

# STAR TREK BY HAL BROWN

(see program on page 21.)

As capabilities of personal programmable calculators approach those of small computers, it was inevitable that the most popular computer game would be programmed for the PPC. This is my attempt at programming Star Trek for the HP-67. It is adapted from a simplified BASIC version (Gerald H. Herd, A BASIC Star Trek Trainer, BYTE, Sept '76, p.40).

Except for omission of two rather frivolous commands ("self destruct" and "surrender"), this program has all the features of the BASIC version.

The Star Trek game simulates a space encounter between the starship Enterprise, commanded by Captain Kirk (the player), and a Klingon battleship, commanded by its captain (a routine in the program). Each ship has weapons consisting of two forward phasors, always fired together; one rear phasor and photon torpedos. Their relative damage capabilities are:

Rear Phasor..... 1  
Two forward Phasors..... 2  
Photon Torpedo..... 4

Each ship also has deflector shields that prevent serious damage from initial hits, but ultimately break down. Damage then accumulates with losses, sequentially, of: Forward Phasors, Rear Phasor, Photon Torpedos, Warp Drive and, if it gets that far, the entire ship.

The spaceship commanders take action alternately (Capt. Kirk is first), issuing one of five possible commands: "Fire Forward Phasors", "Fire Rear Phasor", "Fire Photon Torpedo", "Maneuver to attack", and "Maneuver to disengage". In the case of a weapon firing a hit is signaled if it occurs. The result of maneuver commands, as well as changes resulting from enemy evasion tactics, are displayed in next status report.

The Klingon battleship is more maneuverable than the Enterprise. It can turn and fire a weapon in one action (move). Captain Kirk must use a separate action (maneuver) to turn, if required. Counteracting this advantage for the Klingon ship is potentially better command selection by Captain Kirk.

Weapon and drive capabilities/limitations are:

Forward Phasors - limited to forward quadrant (enemy bearing 0-90°), but within that quadrant only range dependent; i.e., probability of a hit decreases with increasing range. Maximum range is five million kilometers.

B) Rear Phasor - same as above, except limited to rear quadrant (90-150°).

C) Photon Torpedo - limited to forward quadrant and dependent on bearing within that quadrant; i.e., probability of a hit decreases with increasing bearing angle. Probability is independent of range beyond the minimum one million kilometers.

D) Warp Drive - produces much larger range change during maneuvers than when only impulse drive remains.

The engagement ends with destruction of one spaceship or loss of contact due to excess range (a draw).

## OTHER VERSIONS OF STAR TREK

With minor modification Star Trek can be made a two-player game or, for pacifists, a zero-player game. In the two-player version commands for both ships are input at the keyboard. Capabilities of the two ships are identical and like those of the Enterprise in the original version.

With the zero-player version, once started the entire encounter proceeds to termination without further keyboard input. Commands for both ships are selected internally. Capabilities of the ships are equal and like those of the Klingon battleship in the original version.

### Modifications:

For two-player version -

a) Insert "RTN" after step 039.

For zero-player version -

b) Delete "RTN" at step 037 and replace with "GTO 2".

b) Insert "LBL 2" after step 039.

### PROGRAM COMMENTS -

The Klingon Captain's commands are selected by a routine in the program. They are basically sound - a weapon is never fired when conditions are such that a hit is impossible. However, the choices are aggressive and sometimes the ship attacks when retreat (maneuver to disengage) would be prudent.

There is no limit on Captain Kirk's command selection. A foolish command to fire a weapon when the enemy is out of its range will simply result in a miss.

Following a weapon-firing command, probability of a hit is computed based on the geometric situation at the time. This is compared with a random-number value to determine if a hit resulted. Following a hit a damage-assessment routine increments an accumulator register by an amount dependent on the relative strength of the weapon and on the status of hit ship's shields.

Maneuver commands result in change of both range and bearing. Both are in the generally desired direction but have a random element added. Maneuver to attack will decrease range and, generally, turn the commanded ship for best attack next move. Maneuver to disengage will increase range and, generally turn the commanded ship for best attack next move. Range is, of course, common to both ships, but as would be the case in a real situation the two bearings are independent.

The magnitude of range change during a maneuver is to a great extent dependent on the status of warp drive. With only impulse drive available changes are much smaller.

### OPERATION -

Key in seed (random No.<1, e.g. .6201735924)

Key "a" (f,A) to start

Program generates initial conditions then automatically displays, in order:

1. Next - turn ship code
2. Damage code
3. Bearing of enemy (in deg.) relative to heading
4. Range of enemy (in km.)

If it is player's turn, program stops for command (info above can be reviewed if desired by rolling stack. Stack need not be returned to pre-review status before keying command). Command is given by keying one of letter keys. If it is not player's turn, run continues after display sequence.

