Digital Creations Studios

Technical Design Supplement

Army Men : Sarge's Heroes

Gameboy Advance Version

Gameboy Advance Technical overview for Army Men : Sarges Heroes

Risks

Certain points must be considered during the design and development process.

Level Design

When designing the levels the Artists must be aware of where buildings may and may not be situated on the final charcter map with respect to Sprite and Background priority issues - see tech design sketch.

Level GFX tile counts

Artwork for each level has to be kept to a strict tile count. Each level will have 3 layers. Layer 1(1024 tiles) contains the builings or objects the player goes behind, Layer 2(576 tiles) contains the surface and objects the player moves over. Layer 3(256 tiles) contains the overlay information.

Sprite Limitations

The object system used in the game must take into account the sprite limitations of the AGB system, especially when the sprites are scaled. The AGB can display 128 8x8 sprites per line when non-scaled and 64 8x8 sprites when scaled.

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HARDWARE: Processor, DMA and Memory

At the heart of the AGB is a very powerful custom ARM7TDMI 32bit RISC processor running at 16.78 Mhz capable of executing code at high speed. This chip can switch between two modes of operation:

ARM MODE.
All instruction op-codes are 32 bits in length. All instructions are available in this mode.

THUMB MODE
Instruction op-codes are packed and stored as 16 bits in length. Not all instructions are available in this mode but are very memory efficient taking half that of the ARM op-codes.
(design note : is the thumb mode only 16 bit data/addressing as well? - must be as the data/address is stored along with the opcode (risc architecture) must confirm..)

Mode switching overhead is nominal.

AGB also has 4 very fast DMA channels capable of 32 bits wide data transfers - this frees the processor from the responsibility of moving chunks of data around, leaving it free for other tasks such as AI or Collision Detection. DMA channels are especially efficient when copying GFX data to VRAM. This should allow downloading of new sprites/tiles to VRAM every frame as required.

HARDWARE: Graphics

AGB is very similar in a lot of ways, to the Super Nintendo Entertainment System (SNES) in that it utilises (among other modes) a tiled background system with 4 independent background layers and a separate sprite layer. Priorities can be set for each of these layers enabling them to appear in front of or behind each other. This is particularly useful, when we consider the way in which we propose to do Army Men's isometric style backgrounds. There are a few options for screen resolution mode but we propose to use the 240 pixels by 160 pixels tiled BG mode.

The tiled BG mode may display any 8 pixel * 8 pixel character block stored in VRAM, on the screen and all of these characters may select to use one of 16 palettes. This effectively gives us 256 different colours available for our main game-play screen.

The AGB also has linear frame buffer modes, allowing it to render full motion video playback at selective qualities (currently 240*160 pixels at 20f fps) and to display high quality 16 bit images (allowing 32,768 colours on screen also at 240 *160). These modes will be utilised to play cut-scene movies in between the different Acts of the game and at final completion, and to render high quality, high colour still images when required.

