Over-Reaction

by HCM Staff

A nuclear reactor is raging out of control; the world is on the brink of war—earthquakes, riots, and sabotage are the order of the day—and you are the one at the controls . . .

Over-Reaction is a game that simulates the operation of an electric-power-generating nuclear reactor. It's the player's job to keep the reactor operating smoothly, producing a steady supply of electricity at a frequency of 60 cycles per second (Hz). If the frequency deviates by more than 2 Hz (below 58 or above 62), the reactor automatically "trips" (shuts down), ending the game.

The reactor's power output is controlled by 24 fuel rods set up in a 4-row by 6-column grid; each rod is designated by a letter (except in the Apple version, which uses numbers). The grid is divided into four quadrants—each has a temperature gauge which monitors the average temperature of the quadrant. By pressing the proper key, you will push in a rod—this tends to raise the temperature around the rod. By pressing the same key with the shift key depressed, you will pull out the rod, lowering the temperature. The overall temperature of the entire grid controls the reactor's steam pressure, which drives a turbine to produce electricity.

Built-In Variations

As the steam pressure fluctuates, so does the frequency of the electricity you are producing. It is therefore your job to keep a constant steam-pressure level. If the temperature in one quadrant drops too low or increases too high, you will hear a warning buzz. If it goes outside of a safe range, it will cause an automatic shut-down or trip—costing you points and ending the game until the reactor can be repaired.

You must also deal with the effects caused by changes in load demand. If the load demand increases, it tends to pull down the system, and drop the frequency. If the frequency begins to rise unexpectedly, it probably means that the load demand has dropped, and you will need to decrease the overall temperature of the reactor to compensate. You will find that as in real life, the system won't react to your control immediately—it takes time for your actions to take effect.

Photo 1. *This screen from the Apple version shows the normal operating conditions of the reactor. Note the use of numbers rather than letters to indicate the control-rod drives.*

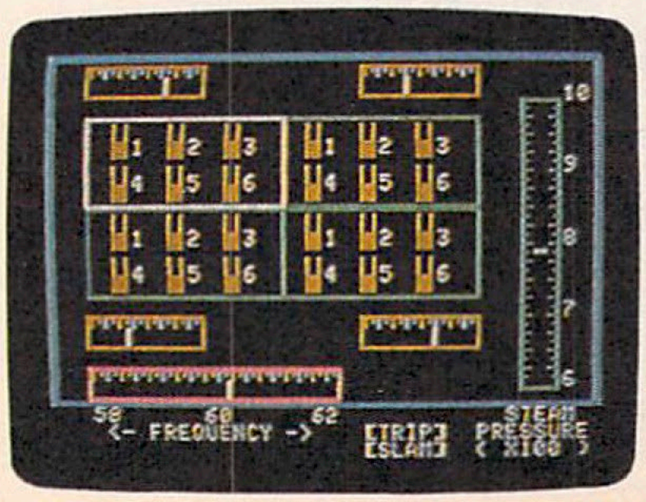


Photo 2. *This screen from the C-64 version shows a broken temperature gauge. Notice the temperature variations in each quadrant. Try to maintain uniform temperatures.*

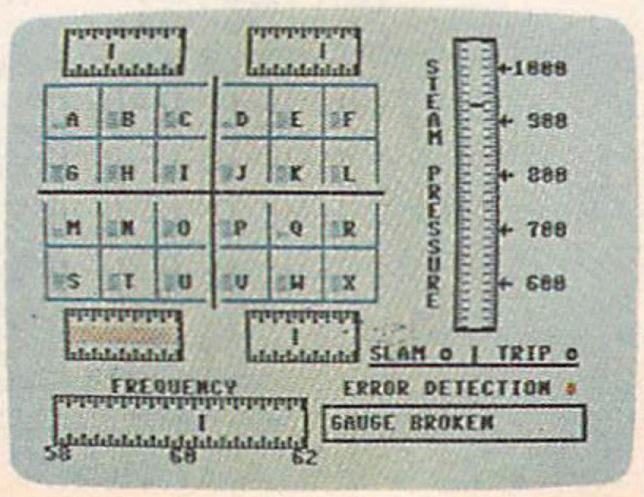
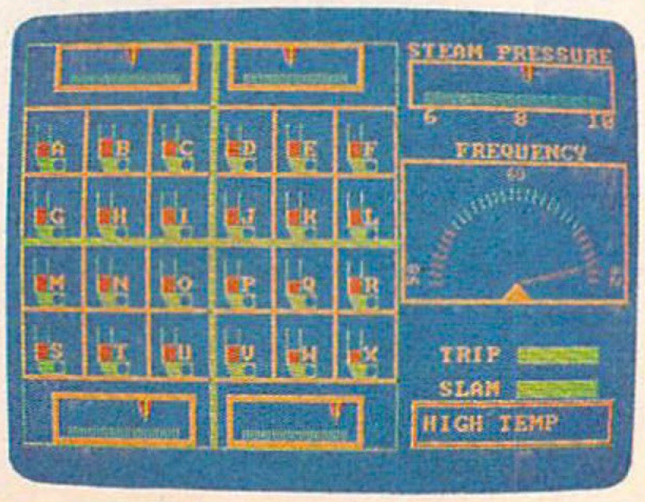