### DISPLAYS, IN ORDER SEEN

DISPLAY	CODE OR VALUE	INTERPRETATION
1) Ship designation	1	Starship Enterprise
	2	Klingon Battleship
2) Damage report	0	"Shields holding, no damage"
	1	"Shields weakening, no damage"
	2	"Forward shields out, forward phasors inop."
	3	"Rear shields holding, forward phasors inop."
	4	"Rear shields crumbling, forward phasors inop."
	5	"All shields out, all phasors inop."
	6	"Minor damage to control center, all phasors inop."
	7	"Heavy damage forward, photon torpedo inop."
	8	"Dilithium crystals overheating, warp drive inoperative"
3) Bearing	(deg)	Bearing of enemy relative to heading
4) Range	(km.)	Range of enemy
(At this point run either stops for Enterprise command selection - manual keying of A, B, C, D, or E - or internally selects Klingon command.)		
5) Command confirmation	1	"Firing forward phasors"
	2	"Firing rear phasor"
	3	"Firing photon torpedo"
	4	"Maneuvering to attack"
	5	"Maneuvering to disengage"
6) Result of action (if applicable)	10.	"Hit". No indication here of other results
7) Termination (if applicable)	-1	"Enterprise destroyed"
	-2	"Klingon ship destroyed"
	10°	"Lost contact at 10° KM. range"

Next display is command code (confirming player's command or giving enemy Captain's command).

If command was a weapon firing, and if there is a hit, the hit code (10.) is displayed. No display for a miss.

Above sequence is repeated, alternating turns until engagement (game) terminates with either a ship-destroyed code or the range ( $10^6$  km) at which contact was lost.

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS
1	Enter seed - 10 digit random no. between 0 and 1	.....1	
2	Start game		f a
3	When run halts for command, select and press appropriate letter key.		
4	Repeat (3) until game ends (see more detailed instructions)		

For 2-player version:

- a Insert "RTN" between steps 039 and 040.
- b Go to step (1) above

For 0-player version:

- a Delete "RTN" at step 037 and replace it with "GTO 2".
- b Insert "LBL 2" between steps 039 and 040.
- c Go to step (1) above, program will run without stop until battle terminates.

R/S

1	LBL 4	32 25 11
	CL REG	31 43
	STO A	33 11
	2	02
5	3	03
	ST J	35 33
	GSB 5	31 22 05
	GSB 4	31 22 04
	STO 0	33 00
10	RCL A	34 11
	P S	31 42
	F ? 3	35 71 03
	GTO A	22 31 11
	GSB 5	31 22 05
15	EEX	43
	6	06
	STO C	33 13
	5	05
	X	71
20	STO B	33 12
	X	71
	STO D	33 14
	CF 0	35 61 00
	LBL 8	31 25 08
25	CF 1	35 61 01
	1	01
	F2 0	35 71 00
	2	02
	RCL 3	34 03
30	RCL 0	34 00
	COS-1	32 63
	RCL D	34 14
	STK	32 84
	F2 0	35 71 00
35	GTO J	22 01
	SF 0	35 51 00
	RTN	35 22
	LBL 1	31 25 01
	CF 0	35 61 00
40	RCL C	34 13
	RCL D	34 14
	X GT Y	32 81
	GTO J	22 01
	4	04
45	RCL 3	34 03
	X GT Y	32 81
	GTO E	22 15
	1	01
49	X LE Y	32 71
50	X EQ Y	32 51
	CHS	42
	CHS	42
	RCL 0	34 00
	+	61
55	FRAC	32 83
	STO 0	33 00
	X LT 0	31 71
	GTO B	22 12
	GTO A	22 11
60	LBL 1	31 25 01
	6	06
	RCL 3	34 03
	X GT 0	31 81
	GTO E	22 15
65	RCL 0	34 00
	X LT 0	31 71
	GTO D	22 14
	.	83
	6	06
70	X GT Y	32 81
	STO 0	33 00
	GTO C	22 13
	LBL A	31 25 11
	SF 1	35 51 01
75	LBL B	31 25 12
	2	02
	F ? 1	35 71 01
	1	01
	PAUSE	35 72
80	X*	32 54
	RCL 3	34 03
	X GT Y	32 81
	GTO 7	22 07
	RCL 0	34 00
85	F ? 1	35 71 01
	CHS	42
	X GT 0	31 81
	GTO 7	22 07
	RCL B	34 12
90	RCL D	34 14
	/	81
	X%	31 54
	LOG	31 53
	GSB 5	31 22 05
95	X GT Y	32 81
	GTO 7	22 07
	1	01
	0	00
	PAUSE	35 72
100	1	01