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HARDWARE: Sound

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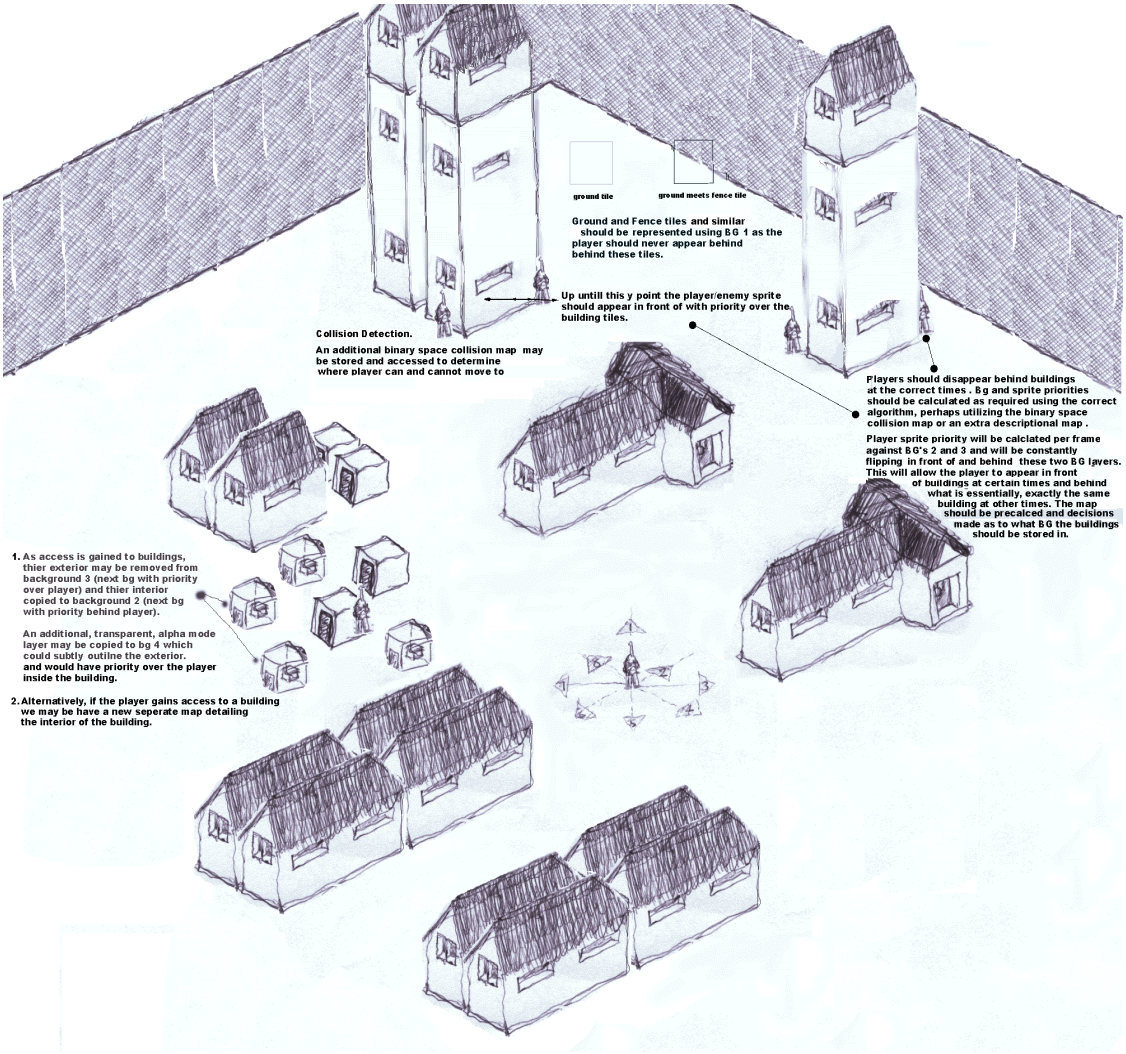
Technical Design Sketch



This sketch highlights many of the elements of the gaming model and should be used as a reference point to help explain how these mechanics operate.

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SOFTWARE: Backgrounds and Scrolling

The game will be developed to employ an isometric viewpoint, illustrated in the design sketch This may be created by using carefully drawn and selected groups of BG character tiles, some with transparent gaps to act as masks. These are copied into their respective backgrounds, each with varying display priority. Using this method should ensure that the player's character and other moving sprites will appear in front of and behind buildings and other objects at the correct times.

Alpha transparency layers will also be used to enhance the look of the game where applicable. See level design.

The scrolling method should be very smooth and the frame rate update should be at least 30fps at all times.

To enhance game-play the scrolling may use fractional x and y speeds and map position. It may also use acceleration linked to the player movement to avoid a single scrolling speed, which may be ineffective.

The background screen scroll offset positions should be updated when the player moves nearer the boundaries of the screen.

> **Remove** - The background should scroll whenever the player is moving, keeping the Sarge sprite in the centre of the screen at all time except when the boundary of the map is reached.

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Player, Enemy, Vehicle and other overlay Sprites.

A sprite system will be used that allows the downloading of in game objects directly into object Video Ram. The sprite system will also allow various sizes of movable objects by combining multiple sprites together and then moving and animating them as a whole.

Some sections of the background buildings will be made up of sprites. These areas will move with the scroll system and allow parts of buildings to be destroyed by the player. Another feature of this system is the ability to animate sections of background graphics, for example a flag could be animated on top of a building or doors could open as the player goes through them.

The AGB system allows 12 sprite sizes internally and the majority of the onscreen objects will use a single sprite. It is estimated that the Sarge sprite will fit into a 32x32 hardware sprite. The building sprite sections are likely to be composed of multiple sprites as described above.

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Control Method - D-Pad Movement

8 D-PAD Directions, 16 or 32 unique graphical player rotations/directions.
As the player rolls through the D-Pad buttons the Sarge sprite will reflect the direction the player is pressing while also inserting extra rotation graphics in between direction presses.