Photo 3. *This screen from the IBM version shows a high temperature warning. Notice that the frequency gauge is dangerously high. Check the 4 quadrants for high temperatures and adjust the control rods accordingly.*



Controlling the Power Output

The difficulties you will encounter vary according to skill level:

1) Normal operation
2) Faulty systems
3) Earthquake country
4) Armageddon

In the first level, you merely have to watch for minor temperature fluctuations and small changes in the load. This mode is best for training, so that you will be prepared to handle the higher levels. Experiment with raising and lowering the control rods—watch how long it takes for your action to cause the reactor to change. Once you feel like you can control the power output, you are ready to tackle the higher levels.

"You will find that the system does not react immediately . . . it takes time for your actions to take effect."

The second level introduces more problems. The temperature here can fluctuate more radically, and the load can increase or decrease as well. Also, any one of your four temperature gauges can break at any time, making it impossible to monitor the temperature of a quadrant. Photo 4 displays an example of some fluctuations. When a warning sounds, you must be prepared to take corrective action where needed.

At level 3, you're faced with all of the problems that can occur in level 2, plus steam leaks caused by earthquake tremors. Here you'd have to increase the temperature to compensate. Photo 5 illustrates what can happen if you don't react fast enough to correct a problem. In this example, the overall temperature of the reactor dropped low enough that the frequency level fell below 58, causing the reactor to trip off-line.

Finally, at level 4, a nuclear war is imminent—riots, sabotage, and even more drastically fluctuating loads will plague you. At this level, be prepared to quickly make adjustments to changes that you see on the gauges. But remember, it takes a little time for the reactor to "react" to your manipulations of the control rods. Before you play the game, review *all* of the accompanying photo examples (regardless of which machine is indicated) to familiarize yourself with some of the different problems that can arise during the reactor's operation.

One final tip for being more successful at the control panel: learn to identify and listen for audible warnings—steam leaks, high temperature warnings, gauges breaking, etc. And, if you should realize that you have overreacted, or that you just can't bring the frequency levels into the safe range and a meltdown is inevitable, fear not. Just push the slam button ((FUNCTION) 1 on all but Apple systems, where it is the (ESCAPE) key). This will keep your score from being lowered by a forced shutdown of the system.

The original, Apple *IIe* version of *Over-Reaction* was designed for use with shifted alpha characters (lowercase). Unfortunately, the Apple II+ does not have this capability. Thus, the Apple *II* Family version of this program is controlled in a slightly different manner. You can select a quadrant with the keys A, B, C, and D. The active quadrant will be highlighted by a color different from those not active; it will stay active until you select another quadrant. There are six control rods in each of four quadrants in the control panel. You can access the rods in the active quadrant by pressing the numbers 1 through 6. Pressing the unshifted numbers will push in the rod. If you press a shifted number, the rod will be pulled out.

The Commodore 64 contains an extremely versatile set of built-in graphics characters, and this program takes full advantage of them. The temperature, steam pressure, and output frequency meters use these characters to position their needles. Two strings are used to contain the desired characters: L$ is used for the horizontal needles of the temperature and frequency meters; the string U$ is used for the steam pressure meter. Each string contains all possible needle positions that can occur within a character. When the meter setting is evaluated, the position of the character desired is calculated and extracted with the MID$ function. The character is then printed on the screen as the new meter position.

