This section seeks to identify the most difficult implementation areas of the game, providing fallbacks wherever possible.

360 degree view

The background graphics for the HUD are to be pre-rendered using Alias software running on Silicon Graphics workstations, or using 3D Studio across a network of PCs. In order for perspective to be maintained during view rotation, a 'slot camera' approach will be used.
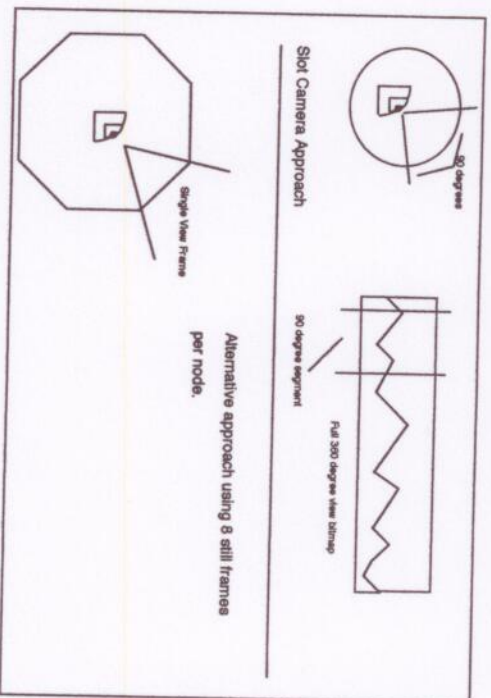
This will create a 1280*140 bitmap image, containing a full 360 degrees of view (see above diagram), which may then be scrolled in real-time on the PC to give the impression of a smooth-rotating 3D view. In the very unlikely event of any problems occurring in either the generation or display of these graphics, an alternative approach will take 8 still-frame renderings at each node, each player rotation resulting in a new frame being shown. This will be easier to implement, although a disadvantage is that each node will require twice as much storage space as before.

Text Display

The text display for the HUD will be limited by the fonts which can be displayed at VGA resolution. For a small font, we are limited to 3*5 pixels which, although perfectly legible, may not be desirable in a game of this nature. An alternative approach, therefore, is to use Super VGA 640*480 mode 101. Because of the very slow nature of CD-ROM, it would not be possible to store the background graphics at this resolution (also the sprite manipulation operations would run around five times slower). Therefore, a technique known as pixel doubling could be used - this would involve storing the graphic display area as a 320*140 off screen bitmap (as before), but drawing a group of 2*2 pixels to the screen for each pixel in the bitmap. In this way, animation, movement and rotation would look exactly the same (and run at the same speed) as for the VGA game, but text (and the line drawings used by the HUD) would be superimposed at the far crisper Super VGA resolution. We have already developed a Super VGA library.

Lighting Effects

The player will be able to switch lighting effects off for slower machines. Because this functionality will be built in from the beginning, any problems with the techniques used will not hamper game development whatsoever. In the worst case, some of the more complicated lighting effects could be removed at any stage of development. However, no such problems are anticipated.

Chapter 12 | Audio

Introduction

Raptor will make extensive use of music, sampled speech and sound effects to enhance the atmosphere and enjoyment of the game. From the very beginning of the game's development, work will begin on the sound and music - this is essential for several reasons:

- Traditionally, developers have considered audio only at the end of a project, resulting in music and sound effects which sound hurried and so do not do justice to the gameplay and graphics.

- Research in areas of industrial and corporate video has shown that the quality of music in a presentation directly affects the viewers' perceptions of the quality of the visuals.

- Composers can work together with artists and animators, fitting music to animations, and vice versa for maximum effect.

- Interactive music may be developed, which may branch and flow with the player's actions.

Music

One of the great advantages of the CD-ROM medium is that the additional storage space provided allows not only high-quality graphics and video to be stored, but also high quality stereo music. Throughout the game, music will consist of digital sound samples, sampled in stereo at 16-bit resolution at a minimum sampling rate of 35kHz (which will be virtually indistinguishable from Red Book CD-Audio quality). Music within the game will take two main forms:

- **Linear Sequences** are those sections of the game (such as the intro sequence, or cut animations) where all the onscreen action is preset, and player interaction is minimal. In these sections of the game, the accompanying music can consist of self-contained pieces of music, which will play from start to finish without branching. The advantage of these sequences is that there are fewer restrictions placed upon the composer, giving him/her a good deal of creative freedom.

