS Version 2.0	Fortran 2.0 BCOV 64 bit	0.369	0.588	1.745	
1983	U.K.MetO	CDC Cyber 205	VSOS Version 2.0	Fortran 2.0 BCO 32 bit	0.389	0.688	1.881	
1983	U.K.MetO	CDC Cyber 205	VSOS Version 2.0	Fortran 2.0 BCOV 64 bit Vectorized version 1.	0.361	0.277	1.434	
1983	U.K.MetO	CDC Cyber 205	VSOS Version 2.0	Fortran 2.0 BCOV 64 bit Vectorized version 2. (150 iterations). All of res tested.	0.349	0.313	1.457	
1983	U.K.MetO	CDC Cyber 205	VSOS Version 2.0	Fortran 2.0 BCOV 64 bit Vectorized version 3. No convergence test - 110 iterations.	0.328	0.178	1.297	
1983	U.K.MetO	CDC Cyber 205	VSOS Version 2.0	Fortran 2.0 BCOV 32 bit Vectorized version 1. Compiler failure.				
1983	U.K.MetO	CDC Cyber 205	VSOS Version 2.0	Fortran 2.0 BCOV 32 bit Vectorized version 1. Separate work subroutine.	0.500	0.201	1.500	
1983	U.K.MetO	IBM 3081 dual	MVS	VS Fortran Level 1.2.0	0.55	1.526	2.49	
1983	U.K.MetO	IBM 370/158	MVS	VS Fortran Level 1.2.0	3.40	13.638	19.47	
1984	ECMWF	CRAY 1	COS 1.12	CFT 1.11	0.072	0.656	0.812	
1984	ECMWF	CRAY X-MP	COS X.13	CFT 1.11	0.057	0.559	0.685	
1984	CSIRO DCR	Facom M180II-AD	OSIV/F4 E40 V12L02	FORTTRAN 77 V01L26 OPTIMIZE(2),SOURCE	0.73	3.900	5.22	\$ 1.82
1984	CSIRO DCR	CDC Cyber 835	NOS 2.2-596/587	FTN 5.1+587 OPT=2	1.081	7.814	9.604	\$ 2.60
1984	CSIRO DCR	CDC Cyber 845	NOS 2.2-596/587	FTN 5.1+587 OPT=2	0.696	3.122	4.224	\$ 1.23
1984	CSIRO DCR	CDC Cyber 205	VSOS VSYS6075	FORTTRAN 2.1.5 cycle 6075 O=BCO	0.382	0.588	2.009	\$ 1.84
1984	CSIRO DCR	CDC Cyber 205	VSOS VSYS6075	FORTTRAN 200 cycle 6075 ANSI,LO,OPT,UNSAFE	0.480	0.592	2.177	\$ 1.94
1988	Csironet	CDC Cyber 840	NOS 2.5-670/670	FTN 5.1+670 OPT=2	0.943	4.206	6.113	
1988	Csironet	CDC Cyber 845	NOS 2.5-670/670	FTN 5.1+670 OPT=2	0.664	3.007	4.047	
1988	CSIRO	CDC Cyber 205	VSOS VS6705	FORTTRAN 200 cycle 6705 ANSI,LO,OPT,UNSAFE	0.591	0.590	2.559	
1988	CSIRO	CDC Cyber 205	VSOS VS6705	FORTTRAN 200 cycle 690P ANSI,LO,OPT,UNSAFE	0.508	0.407	2.406	

