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SUBJECT: high performance machine ... OMNI DATE: 10/20/83

I propose that we develop a new generation machine with the following key features:

1. CPU = Motorola 68010

2. Main Memory = -- 64 KWords [minimum] RAM
-- 16 KWords operating system ROM

3. Graphics Chip Set = PENNY, VIVIAN, and HEATHER (described below) plus associated video RAM (48 KWords if external; 24 KWords if in the PENNYs)

4. Sound/Speech/Music Synthesis Devices = AMY + Intel 8052 (described below)

5. Controller/Keyboard Interface = wireless via an IR transciever under software control (via a dedicated micro such as a Z8, 805x, 6500/xx, or 6800/xx); controllers to plug into base unit for recharging

6. Software Distribution = Optical ROM via a built-in reader (described below), ROM, or ED (with external modem)

7. Interface = completely open architecture to accommodate:
   - videodisc players
   - other video sources
   - robots
   - external computers
   - appliance/home controllers
   - adapters to play the software intended for other game machines
   - upgrades (additional memory, new graphics or speech chips, magnetic disk (floppy or winchester)
   - musical instruments
   - high speed telephone and TV cable modems

8. Home TV Interface = automatic RF switch box internal to the core module

9. Modularity = the core module to contain all of the above features and all add-ons to have a

consistent physical ID which directly
mates with the core module (no cables)

10. Power Supply = standard 110 VAC cord and cable with
power supply chassis to nest within
the shell of the core module; carrier
current signals as used by AtariTel
shall be passed through the power
supply to/from the core module

11. Price Point = $499. when introduced, falling to
$249. after 2 years

PENNY, VIVIAN, HEATHER:

PENNY is the new graphics chip being designed by Mark Filipak. It will generate images to the limits of a home color TV set (NTSC, PAL, and SECAM versions) and will be capable of displaying 80 columns of text on a composite video monitor. We intend to produce a system containing 96 multi-color, reusable sprite generators. This will allow the display up to 18,432 multi-color, motion objects on the screen at one time without any flicker. Displays will be to 1/4 color clock resolution (764 horizontal by 264 vertical pixel displays).

HEATHER, another custom chip, will be used to do the video RAM memory management between the PENNY chips and the CPU. This will ensure that PENNY will always have access to its video RAM when needed (the CPU will not get in the way) while allowing the programmer to read and write to the video RAM as if it were in its main display space. The total video RAM requirement will be 48 KWords (in addition to the main system RAM). This may turn out to be internal to the PENNY chips; if so, only 24 KWords are required.

The outputs of the PENNY chips will be fed to the custom VIVIAN chip which contains the color palette RAM and all of the video

encoding circuitry. This system will provide a total of over 44,200 color/luminance/intensity combinations in the video output. This is obviously several orders of magnitude beyond anything predicted for the consumer game/computer marketplace in the next few years.

AMY:

The AMY chip is a sound, speech, and music synthesis chip already designed and emulated by Gary Sikorsky's group in Corporate R&D (1165). AMY is an additive, 8 voice, 64 harmonics, audio frequency synthesizer. It can generate fundatmentals from 5 Hz (sub-sonic) to 7.8 KHz with 1/64th semitone resolution. The pitch can be changed at a rate of from 0.12 to 236 semitones/second. Each voice can be amplitude modulated in a 64 db range at 1.9 to 3800 db/sec. Two noise sources are also provided with bandwidths of 100 Hz to 8000 Hz.

The 8052 is an Intel microcontroller with 8K of on-board ROM and 256 bytes of on-board RAM which is used to control the AMY's output. This device family is prefered since a lot of the software being developed for AMY by Sikorsky's group is based on it.

In layman's terms, one AMY chip chip can simultaneously produce the audio tracks of Barbara Streisand singing "Hello Dolly" and John F. Kennedy giving a press conference.

OPTICAL ROM:

The optical ROM is a new media for software distribution being developed by Paul Wehrenberg's group in Advanced Engineering. It will permit 64 Kbytes (32 Kwords) of usable data to be put onto a 4 inch diameter, hard plastic disk which we will be

able to manufacture for under 50 cents each.

The turn-around time on the masters for producing these disks will be on the order of 1 to 2 days; and the cost of each master will be under $1,000. We will be able to produce these masters in our own small lab in the Bay Area.

The total time to read 64 Kbytes of program and data into the game machine would be under 6 seconds.

The key hardware components are a 1,024 element charge coupled device, a low torque/low rpm motor, and the hub clamping and alignment mechanics.

This can be thought of as a proprietary, patentable and copyrightable, low cost, rugged and easily manufactured, read only, disk drive.

ADDITIONAL MODULES:
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1. Data Communications = 300/1200 Baud and variable speed, direct connect modem for links to ED, large computers, other game machines, etc.

2. Data Retention = non-volatile RAM or EEPROM for score and game status retention (size yet to be determined)

3. Adapters to play other game software = 2600, 5200, 3600, 400/800/XL, Apple, ColecoVision

4. Floppy/Winchester Disks = either for expansion of the system into a general purpose personal computer and/or to allow this machine to be used as its own

software/graphics/sound development system

5. Additional Memory = in ____ KWord chunks

6. Standard Computer Interface = parallel, TTL serial, and RS-232C

7. Videodisc interface = as per the specs from 275 Software