- **Interactive Sequences** will be used in parts of the game where the player's actions can change the mood of the game, and hence must change the mood of the music. For example, if the player is walking along a quiet corridor in Aeternis, the mood of the music will reflect the atmosphere - peaceful, yet somehow tense. Suddenly, a change in the music at this point (probably an enormous orchestral hit) will terrify the player, not only enhancing but actually creating the atmosphere of the piece. The vast majority of the music in the game will be of this form, and will greatly enhance the feel of the game.

Speech

Within the game, whenever the player speaks to another character, s/he will hear them speak. Human speech has a far more limited dynamic range than music, and can be sampled at 8-bit resolution, in mono, at a rate of 30kHz. The space savings made by sampling this way (there will be no noticeable reduction in quality) allow far more speech to be stored, increasing the number of possible dialogues. Despite the fact that the speech will be stored as mono samples, we will be able to adjust the pan position of speech playback to appear anywhere in the left-right field, giving the player full directional hearing.

Lip Synch

Characters within the game, when speaking, will appear fully lip-synched with the sound. This will be achieved by filming, for each character, a front-view of an actor's face, with his/her mouth in a variety of positions (each position corresponding to a lip movement associated with a phoneme). These video images will be texture-mapped onto the relevant sprites' faces using our *VideoWrap* technology on Silicon Graphics workstations. The sprite may then be 'filmed' from any angle, with the animated face featuring computer-generated shadows and highlights from the ray-tracing procedure.

A simple PC-based utility will be written which allows speech samples (taken from DAT recordings of actors' speeches) to be played while a user views a frontal view of an actor's head. Various keypresses on the computer keyboard will allow the user to change the actor's mouth position, with one key represent-ing one mouth position. By 'recording' which keys are pressed during playback of a sample, an electronic representation of the mouth movements can be generated, and saved to a file. During the game, these files will be used to play back the mouth movements in perfect synchronisation with the speech. This method not only saves a great deal of disk space (storing moving images of each sprite speaking every possible phrase would take far too much space, and VideoWrap cannot be performed in real-time), it also avoids the many problems associated with synchronisation loss which frequently occur in multimedia video applications.

Sound Effects

Sound effects will also feature heavily in the game. These will consist of sampled sound fragments, the sampling method used depending upon the specific sound effect. Low-frequency effects, such as earth tremors and falling bodies, can be sampled at 8-bit resolution at a very low rate (such as 15kHz), whereas high-pitched sounds, such as the screams of a Eugene or breaking glass, must be 16-bit samples at rates in excess of 30kHz. Many of the sounds made by the player's MS-2 helmet can actually be synthesised by the player's sound card (by their nature they will have an artificial sound). This is useful, because most sound cards place a strict limit on the number of samples which can be played simultaneously.

In linear music sequences, some sound effects can actually form a part of the sequence and so will require no additional disk space or processor time to produce. Other sound effects will be triggered by the player's actions and game events (such as the arrival of a character, the opening of a door or the falling of rocks).

OVM Introduction

OVM is Intelligent Games' own class library for implementing the low level functions needed in all games, such as sound, graphics and primitive data structures.

OVM Primitives

VGA/SVGA screen drivers (GFX)

Graphics routines for drawing geometric primitives to off screen bitmaps, and for translating those off screen bitmaps to the screen. Includes facilities for clipping, bit blits, highly optimised line drawing, flood filling and polygon drawing. Anything that is drawn to the screen will be drawn by GFX. FON uses GFX's bitmap handling capabilities to display fonts. These fonts are in a proprietary format, but can be generated from any Macintosh font so that a wide range of fonts are available for use in programs.

Supports all popular VGA / SVGA boards

Runs in protected mode

Supports Mode 13 and Mode 101

Palette manipulation and fading

Off screen bitmap handling

Clipping

Graphics primitives: rectangles, circles, lines, points, polygons

Displays text using a variety of Macintosh-derived fonts

Loads pictures

Sound drivers (SND)

Object oriented interface to the Miles sound drivers, allowing simultaneous playing of digitised sound effects and MIDI music. All the music, speech and sound effects for the project will pass through SFX.