1988	CSIRO	CDC Cyber 205	VSOS VS6705	FORTRAN 200 cycle 690P	0.574	0.406	2.503	
				ANSI,LO,OPT,UNSAFE 32 bit				
1988	CSIRO	CDC Cyber 205	VSOS VS6705	FORTRAN 200 cycle 690P	0.483	0.312	2.344	
				ANSI,LO,OPT,UNSAFE Vectorized version.				
1988	CSIRO DAR	HP A900	RTE-A	FTN 77/LTCYJ single		41.140		
1988	CSIRO DAR	HP F series	RTE-6VM F6S012	FTN 77/LTCXJ single		132.410		
1988	CSIRO DAR	DUAL	UNIX	Silicon Valley Graphics		<37		
1988	CSIRO DAR	MicroVAX II	VMS	single	5.03	41.531		
1988	CSIRO DAR	MicroVAX II	VMS	double	5.26	45.180		
1988	CSIRO DAR	Olivetti M24SP 8087	DOS 2.11	Lahey 2.22 single	15	77.1		
1988	CSIRO DAR	Olivetti M24SP 8087	DOS 2.11	Lahey 2.22 double	15	84.7		
1988	CSIRO DAR	Olivetti M380/C	DOS	Lahey 2.22 single		22.078		
1988	CSIRO DAR	Olivetti M380/C	DOS	Lahey 2.22 double		26.140		
1988	CSIRO DAR	AST Premium 286 80287	DOS	Lahey 2.22 single		106.83		
1988	CSIRO DAR	AST Premium 286 80287	DOS	Lahey 2.22 double		124.02		
1988	CSIRO DAR	IBM PS/2 80	DOS	Lahey 2.22 single		23.898		
1988	CSIRO DAR	IBM PS/2 80	DOS	Lahey 2.22 double		28.510		
1988	SUN	SUN 3/260	UNIX	OPT level 3		<84		
1988	SUN	SUN 4/260	UNIX	OPT level 3		5		
1988	SUN	SUN 4/110	UNIX	OPT level 3		7		
1988	CSIRO DAR	Olivetti M280	DOS	Lahey 2.22 single		95.633		
1988	CSIRO DAR	Olivetti M280	DOS	Lahey 2.22 double		110.130		
1988	CSIRO DAR	IBM PS/2 80 20Mhz	OS/2	Lahey 2.22 single		18.561		
1988	CSIRO DAR	IBM PS/2 80 20Mhz	OS/2	Lahey 2.22 double		23.850		
1988	CSIRO DAR	IBM PS/2 80 20Mhz	DOS underOS/2	Lahey 2.22 single		19.410		
1988	CSIRO DAR	IBM PS/2 80 20Mhz	DOS underOS/2	Lahey 2.22 double		22.910		
1988	CSIRO DAR	Apple Mac II		Fortran single		83		
1988	CSIRO DAR	Apple Mac II		Fortran single		86		
1988	Csironet	Fujitsu M380	OSIV/F4 E20 V10L20	FORTRAN 77 V10L10	0.459	0.85	\$ 1.33	

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1988	HP	HP 9000/825	HP-UX	fc -O single		6.40		
1988	HP	HP 9000/825	HP-UX	fc -O double		8.08		
1988	CSIRO MPE	SUN 4/280	SunOS	f77 -O single		3.61		
1988	CSIRO MPE	SUN 4/280	SunOS	f77 -O double		4.98		
1988	CSIRO DAR	SUN 4/110	SunOS 4.0	f77 -O single		4.30		
1988	CSIRO DAR	SUN 4/110	SunOS 4.0	f77 -O double		5.88		
1988		Apollo DN10020		single		1.151		
1988		Apollo DN10020		double		1.488		
1988		HP 9000/835s		fc -O single		1.54		
1988		HP 9000/835s		fc -O double		2.08		
1988		MIPS 2000-8		single		0.60		
1988		MIPS 2000-8		double		1.00		
1988		HP 9000/835s		fc -O single		1.54		

1988	SUN 4/280	SunOS	f77 -O single	3.03			
1988	SUN 4/280	SunOS	f77 -O double	4.32			
1988	Sequent S27		single	14.77			
1988	Sequent S27		double	17.68			
1988	Convex C120		single	0.496			
1988	Convex C120		double	1.094			
1988	Edge 1100		single	4.467			
1988	Edge 1100		double	7.650			
1988	Silicon Graphics 4server-8		single	1.15			
1988	Silicon Graphics 4server-8		double	2.44			
1988	Silicon Graphics 4D/20		single	2.13			
1988	Silicon Graphics 4D/20		double	3.46			
1988	ELXSI	EMBOS	single	2.749			
1988	ELXSI	EMBOS	double	3.733			
1989	Mendota H CRAY X-MP	UNICOS	double	0.070			
1989	Chippewa CRAY Y-MP	UNICOS	double	0.047			
1989	Richards. Convex C230	UNIX	single	0.34			
1989	Richards. Convex C230	UNIX	double	0.35			
1989	Purdue In ETA 10P*	System V	double	0.317			
1989	ANU Fujitsu VP100	OSIV	double	0.116			
1989	Ardent P2/4	UNIX	double	1.0			
2013	CSIRO ASC SGI UV1000	SUSE Linux 11	ifort version 12.1.2 -i8 -r8 -O3	1.61	0.002058	1.64	\$.000044

(Best times)

\*EOP<Tabs> 0"11"21"41"61"91"101"111"121" <Tabs> 0"11"21"41"61"91"101"111"121"