

The Atari Machine

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I first saw Atari's Mean Machine at an education-and-computers conference last September. A lot of pompous Educators had come to receive the word from some Foundation People about the blessings that small computers and videodisk were about to bring to them. I was there with Stuart Greene, an associate and filmmaker who also has a sense of what computer graphics ought to do.

Well, there was a keynote address from the highest Foundation Person, and good things were said; and then a wonderful thing happened.

Up got Ludwig Braun with his fierce mustache and apologetic manner, Lud Braun who has tried indefatigably for so long to arouse the educational establishment to the educational potential of simulation and little computers; up got he, at an Advent screen, and said he had a new machine to show us.

He turned on the Atari.

Here is what we experienced.

We are on a spaceship, cruising at near-light speeds. Stars are on the screen, but they part before us, moving smoothly out from a common center as we cleave the void. A low rumble—ship's noise or remanant Big Bang—accompanies our movement.

The pilot turns. The stars still move apart for us, but now the center of diverging motion has moved to another part of the screen. Stars pass each other—they must be the near ones—and we see that the display really shows us moving through stars in three dimensions.

PLANETS shoot by.

Enough of the slow stuff. Let's take this baby out for a spin.

Acceleration! The rumble rises in pitch and volume. The stars really start to fly apart. HYPERWARP ENGAGED, flashes a warning on the screen. Faster and faster shoot the stars, as from a Fourth-of-July sparkler, AND NOW THE SCREEN IS RED IN SUDDEN SILENCE, AND IT FLASHES "HYPERWARP"!

And out again! There is roaring anew, and new stars split to let us pass, but we are slowing down now.



The rumble lowers. We have gone halfway across the universe.

Stuart and I were shouting and cheering and clapping. I think I may have been on my feet with excitement. The Educators turned to stare at us. "What does this have to do with Education?" asked their faces. Guys, if you don't know, we can't tell you.

I've been in computer graphics for twenty years, and I lay awake night after night trying to understand how that Atari machine did what it did.

We are on a spaceship, cruising at near-light speeds. Stars are on the screen, but they part before us, moving smoothly out from a common center as we cleave the void.

As I have always known the field, there are basically two kinds of computer graphics machines. The bit-map machines, the video type, have a fixed number of dot positions, and if you want to "move" a shape, you have to keep erasing it at one spot and re-writing it at the next. (The Apple computer's hi-res is of this type.) Either the movement is cyclically jerky, as your movement subroutine reaches different picture elements, or you have to prepare a "next frame" in a different area of core, which may be slow, and flip the new image to the screen when it's all ready. (The Apple allows this.)

Problems arise when a moving figure crosses a still figure; restoring

the background after a moving shape has passed is a real problem. Preparing an unseen Next Frame that restores the background is again the solution, but that takes still more time.

Then there's the other kind of graphics machine, the Super kind—the "calligraphic" display—where points and lines are individually placed on a rasterless screen. Special hardware steps through a display list in core, putting each part of the picture where the program says. Each time the screen is refreshed, the points and lines can be moved individually as your program changes the screen positions specified by the display list. (Examples are the Picture System from Evans and Sutherland for \$100K, or in the \$15K ballpark, Imlac's PDS-4 and DEC's VT-11.)

But this, *this* new machine, was something else.

In a package under one thousand dollars, and using a conventional raster screen—a TV—the Atari computer was doing smooth motion in all directions at once, seemingly in 3D.

This had to mean, I reasoned, that there was some sort of a DMA readout from core (as in the calligraphic machines), in order to match the raster-timing demands of the TV screen. But then there would have to be some sort of address translator, allowing the element itself to remain on a display list in core, where its screen address could be changed between frames.

But then there would also have to be some list, corresponding to the picture arrangement on the screen, of where everything was in core.

It just didn't make sense.

Machine, cont'd...

Well, I know how it works now, dear reader, and I wish I could tell you. But, unfortunately, *Creative Computing* as a software producer, has signed a non-disclosure agreement with Atari, so that anything I've learned through these channels I can't publish. But aha, if I can find it out through *other* channels, says Dave Ahl in his Solomonic wisdom, then I can publish it. So I will be spying assiduously, dear reader, to find out what I already know so I can tell you about it. Ah, modern life.

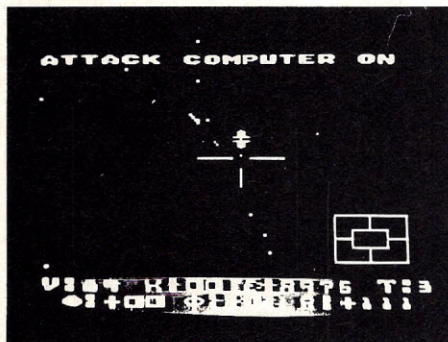
The Atari machine is the most extraordinary computer graphics box ever made, and *Star Raiders* is its virtuoso demonstration game. Be not misled by the solidity of the *Star Raiders* capsule you must push into place; it is not hardware. It is a program.

