Arcade Emulators

Simon Goodwin checks out Amiga emulators for classic arcade games
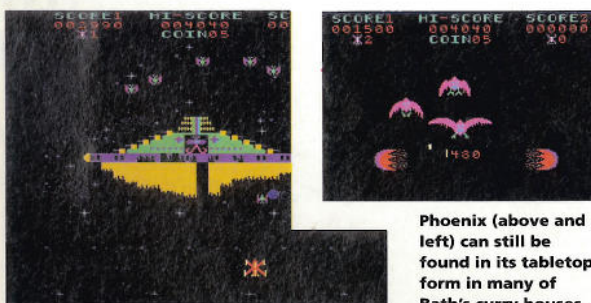
AFCD21:-In_the_Mag-/Emulators

ON THIS MONTH'S CD

I n the days when TV games manipulated monochrome blocks, 'telly tennis' style, you had to visit an arcade to see the future of electronic gaming. Massive wooden cabinets housed custom-made hardware, coin-operated and finely tuned to deliver an addictive gaming experience.

There were no instructions beyond a few words on the cabinet. Atari founder Nolan Bushnell stressed the need for games that were instantly playable, attractive and addictive. Sound and colour were pushed to the limits of available technology, and developed with every new game.
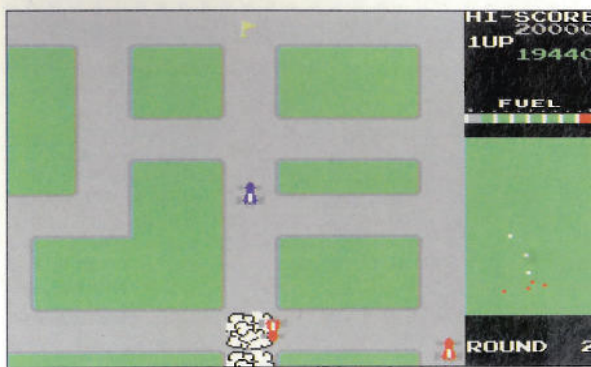
These consoles soon muscled into the areas once dominated by pinball machines and one-armed bandits the world over. With no prizes, there were massive potential profits for site owners. Hidden controls inside the cabinet let game speed and difficulty levels be tuned to maximise profit without driving away beginners.

Once, great firms like Atari and Nintendo vied to produce new games, supplying arcades, motorway services and (appropriately enough) chip shops, with the EPROM chips and add-on boards to give the basic box the latest personality. Much hardware came from Atari and Amiga visionary Jay Miner, augmented by add-on boards developed to give individual games the edge – like the vector graphics of Asteroids and Battlezone (see box opposite).

Internal extras included sound boards, co-processors and space for more EPROM memory chips. The

hardware was steadily upgraded to offer more colours, improved scrolling, more and bigger sprites, prestaging home computer developments. This was the birth of the third-party games industry. Atari could not meet the demand for new games alone. Big hits were provided by Taito with Space Invaders, Williams with Defender, and Nintendo with Donkey Kong.

It might seem perverse to run original Pengo or PacMan code on an Amiga. There's no shortage of rewrites of these games, often noisier and prettier, and other arcade favourites. But arcade emulators mimic the gameplay, timing and details of the originals exactly, given enough processor power, and if you're familiar with the real thing that may be crucial. Each ghost in PacMan or alien in Defender has unique behaviour which you learn to exploit. Months of playtesting went into the design. Copies rarely catch such nuances.

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EMULATION

MAME was dreamt up by Nicola Salmoria, who grew sick of writing specific emulators for each classic arcade game. Realising that the underlying hardware was little changed between games, and the original game code was available on the Internet, Nicola devised the Multi Arcade Machine Emulator, or MAME - a collection of software components to simulate classic arcade hardware.

MAME includes processor emulators - the original Space Invaders was content with a 1974-vintage Intel 8080, but later games used Z80s, 6502s, 6809s and even a few 68000 chips - plus graphics and sound emulation. Source code - in portable but inefficient C - was freely available from the start, and MAME has also been ported to Archimedes, Mac, Unix and Windoze, although it needs a fast Amiga to do justice to the unoptimised code.

Phoenix (above and left) can still be found in its tabletop form in many of Bath's curry houses.

Classic arcade racing action in Rally-X. Collect the flags and avoid your persuers to amass a high score.
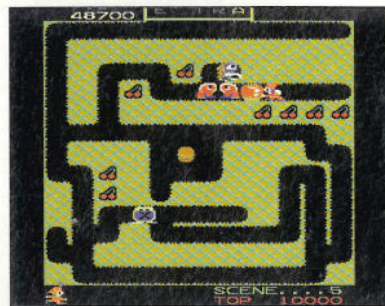

MAME can struggle with more modern games such as 1942 – you need an '060 to get anywhere near 100% original speed.

Mr Do! is the editor's personal favourite, and works surprisingly well under emulation.

MAME is complicated because it must emulate many systems, rather than just one. It has built-in configuration data for each known game. More than 70 programmers have contributed to the MAME project, including Marat Fayzullin. Development is currently being led by Mirko Buffoni, with Jonathan Belson and Mats Eirik Hansen responsible for AMAME and MAME respectively, on the Amiga.