Supports SoundBlaster and SoundBlaster Pro
Plays MIDI files and sound patches simultaneously
Plays patches and MIDI on an interrupt so that the program can continue operating

Resource Manager

A resource compiler allows different files to be concatenated into a single resource file and indexed. The resource component allows easy access to subsections of a resource file by using the index. RES will be used to pre-cache, interleave and access all the assets on the CD-ROM.

Reads and writes data to resources files

Access data in resources files using indices

Caches resources in memory according to need and memory available

Allows resources to pre-loaded

A resource creation programs allows any number of files to be concatenated into a single

resource file and allows files to be interleaved (so that packages of sound and video, forexample, can be mixed to stream in data from CD-ROM)

Mouse and keyboard handling (EVM)

The event manager handles user input from the keyboard and mouse and queues it for handling by VWM. It also handles timer and special program events. It enables event masking, and fine feedback on cursor movement for cursor tracking.

Interrupt drive event queue

Handles keyboard and mouse events

Allows the use of variable sized bitmaps as mouse cursors

Animation conversion tools

Animation conversion tools assist the translation of files from one format to another. See the section on Technical Details in the Artistic schedule for more information.

Move frames of a PICS file from the resource to the data fork of a file

Convert a PICS file to a FLIC file

Demonstrate the process using a sample PICS movie

Use Debabelizer to convert QuickTime movies to PICS/FLIC's

Synch sound and video in an animation format

Convert sound files from Mac to PC sound format

Animation player (FLI / SEQ)

The animation player can play basic .FLI files, and modified .FLI files which are capable of variable sizes and a variety of frame compression methods. The SEQ system used FLI to play animations. Simple scripts allow the synchronisation of sound and animation using a proprietary algorithm. Integrates closely with FLI, VWM and SFX. Every video sequence in the project will be generated by SEQ.

Plays modified FLIC files at different speeds
Plays single and multiple flics simultaneously
Uses a variety of CODECs
Integrates with VWM

Memory Manager (MEM)

Provides valve functions for accessing memory using handles and pointers. These valves check for memory protection errors, memory leaks, dangling pointers, and pointer overruns. All the memory use in the project will be co-ordinated by MEM.

Allocates and frees memory and provides pointers to memory
Traces and accounts for memory allocated
Provides debugging support

Debugger (DBG)

Controls the use and output of OVM's debug facilities; which include tracing, memory dumps, variable dumps and object validation. DBG will simplify debugging of the game by providing additional checks and security and an alternative to a source level debugger.

Provides on screen, to disk and to stderr output for errors and messages
Facilitates tracing, object validation and information dumps

Switches off for non-debug code transparently

View Hierarchy Manager (VWM)

VWM marries the screen, EVM and GFX by providing a framework for user interface components like buttons and bitmaps. It co-ordinates redrawing, user input and layering in windowed user interfaces. It simplifies the creation and manipulation of user interfaces.

Co-ordinates drawing priorities for different views
Provides resolution independent scaling and co-ordinate translations
Clips updates
Focuses, clips and orchestrates full screen or partial updates

Provides standard buttons, text, scrollbar and edit text views

Geometry Primitives (GEO)

Geometric primitives include lines, circles, rectangles, and polygons. These can drawn, clipped, intersected and overlapped using GEO and GFX. They provide a machine independent way of representing graphical primitives. Geometric primitives are used everywhere in a game.

Geometry primitives include: points, lines, boxes, circles, ellipses, and polygons.
Draws, scales, and transforms primitives consistently
Provides 'Point in Primitive' checks for each primitive.

Application Shell

The application shell provides the main event loop, OVM start-up and shutdown, and client start-up functions. It simplifies porting by isolating a program from the operating system. The game will use the APP object to handle interaction with the user interface.

Starts up and closes down OVM and provides a core event loop

File Manager

This provides simple wrapper classes for basic file manipulation (like saving games or RES's internal file handling) to check for errors.

Collection Classes

Collection classes include all the basic data structures, including lists, stacks, queues, hash tables, sorted lists, sets and (optionally) binary trees. They all are object oriented and include a range of utility functions and debugging aids. Any program that uses these collection classes and DBG gains a considerable amount of automatic debugging help.