The IBM PC and PCjr version of *Over-Reaction* uses two methods to display the meter needles on the control panel. The temperature and steam pressure indicators both use a sliding-scale meter which moves horizontally, both left and right. The needle is displayed using the PUT command. This command allows you to display a graphics shape that was previously saved into an array using the GET command. The PSET option is

Photo 4. *This screen from the C-64 version shows power fluctuations—two temperature gauges are broken. Fluctuations will make the frequency level behave erratically, so try to anticipate "hot" spots.*

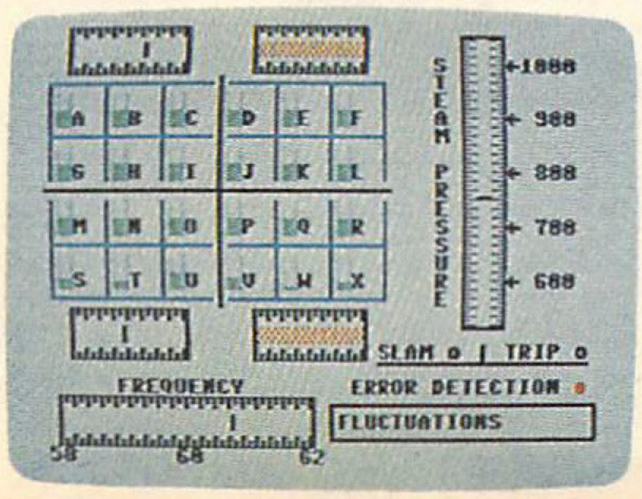


Photo 5. *This screen from the IBM version displays a bad-frequency warning. The frequency level is extremely low; too low—the reactor has tripped. At this point, the game ends and you can try again next time.*

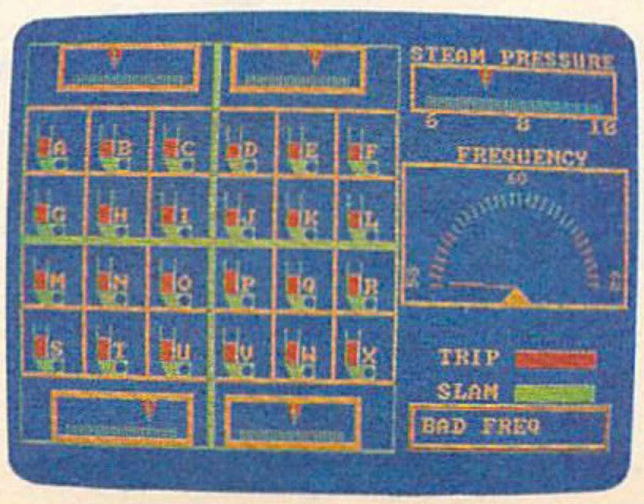
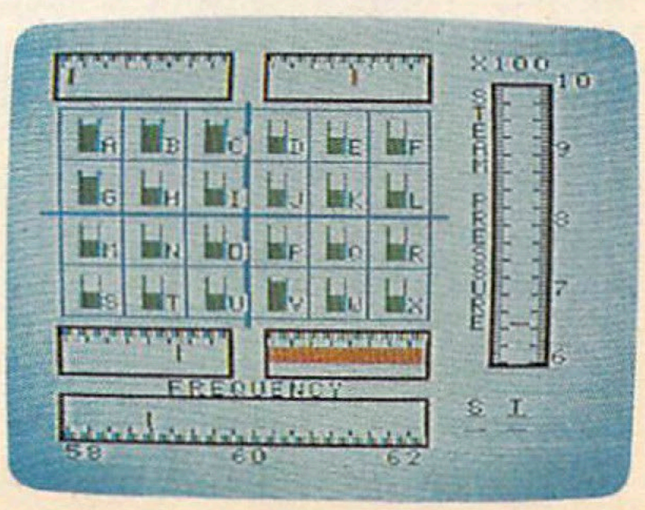


Photo 6. *This screen from the TI version shows normal reactor operations, but notice the faulty temperature gauge. Try to keep the frequency as close to 60 Hz as possible.*



used with an area for the needle which extends to the left and right of the needle itself. In doing this, the needle will erase its old image every time it is moved. This method produces much less "flicker" than the default method of erasing the old image with the XOR option. The frequency meter looks like an old-fashioned analog meter, with a long needle sweeping across a semi-circular dial. The needle produced here is drawn with the LINE command. The program will redraw a new line only if a calculation shows that the needle position has changed. **NOTE:** the (CAPSLOCK) key *must not* be activated before and while you run the program. Also, do not hold down a key after the acceptance beep—it may cause the keyboard buffer to overflow, which may result in erratic program behavior.