Yes, friends, all the effects I have described—and many more indeed—can be programmed on the Atari.

There is just one problem.

They won't tell you how.

That's right. You can buy an Atari computer and they won't give you instructions on how to work it.



Everything is under wraps. Oh, of course you can program the 6502 chip, that's in there, same as in the Apple. But that *other stuff*, those mysterious peek-and-poke locations that move the stars, and whatever else they do do, are a deep dark secret.

Now, I'm pretty sure that if you wanted to bring a case before the Federal Trade Commission, there's some statute saying you're entitled to get operating instructions for whatever you buy. So if you want to make a federal case out of it, you can probably get the inside data in about three years for a quarter of a million dollars in legal costs. However, there's a faster way.

Wait.

The hacker's race is on. Who can figure it out first?

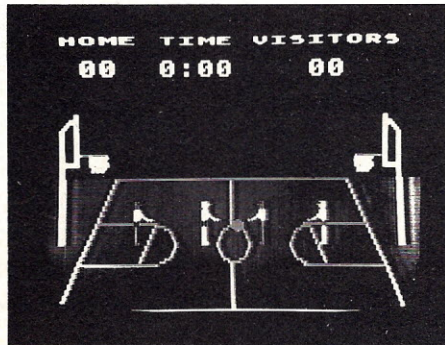
Even if nobody violates Atari's elaborate security, I'll wager that

most or all of the secrets of the Atari machine will be out by the end of 1980—probably including secrets that the Atari people didn't know existed. Because there is nothing like a real challenge to delight a computer hacker, and this is a real challenge.

Now, there are all kinds of signs in the wind. For instance, one California company, advertising in these very pages, says they have a book on the Secrets of the Atari. Not to mention a disassembler that will ferret out even the deepest secrets of *Star Raiders*.

I called them about the book and they said well, it wasn't quite ready yet, and when I asked for galleys they allowed as how it wasn't quite *written* yet, but I'm sure it will be a very good book when it comes out, and that they won't be the only sources for the information. Because if there's one thing that makes the world go round it's gossip, especially juicy true gossip, like how to control horizontal scroll or interrupt on raster-line count (just to take fictitious examples).

An interesting question is why Atari is bothering to hide the information at all, and from whom. Is the information being hidden from the purchaser of the Atari computer? That would hardly seem proper, let alone sane. From rival hardware manufacturers? Fiddle de dee. The last thing any hardware rival would do would be to sink hundreds of grand in copying the Atari special chips. Anyone who has the temerity to design a computer always thinks he can do it better anyway. (One conceivable possibility is that Third-World Manufacturers might try to build imitation Ataris—as has been done for the TRS-80, but not the Apple. It seems a lot of effort for a far-fetched threat—especially considering the system price, which is an extraordinary value; it's hard to see how Taiwan or the Philippines could compete with it in price for several years. Perhaps the Atari folks are just that sure of their own



infallibility that they worry about others hornning in on a multi-million-unit market.)

Another interpretation is that the Atari people are trying to hobble potential software rivals. If nobody else knows how to get the hotshot effects, then the Atari guys have an advantage with their software, right? Again a strange notion. Since Atari makes the machines, why do they mind? (Anyway, Atari is being co-operative with independent software vendors, *provided* they don't tell how it works. So the whole thing is very mysterious.)

There is nothing like a real challenge to delight a computer hacker and this is a real challenge.

What It Can Do

The only way to explain fully what the Atari will do is to reveal its internal hardware structure. As explained above, that cannot happen here now yet. However, there is a very simple way for you to study the capabilities of the Atari machine: that is to go to your local video-game arcade and play the Atari arcade games. Because everything they do, the Atari computer will do. (I know of only one exception: the "Lunar Lander" Atari game, which uses vector graphics and is therefore incompatible.) Two very good examples for study, if you can find them, are "Basketball" and "Sky Raiders."

(I regret that Sky Raiders is a shoot-em-up game, or, indeed, that our society has such a high regard for games where you get high scores for murdering lots of imaginary adversaries. It could be argued that Vietnam, the Body-Count War, was born in the arcades of yesterday, and that Star Trek games are setting us up for World War Three—but that's a different article. Anyway, consider that the effects you are seeing can be put to peaceful uses, like the teaching of physics and watching the flowers grow.)

Here are some things you should look at.

The way that the whole screen can be filled with shaded graphics, that is, pictures made out of colors or grey levels. (Colors are not much used in Atari arcade games, with some exceptions like the multi-car Speedway game. But the colors are just fine on the Atari computer.)