Display systems

Layered bitmap display
Background display
Rotation of backgrounds
Light effects using bitmap recolouring and palette animation

Sprite display
Sprite scaling, rotation and animation

Prototyping

Dialogue prototyping

The dialogue prototyping allows the entry and editing of dialogues between characters. Using Hypercard or a similar PC system it allows branching dialogues to be tested by walking through them simulating player choices.

Implemented in Hypercard or similar program
Easy input and editing of dialogue text
Output of text in ASCII and resource manager string formats
Hypertext links between speeches to simulate player choices
Simulation of the selection of dialogues according game events
Simulates game event flags
Simple text based user interface
Network multi-player option

Board game

Dialogue testbed
User interface prototype
Uses Macromind Director to simulate different elements of the game user interface. Allows us to test different methods of interacting with the game and different user interface graphics styles without major reprogramming.

Allows key and mouse input
Simulates different screens: map, inventory, HUD, player database etc.
Simulates dialogue between the player and NPCs

Gold Disk CD-ROM testing

Game play testbed

This is a fully coded prototype of the game models and database, but without a complete user interface. This will allow the testing of different elements of the game play. It uses network multi-player support to simulate NPC AI.

Movement model
Combat model
Hearing / noise models
Simulated dialogue
Energy model

Game Implementation

User interface
Integrates mouse and keyboard driven commands
Controls cursor shape and updating
Controls palette changes
Save / load dialogues
Displays start up screen, attract mode, dream sequences, and end games.
Displays 3rd person animations during gameplay
Integrates map, inventory, background, sprite, database and dialogue views

Integrate display systems

Game start-up screen

Map display
Toggles between map modes
Shows exploration and player's knowledge of the map
Allows player annotation of the map
Auto-maps for the player
Scrolls and zooms
Displays icons and map overlay information generated by HUD

PC / NPC / Object interactions

Inventory display

Save and load game

Game controls

Head up display
Smart cursor
Knowledge display / hypertext system
Targeting system
HUD icons
Status line
Status graphs

Raptor toys
Scanner
System check
Night vision
Light meter
Torch / flares

Plot engine
Hand cooling complex plot elements

Game models
Player health
Combat

Dialogue system

Integrate OVM components

Game Database
All information needed by the game models and display will be stored in a game database, and access to it will be via a number of valve functions which acts as information 'librarians'. As well as allowing for efficient programming (they will be software black boxes), this will allow the database and the front end to run on two different machines (see Network Test).

Network Test
The network test component is designed to test the feasibility of running Raptor as a client / server style multi-player game over a network.

Integration
Testing
Production path testing
Primitives testing
Compatibility / configuration testing
Board game play testing
Prototype board game play testing
Final game play testing

Non-player characters

NPC empathy
Relationship table
Rules for co-operation and defection
Trust tables
Indirect relationships (the friends of my enemy is my enemy)
Branching dialogue
Prisoner's dilemma code
Hard code responses for special behaviour

NPC dialogue
Branching dialogue
Non-branching dialogue
Object request
Information request
Collaboration request
Orders

NPC learning / memory
Knowledge exchanges
Recording information about objects, puzzles, and characters

NPC behaviour
Specification for script language for NPC behaviour
Compiler for script language to generate NPC behaviour finite state machines (FSM)
FSM transition checks coded
FSM interpreter
FSM actions for movement, interaction, combat, puzzle solving, NPC objectives, and interaction
Script writing
Script testing
Special behaviours and reactions

Miscellaneous

Manual
Installation program
Code documentation
CD-ROM research
Hard disk slow down code
Disk interleaving
Mastering
Music
Sound

Asset acquisition / creation

Character voice recording
Dialogue scripting
Character VideoWrap face acquisition
NPC object modelling
Location modelling
Rendering
Intro and outro sequences
HUD graphics
Inventory graphics
Map graphics
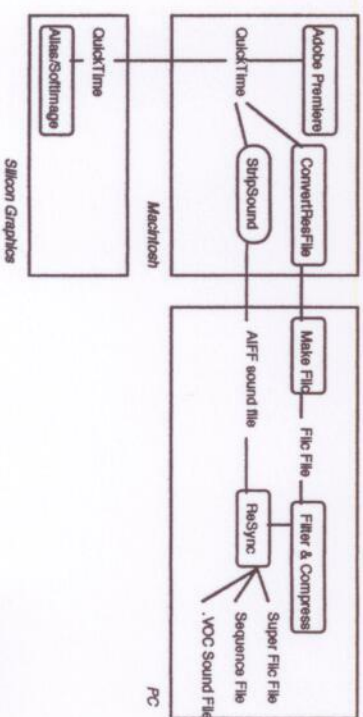Player database graphics
Nodes, maps, Murphspective
Vision animations

Video Grabbing

A Macintosh Quadra 950 equipped with a VideoVision Studio board (hardware JPEG compression) running Adobe Premiere will be used to grab video. Hi-8 video will be used for low-priority and test sequences, BetaCam will be used for the rest. Grabbed video will be archived on DAT tapes before and during editing.