1	F?	35 71 01
	2	02
	GTO 6	22 06
	LBL C	31 25 13
5	3	03
	PAUSE	35 72
	6	06
	RCL 3	34 03
	X GT Y	32 81
10	GTO 7	22 07
	RCL C	34 13
	RCL D	34 14
	X LE Y	32 71
	GTO 7	22 07
15	RCL 0	34 00
	X LT 0	31 71
	GTO 7	22 07
	X <sup>2</sup>	32 54
	GSB 5	31 22 05
20	X GT Y	32 81
	GTO 7	22 07
	1	01
	0	00
	PAUSE	35 72
25	4	04
	LBL 6	31 25 06
	P EX S	31 42
	STO 4	33 04
	RCL 1	34 01
30	x	71
	2	02
	X GT Y	32 81
	R dn	35 53
	STO + 2	33 61 02
35	RCL 4	34 04
	9	09
	/	81
	STO + 1	34 61 01
	8	08
40	RCL 2	34 02
	INT	31 83
	STO 3	33 03
	X LE Y	32 71
	GTO 3	22 03
45	1	01
	F? 0	35 71 00
	2	02
	CHS	42
49	RTN	35 22
50	LBL 7	31 25 07
	P EX S	31 42
	LBL 3	31 25 03
	GSB 5	31 22 05
	-	83
55	6	06
	+	61
	STO x (i)	33 71 24
	RCL D	34 14
	EEX	43
60	8	08
	X LE Y	32 71
	RTN	35 22
	GSB 5	31 22 05
	GSB 4	31 22 04
65	3	03
	0	00
	x	71
	RCL 0	34 00
	COS-1	32 63
70	+	61
	COS	31 63
	STO 0	33 00
	GTO 8	22 08
	LBL D	31 25 14
75	ST 1	35 51 01
	LBL E	31 25 15
	RCL 3	34 03
	8	08
	X GT Y	32 81
80	1	01
	.	83
	3	03
	ex	32 52
	F? 1	35 71 01
85	GTO 1	22 01
	STO x (i)	33 71 24
	5	05
	GTO 2	22 02
	LBL 1	31 25 01
90	STO / (i)	33 81 24
	4	04
	LBL 2	31 25 02
	PAUSE	35 72
	4	04
95	RCL 3	34 03
	X GT Y	32 81
	GTO 1	22 01
	2	02
	X GT Y	32 81
100	GTO 1	22 01

STEP	INSTRUCTIONS	INPUT DATA/UNITS	KEYS	OUTPUT DATA/UNITS
1	ENTER SEED - 10-DIGIT RANDOM NUMBER BETWEEN 0 & 1	.nnnnnnnn...		
2	START GAME		f A	
3	WHEN RUN HALTS FOR COMMAND, SELECT AND PRESS APPROPRIATE LETTER KEY.			
4	REPEAT (3) UNTIL GAME ENDS (SEE MORE DETAILED INSTRUCTIONS)			
FOR	TWO-PLAYER VERSION:			
a	INSERT "RTN" BETWEEN STEPS 039 & 040			
b	GO TO STEP (1) ABOVE			
FOR	0-PLAYER VERSION:			
a	DELETE "RTN" AT STEP 037 & REPLACE IT WITH "GTO 2"			
b	INSERT "LBL 2" BETWEEN STEPS 039 & 040.			
c	GO TO STEP (1) ABOVE, PROGRAM WILL RUN WITHOUT STOP UNTIL BATTLE TERMINATES.			

[illegible]

201	RCL C	34 14
	RCL C	34 13
	X GT Y	32 81
	CHS	42
205	LBL 1	31 25 01
	ENTER	41
	ABS	35 64
	/	81
	STO 0	33 00
210	GTO 7	22 07
	LBL 4	31 25 04
	2	02
	x	71
	1	01
215	-	51
	RTN	35 22
	LBL 5	31 25 05
	RCL A	34 11
	RC I	35 34
220	x	71
	FRAC	32 83
	STO A	33 11
	RTN	35 22
224		

0 USED	1 USED	2	3 USED
OFF	OFF	OFF	OFF

Star Trek, NOP.

Step 63, should be  $X > Y$ , code 32 81. Those who tried the program as published found the Klingon ship running away as soon as any damage was suffered. Actually it is very aggressive, sometimes staying to fight when retreat would be the best course. Also, it was not clear in the writeup that Enterprise commands are given only when the program completely stops (not during a pause), and they are issued simply by pushing a letter key:

- A for "Fire Forward Phasors"
- B for "Fire Rear Phasors"
- C for "Fire Photon Torpedo"
- D for "Maneuver to Attack"
- E for "Maneuver to Disengage"