Frame no:01234567891011
Direction Held:UPUPUP+RIGHTUP+RIGHTRIGHTRIGHT
Rotation gfx :112344

The animation frame to be used may be determined by checking the difference between the direction held last frame and the direction held this frame.

Conditionally though, If the player is moving right and turns to move left - this should take effect immediately.

RIGHT on D-Pad followed by LEFT on D-Pad produces:

Right Facing Graphic, immediately followed by Left Facing Graphic.

Control Method D-Pad Movement, Strafe Button

When the strafe button is held down, the players current rotation will remain unaltered for the duration but the player may still be guided around the map by using the D-Pad. This will allow the player to hold a current firing rotation while still being able to manoeuvre the terrain.

See Concept Design Document for other Controls.

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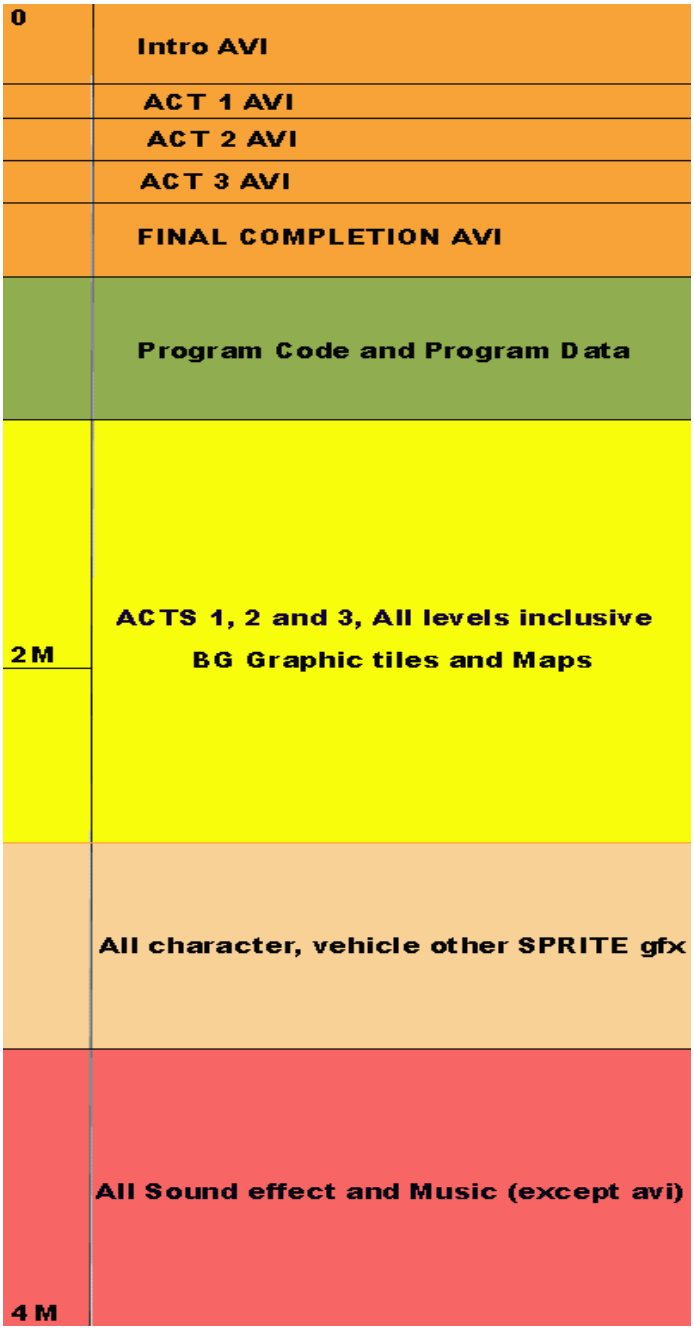
Cartridge Configuration / Memory Footprint

The cartridge type to be used will be 32 Mbits, which allows us 4Mbytes of ROM data.
All data required, Graphics, Sound and Program Code will be distributed across the 4 Mbytes address space as detailed in the Memory Footprint shown below



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Localisation

As the game will have a language selection feature, care must be taken to ensure the correct language text will be used when appropriate. Any messages to player should be accessed from suitably structured arrays of strings. Stored with multiple languages taken into consideration - no immediate text data i.e. - 'MYTextPrint("Select etc..");'

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Rumble Pak requirements

We are still waiting for confirmation of this from 3DO and Nintendo.

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Battery requirements

Cartridge may have to contain battery back up for SRAM. As the data needed to be stored is very low, a password system would be more suitable to save SRAM production costs. At this stage NOA has yet to decide whether there will be any non-SRAM cartridges.