Hi-8 / BetaCam — Raw video — VideoVision Studio — QuickTime Movies
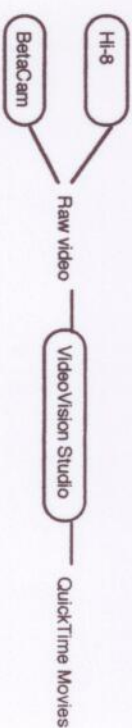
Production paths

Video, once edited in Premiere, will be saved and archived in QuickTime format and then converted to a proprietary format for transfer to the PC and the sound stripped for later re-synchronisation. On the PC the video will be run through a filter program to optimise the compression, and it will then be re-synched to the sound and a sequence player script automatically generated so that it can be played on the PC using our animation player.

Macintosh

Adobe Premiere — QuickTime — Alias/Softimage / Silicon Graphics
ConvertRecFile — StripSound — Make Flic — AIFF sound file

PC

Flic File — Filter & Compress — ReSync — Super Flic File / Sequence File / .VOC Sound File

Formats

The following file formats will be used in preparing video for use in the game.

QuickTime
Apple's standard multimedia file format - combines and synchronises sound and video. With hardware compression, can store and edit production quality video.

AIFF
Apple's sound file format - easily stripped out of a QuickTime movie. It allows different levels of quality and stereo sound.

PICS
A Macintosh equivalent of FLIC file. Used to transport animation from the Mac to the PC before conversion into a FLIC file.

Flic file
This is a slightly modified flic file format. The main modification is to allow frame sizes bigger or smaller than 320x200 pixels. If these files were 320x200, then they could be played and edited on any Flic file compatible PC program.

Super flic file
A heavily modified flic file format capable of interleaving sound and video, and supporting multiple frame compression types. It is used primarily to store extra information used by VVM and SEQ to control the area to be updated and to carry information about the length of time taken to decompress each frame to synchronise with the sound player.

Sequence file
This file is the output of a script compiler which is used by the OVM component SEQ to synchronise sound and video. For every animation sequence, there will be a sequence file, a super flic file and a .VOC file.

.VOC file
This is Creative Labs digitised sound file format.

Format conversion

Format conversion from PICS to FLIC already exists, using an Intelligent Games utility. The ConvertResFile program makes a PICS file PC compatible by moving the resource fork into the data fork. The StripSound and QuickTime to PICS conversions can be done using features of Adobe Premiere, although it may be useful to have custom utilities to speed up these conversions and to carry them out in batches. Converting AIFF to VOC files can also be done with public domain utilities, and again it may be useful to write custom utilities. The Filter and Compress utility is game-specific and depends on the video compression technique chosen.

Chapter 14 Game Rules

These rules have been designed to make a playable board game only; they are not protocols for a computer game.

The board game requires: a board, Stat Sheets for all characters, 1 six-sided die, and at least 1 Raptor player + 1 person who takes on the task of Moderator (should have experience of role-playing).

The movement rules presented below are intended for a structured traditional board game approach only. The intention is for turn movement to only become important in combat/conflict. Other actions are handled at the discretion of the moderator as in a non-computer based Role Playing Game. The moderator controls all characters not under the direct control of Raptor players hereafter referred to as Non-Player Characters or NPCs).

Movement/ actions

Actions take place simultaneously in the game.

Players select their actions in advance using the sliders on their sheets, then declare them in turn sequence. A character can only perform one action in a turn. The board is divided into spaces, which represent the 'grains' used in the computer game. They may move in the direction of their facing. Moving forward 1 space constitutes 1 turn.