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Hearty Appetite.

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†Recommended system configuration consists of 48K CP/M, 2 full size disk drives, 24 x 80 CRT and 132 column printer.

Ⓜ Modified version available for use with CP/M as implemented on Heath and TRS-80 Model I computers.

Ⓢ User license agreement for this product must be signed and returned to Lifeboat Associates before shipment may be made.

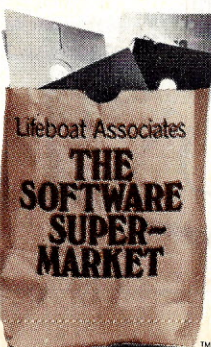
Ⓢ This product includes/excludes the language manual recommended in Condiments.

Ordering Information

MEDIA FORMAT ORDERING CODES
When ordering, please specify format code.

Computer system	Format Code	Computer system	Format Code
Altair 8800 Disk	See MITS 3200	Processor Technology Helios II	B2
Altos	A1*	RAIR Single Density	R9
Apple + Microsoft Softcard	R9	RAIR Double Density	RE
Blackhawk Single Density	03	Research Machines 8"	A1
Blackhawk Microplus Mod II	02	Research Machines 5 1/4"	RH
CD5 Versatile 3B	01	REX	03
CD5 Versatile 4	02	SD Systems 8"	A1*
COMPAK-80	03	SD Systems 5 1/4"	R3
Cromemco System 3	A1*	Sorcerer	A1*
Cromemco Z80	R8	Spacebyte	A1
CS25 BACKUP (tape)	A1	Superbrain	See Intersec
Dalla	A1*	Tabell	A1*
Disc-Log Microform II	RD	TEI 5 1/4"	R3
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Digibo	See Morrow Discs	Thinkertop	A1*
Durango F-85	RL	TRS-80 Model I	R2
Dynabyte DB/2	A1*	TRS-80 Model I + Micromation	A4*
Dynabyte DB/8	A1*	TRS-80 Model I + Omikron 5 1/4"	RM
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Heath HB + H17/H27	P4	TRS-80 Model II	A1*
Heath 89 + Lifeboat CP/M	P4	VDP-40/42/44/80	See IMSAI
Heath 89 + Magnolia CP/M	P7	Vector M2	02
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IMS 5000	RA		
IMS 5001	A1*		
IMSAI VDP-40	RA*		
IMSAI VDP-42	RA*		
IMSAI VDP-44	RA*		
IMSAI VDP-80	A1*		
Intel MDS Single Density	A1		
Intersec Super-Brain DOS 3.1	R7		
Intersec Super-Brain DOS 0.6-2.X	RJ		
Intersec Super-Brain DOS 3.X	RF		
Kontrol P30-80	02		
Meca	08		
Micromation (Except TRS-80 below)	A1*		
Microplus Mod I	01		
Microplus Mod II	02		
MITS 3200/3202	02		
Morrow Discs	A1*		
Moslek	A1		
MSP 5 1/4"	RC		
North Star Single Density	P1		
North Star Double/Dual	P2		
Nylos Single Density	P2		
Nylos Microplus Mod. II	02		
Onio Scientific	A3		
Pentec PCC 2000	A1*		

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Manual cost applicable against price of subsequent software purchase.
The sale of each proprietary software package conveys a license for use on one system only.



Machine, cont'd...

The way that pictures of small objects can move across this overall picture without disturbing it. (Examples: basketball players in the Basketball game; automobiles in the Speedway game; the hook and ladder truck in the Fire Truck game, which can actually be driven across people's lawns and driveways, and through their houses, with very satisfying sound effects.)

Of all the Atari arcade games, the most portentous, in my opinion, is *Sky Raiders*. This is a bombardier game in which you get points for destroying cities, factories and power lines. (Again, ignore the shoot-em-up aspect.) What you see is a continuing panorama unrolling below your bombsight: the aerial view of the countryside. The video monitor is mounted vertically, and the aerial view descends down the screen—sideways on the video.

In other words, what you are seeing is *horizontal scroll* of detailed graphics relative to the monitor.

Another feature that merits your close attention is the interaction

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between moving objects and the background. In the basketball game, for instance, not only do the two players move around in front of a full background picture; they also *block one another*: either the black player is in front of the white player, or vice versa. You may have an interesting time thinking about what hardware this implies.

Moving objects may also interact with the background picture. For instance, in the "Sky Raiders" game, a bomb which is on target creates an explosion on the ground. This implies interesting interaction between the data about moving objects and the data about the background.

Well, Space Troopers, that's it for now. The Atari is like the human body—a terrific machine, but (a) they won't give you access to the documentation, and (b) I'd sure like to meet the guy that designed it. □

Those who cannot remember the past are condemned to repeat it.

Statistics are no substitute for judgement.