More than 200 games are supported, although not all perfectly. Sound is a notable weakness of the Amiga versions, although this varies from game to game. Vector graphics may be unbearably slow unless you have a graphics card.

VERSIONS

MAME was first compiled on a DOS PC, but there are two Amiga ports, confusingly known as AMAME and MAME. Another arcade emulator, ArcEm, recently arrived on Aminet, courtesy of Andrew Bennett. So far ArcEm only runs half a dozen early games, but it's fast and stable, with a hand-coded 8080 emulator that runs rings around compiled C versions. ArcEm runs at configurable speed – 20 is just right for the author's 28 MHz 68020; I needed to boost this to 60 on a Warp Engine 68040 and 112 on my Cyberstorm 68060. It can simulate gel overlays on the original screen, for authentic colour stripes. ArcEm is elegant and Amiga friendly, with icons for each game it supports, an easily edited configuration file, and a separate directory for the raw data – but it supports far fewer games than the MAME variants.

MAME is versatile but much slower. It calls AmigaOS to update screens, so patchWPA8 (aminet/util/boot) is strongly recommended for AGA users. Version 0.20 of AMAME gained a workbench interface, although not all the buttons work yet. The code file is over half a megabyte in size.

Hansen's MAME is a more up-to-date port, so it supports more games but

is even more bloated. I tested the 68040 version 0.28, which occupies 1.5 Megabytes! It has a good front-end, using MUI to assign sound, control and display options. You can use any retargetable screen mode – not just a small workbench window – but AHI sound is not yet supported.

The arcade emulators on our CD do not come with games but these are on the web and 'PD' floppies and CDs, usually as ZIP files. They're quite small,

Bomb Jack was a landmark in arcade entertainment. Apparently.

even uncompressed. In the early days a single EPROM held only 2K of code or data – so they don't take long to download, and the games are a marvel of compactness by modern standards, packing in attract modes, bonus and high score routines, and hidden configuration and self-test menus alongside the game itself.

The emulators assume certain file names for each ROM image. You must get these right or the game won't run. The MAME FAQ and related files can be found on Atmospherical Heights, a web page maintained by John den Hartog.

CONTRASTS

MAME and AMAME are worth a look if you've got a 68040 or later Amiga and a penchant for arcade classics. If you're not a power user, ArcEm is better, though even that needs at least a 68020. The games it supports are authentic but unexciting by modern standards.

Let's hope ArcEm can be extended to support more games, and a PPC version of the full MAME arrives to bring C versions up to speed. Either way, arcade emulation is feasible now on 32 bit Amigas, and is sure to get even better in the future.   AF

VECTOR GRAPHICS

Most computer displays are built up like TV pictures, scanning the entire screen systematically line by line, displaying dots at fixed positions in a rectangular grid or 'raster'. Vector graphics computers control the display beam directly, sending it around the screen in any sequence like a laser beam, drawing continuous outlines rather than discrete dots.

Vectors have many advantages. They need little display or pattern memory, because only co-ordinates need be stored, rather than a complete map with room for details of every possible pixel. Objects can be moved or scaled without the jumps in position and resolution inevitable on pixel-based systems. Rotation, reflection, stretching and squashing are trivial to vector machinery.

There are disadvantages, too. Images fade and there's no automatic redrawing from top left as you'd get with a raster display. The more vectors there are on the screen the longer the system takes to re-paint them all, so screens flicker and dim as images becomes more complicated. Colour requires precise co-ordination of three beams, and the slightest misalignment leads to confusing displays.

Asteroids was the first mass-market vector graphics arcade game, though similar technology was used in Space War, Bushnell's 1972 debut. The tank simulator Battlezone followed, again in monochrome, with coloured overlays to liven up the display. Vector graphics caught up with colourful bitplanes when Tempest was released, but lost ground as bitmap resolution and sprite handling advanced, eroding the memory and processor-saving advantages of vectors.

You can simulate vector graphics on a high resolution raster display, but the grid intrudes and the results are never quite as smooth or subtle as a real vector scan image. Vectrex, a home vector graphics system featured a built in mono screen, and its games are now freely available. There's a PD Vectrex emulator, but no one has yet ported it to the Amiga, so for now MAME is as close as you'll get.
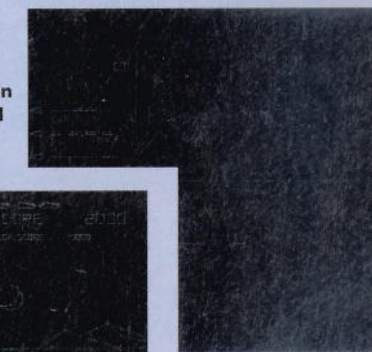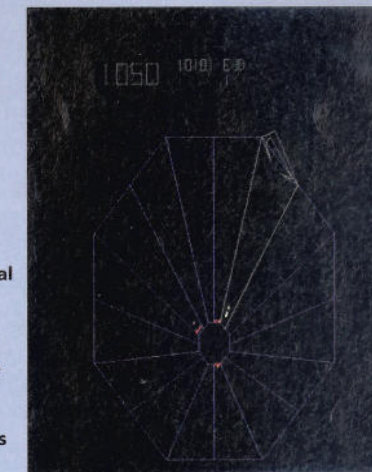

Asteroids and Battlezone (left) were the original vector games. Later examples featured limited colour as in Tempest (top) and Star Trek (above).