They face, are aware of, and may move through a field of 180 degrees forwards (inclusive of directions precisely at right angles to direction of facing). When characters move, they automatically end their turn facing in the direction of movement. To turn right around (through 180 degrees) is 1 action. All movements are equal in duration.

Moving Things Around

In order to move an object/character, you have to overcome its original body level with your current body level. If yours is equal to or higher than the object's, you can move it, if lower, you can't. Certain paths may be of constricted size as well, and exclude larger characters. Object size in a constricted space is subtracted from the size of the space to calculate the size of the gap left.

(Example; Kurt finds his path blocked by a heavy wooden throne (size 5) which almost fills a doorway, leaving only a size 3 gap to pass through. He is Body Size 4, and therefore cannot budge it, nor can he pass through the gap; he must find another path. Later, Edgar (body size 5) comes to the same throne. His size equals that of the chair, and so he can push it out of the way, and pass through the now larger gap.)

Perception

Basic sight extends over 2 spaces, but is further limited by lines of sight, determined by the moderator where necessary. 'IR' augmented sight extends up to 4 spaces by line-of-sight. This only remains active for 1 turn, it does not remain active across turns. Creatures begin hidden (only the moderator knows about them) and are only revealed to the Raptors when discovered.

Normal speech may be overheard over 3 spaces. Characters may make themselves heard over up to 6 spaces, but this allows all within up to 6 spaces to overhear them.

Gunshots may be heard over 10 spaces.

Footsteps may be heard over 1 spaces.

Any significant obstruction (closed doors, 3 consecutive corners) reduces sound range by 4 spaces.

Any line-of-sight obstruction generalises the direction of sound to a quadrant of 90 degrees (the hearer can only identify the source of sound as being within this quadrant). If a clear line-of-sight exists, the sound can be pinpointed precisely (particularly important in the case of animals which steer by sound).

Raptors' helmets give an automatic proximity warning if any life form approaches within 1 space.

All perception ranges and reactions are kept up-to-date by the moderator.

On a surprise encounter between Raptors and other characters (one where no line of sight has existed previously and no sound has carried between them) the non-Raptor character is surprised for 1 turn. Surprised characters must continue the action they were conducting last, and cannot react to the presence of the Raptor.

(Example; the Raptor Kurt and the guardian Edgar both approach one corner from different directions. Arriving at the corner first, Kurt waits before continuing around it. He therefore hears Edgar when he approaches on the next turn (footsteps carry over the one space that separates them), but because Kurt is not moving when Edgar approaches, Edgar can hear nothing. Therefore, when Edgar rounds the corner, he is surprised and Kurt has one free action before Edgar can react.)

Combat

If you can see it, you can shoot at it. You need only spend one move aiming, after which the cross hair is centred on the target and firing is instantaneous. Whether or not you hit is determined by rolling 1 six-sided die. To the number rolled you add the Body Size of the target, and from it you subtract the range from firer to target in spaces. If the result is 5 or greater, you have hit. Damage for the gun is calculated from the number shown on the die +2. Therefore, requiring a 5, you roll a 1,+4 for body size =5, -0 for no spaces range- a hit. 3 points of damage would be inflicted (the number shown on the die +2). As yet, no rules exist for partial cover. If the Target has elected to move during the turn that they are attacked, a further modifier of -1 is applied to the roll.

Guardians throw round knives, based on the same to-hit system as the gun, but with a to-hit number of 6 instead of 5.

Damage inflicted is the guardian's current body level +1, -1 per space of range.

Hand to hand combat can only occur if two or more characters occupy the same space. The number required to hit is 5, on 1 die + body size of target, - 3 if the target attempts to dodge/parry the attack.

Hand to hand weapons (generally swords/axes) inflict damage equal to the wielder's current body level +/- the modifier of the weapon. Fists have a modifier of -2, and swords or axes have a modifier of +2.

(Example; Kurt wants to shoot Edgar. Edgar has body size 5 and is at a range of 1 space. Kurt requires a 5 to hit. He rolls a 2, +5 for Edgar's size, - 1 for the range, -1 for Edgar's movement makes 5, and Edgar duly takes 4 damage (original hit roll of 2, +2) leaving him on 1 body level. Edgar simultaneously advances to the same space as Kurt, and for their next actions, both attack. Kurt fires again, rolling a 5 + 5 - 0 = 8, for 7 more damage, which will kill Edgar outright (leave him on -6). Edgar rolls a 6 to-hit + 4 (Kurt's body size) - 0 (Kurt is not trying to dodge) = 10, meaning that he could do 7 damage (5 (Edgar's body size) +2 for the axe) under ideal circumstances. However, his current body level is 1 (due to the wound he sustained on his last action, but not counting the damage Kurt is doing him at the moment), which means he can only do 1+2 for the axe = 3 damage to Kurt. At the end of the combat, Edgar is dead and Kurt is left on 1 body level.