The TI version of *Over-Reaction* takes advantage of the 99/4A's ability to redefine character graphics, producing what appears to be a high-resolution motion of the indicator needles used in the the control panel's instruments. Only four characters were needed to define the horizontal meter needle, and four more for the vertical meter needle. A calculation determines which character is required for a given position in the meter. The character is then placed on the screen using the HCHAR command.

Eight characters were defined for the control rods. There are sixteen positions in each control rod, requiring that two characters be used. These algorithms can easily be employed in a multitude of applications where the relative position of a value is more important than the value itself. As you may know, it takes quite a while to display messages or numbers on the screen by using TI BASIC without scrolling the screen. Although this program doesn't burn up the track with speed, you will nevertheless be impressed with the amount of activity going on, and the speed with which the program executes.

Over-Reaction (Apple *II* Family) Explanation of the Program

Line Nos.	
100-200	Program header.
210-230	Relocate program above hi-res screen.
240-350	Initialize the program.
360-390	Get skill level.
400-570	Draw the control panel.
580-630	Initialize the variables.
640-790	Main control loop.
800-940	Select-problems routine.
950-1110	Start-of-game messages.
1120-1370	End-of-game messages.
1380-1420	Controlled shutdown—slam.
1430-1480	Control updating gauges.
1490-1520	Meltdown routine.
1530-1560	Update steam gauge.
1570-1600	Update frequency meter.
1610-1720	Scan keyboard to control the reactor.
1730-1780	Update rods & block temperature.
1790-1800	Draw a box routine.
1810-1820	Routine to flash the screen.
1830-1970	Program DATA.

Over-Reaction (C-64) Explanation of the Program

Line Nos.	
100-190	Program header.
200-390	Initialize program.
400-450	Skill-level option screen.
460-700	Start-of-game messages.
710-1210	Draw the reactor control panel.
1220-1250	Initialize variables for a new game.
1260-1390	Main control loop.
1400-1530	Determine types of problems.
1540-1620	Scan keyboard. Reactor control.
1630-1660	Position the reactor rod graphics.
1670-1740	Update the block temperature.
1750-1810	Trip and slam routines.
1820-1910	Update temperature gauges.
1920-1960	Update steam pressure meter.
1970-2000	Update frequency meter.
2010-2080	Error-condition routines.
2090-2440	End-of-game messages.
2450-2460	Move-cursor routine.
2470-2680	Program data.

Over-Reaction (IBM PC and PCjr) Explanation of the Program

Line Nos.	
100-220	Program header.
220-340	Initialize the program.
350-430	Main control loop.
440-470	Branch to problems for skill level.
480-500	Temperature meter malfunctioned.
510-520	Cooling system malfunctioned.
530	Control problems for levels 2 and 3.
540	Steam leak develops. Pressure drops.
550-600	Scan the keyboard. Reactor control.
610-650	Move rods in or out.
660-720	Update the block temperature meters.
730-790	Update steam pressure meter.
800-850	Update frequency meter.
860-1010	End-of-game messages.
1020-1150	Get skill level. Display messages.
1160-1310	Draw the control panel.
1320-1350	Routine to scan the keyboard.
1360-1400	Coordinate the rods.

Over-Reaction (TI-99/4A) Explanation of the Program

Line Nos.	
100-200	Program header.
210-310	Select skill level.
320-890	Initialize program.
900-1140	Main control loop.
1150-1410	Select problem routine.
1420-1650	Start-of-game messages. Determine skill level and problems.
1660-1980	End-of-game messages. Replay option.
1990-2090	Slam routine.
2100-2210	Update temperature meter.
2220-2290	Update steam-pressure meter.
2300-2370	Update frequency meter.
2380-2660	Key input routine-position rods.
2670-2770	Update block temperature.
2780-2800	Key-scan routine.
2810-2840	Routine to update graphics position.
2850-2980	Character graphics & color DATA.
2990	DATA for meter position array BP( ).
3000-3070	Screen display format DATA.

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For your key-in listings, see HCM PROGRAM LISTINGS Contents.