Healing/Regeneration.

Characters heal at a rate of 1 body level per turn. There is a delay of 2 turns before any healing takes place in order for blood loss to stop etc.

While a character is on 0 or less body levels, they can take no actions.

Total, final death comes when a character has been reduced to less than the negative of their maximum body level. Therefore, a character of body level 4 must be reduced to -5 (1 below the negative of their body level) to die without hope of regeneration. All characters may use swords to administer a coup de grace, though only guardians may use swords in combat. If a monster has incapacitated you, and remains to eat you, it inflicts its own body levels in damage/turn.

(Example; Kurt is left on 1 body level. No healing takes place for 2 turns, then Kurt heals at 1 pt/ turn. It will take him 5 turns to heal entirely. Edgar, on the other hand, is on -2. It will therefore take him 2 + 3 turns to get up to 1 body level and regain consciousness, then a further 4 turns for him to heal fully)

Energy Use

Raptors' equipment carries a maximum of 20 energy points(EP).

Every turn spent in lighted spaces can regenerate 1 EP.

Every turn spent in an unlit space (corridors/certain rooms) costs 1 EP.

Alternative Rule; Energy is generated by body movement/heat, and normal actions can maintain a sight level of 2 grains. Every turn spent stationary or speaking only costs 1 EP. Every turn of movement forwards gives 1 EP.

Vision may be augmented to the further zone at 2 EP cost per turn.

All of the above costs are calculated at the end of a turn, after all actions.

Each firing of the gun costs 5 EP.

Alternative Rule; Firing the gun costs no energy, but you only begin with 7 shots' ammunition. In this case, the max. energy level is 10 points.

The strategic detection system allows you to detect life within 10 spaces' range and costs 6 EP/move or second to use.

The narrow beam scanner allows you to scan straight ahead in a 90 degree arc for 10 spaces, and costs 2 EP/sec to use.

Viewing through other Raptors' helmets costs 1 EP.

All of these costs are calculated at the time the action is taken.

If at any time Energy falls to 0, the first three turns spent in a lit space thereafter (or moving) are used for rebooting the system, and only after this time does energy start to regenerate. Only the proximity sensor remains operational at all times.

(Example; in the above example, Kurt is about to enter a corridor, and uses his narrow beam scanner to check the terrain ahead (costs 4 EP for 2 second scan, returned 1 EP for still being in a lit space =17). He detects Edgar moving through the next room, and advances into the corridor (-1 EP for 1 turn in an un-lit space gives total 16), where he waits for 1 turn(-1ep: total 15). Edgar rounds the corner, and Kurt fires his gun(-5 for the shot,-1 for the un-lit turn.: total 9). The next turn Kurt fires again (-5 for the shot,-1 for the turn: total 3), and, having downed Edgar, advances around the corner (-1ep for an un-lit turn: total 2) and into the next room (regenerate 1ep: total 3). He will not now be able to fire his gun for at least a further 2 turns. If he fires at that time, he will use up all of his energy reserve and will be on 0 energy for 3 turns.)

Special Locations

These are intended to give an additional degree of complexity to the setting, and to provide relief from the oppressive, heavy atmosphere generated by the sombre gothic architecture which dominates the temple complex.

1) The Wharf described in the 'examples of puzzles' section - the player treks down a cramped passageway for some distance, eventually emerging into an enormous cave-like space - the 'Caverna Marea' or Cavern of the Sea. Immediately in front of the player is a crumbling stone wharf, moored to which is a pair of huge, decayed galleons, which sag and slap against the quayside. These are the ships which transported the materials for the temple's construction, and which brought the slave labourers to the site.

Hanging from the rigging of the further ship is a string of corpses - the mutinous slaves who tried to escape the complex when it became apparent that they were not to be allowed to leave on its completion. The ship is infested with the angry ghosts, who will attempt to mislead the player as much as possible, and will berate the player for as long as they remain in the area. The ships are in an advanced state of decay, and in many places the decking has fallen through - the player will, however, through perseverance, discover objects and notes made by the guardians during their torture of the captives, which allude to the secret passage made by Tomas, and which detail where Tomas was buried in the complex. No mention is made, however, of where the outlet of the passage is, the guardians know only that its entrance is somewhere near to the grail.

2) A chamber which has mostly collapsed into the cavernous labyrinth of Underworld - the haven of the dinosaurs, and other mutated creatures. The floor of this chamber has fallen away in almost all places, and has been replaced by a makeshift wooden scaffolded structure. The animals cannot climb the supports, so the walkways are actually relatively safe, but the paths are narrow, and there is a vertiginous drop to the floor of the cavern. This might well be home to a group of Mogs, the ape-men that have claimed certain parts of the outer temple, and passage through it could prove extremely difficult without their goodwill. Both above and below, this location holds a multitude of crawl-ways, nooks and crannies, all affording unexpected views of other parts of the cavern and the scaffold structure - an ideal place to hide objects, characters or clues.

3) The "light" room - a haven for all humans, this room has large colonies of the phosphorescent fungus which can be found throughout the temple's precincts. The light in this room repels the animals which have grown accustomed to the dark that reigns most of the outer temple, and so the room has become a valued safe place inhabited occasionally by guardians and others who have merely strayed into the temple. As well as providing a good source of light in which to recharge the Raptors' helmets, this room can be a good place to arrange to meet people, and a good means of encountering new characters for the first time. Generally, the player will only be able to find it through invitation, and it is not represented on Sir Richard's map.

These are protocols for a board simulation of the computer game. The game detailed here will appear stilted unless played out with the speed and management abilities of a computer.

Moderator's Notes.

The role of the moderator is unlike the role of the players. The players need only control their own Raptor character, and their objective is to win. The moderator, however, must manage the game, help to make it fun for the players, and present all the details of the game to the players' satisfaction. This involves some spur-of-the-moment invention on the moderator's part in both description and arbitration, and especially in the conversations which may take place between the Players' Characters (PC's) and the Non-Player Characters (NPC's). It is the moderator's job to make the setting and the characters come to life, and this can only be achieved through vivid description and enthusiastic storytelling. To help with this task, and in order to give players a clearer view of Raptor, pictures of all the major locations have been included, along with descriptions of all the characters involved, so that the moderator can have a template on which to build the inhabitants of the temple.

Checklist For Moderator's Bookkeeping:

1) Hide all tokens the PC's can't see so they don't use them as clues.

2) Mark unlit rooms once explored.

3) Use the Moderator's map for your own reference.

4) Make player screens so they can hide their decisions.

5) Keep the game moving along - don't give players too much time to think, keep them off balance.

Moderator's Turn Sequence:

1) Get players to make a decision on moving

2) ...and MOVE.

3) check all players' views - if any can see a new scene, show it to them at the first opportunity

4) describe the scene fully. If there are any bits of puzzles around, tell the player about them- do not wait to be asked. Show all relevant pictures immediately - they are a powerful clue to the presence of puzzle.

5) Always turn all characters to face the direction of their movement.

Gameplay Summary And Moderator's Instructions.

This is a complete list of the characters and puzzles, and their locations in the temple complex. It is intended as a set of guidelines only, and not an exhaustive treatment of all the situations which can occur in the game, or all of the possible paths to solving the puzzle.

18) Sir Phillip. If a player talks to Phillip, he will tell them that Sir Tallum patrols the corridors and will not tolerate anyone else being in the temple, not even himself, Phillip. He says that the way to deal with Tallum is to tell him that they are a friend of Sir Richard's, whom Tallum feels guilt over, believing himself to have killed him. This stratagem will allow them to get close enough to dispatch him at (8).

12) Darkened room. Subtract 1 ep per turn in this space.

11) Room inhabited by Warren- If played as an NPC, he will not move until another Raptor comes within his sight or makes a sound he can hear. Then he will do nothing overtly violent to the other Raptors unless fired upon himself. Warren exists to help the other Raptors by example - if they cannot work their way through a puzzle, Warren will complete part of it himself, or act in a way which suggests the solution. Warren, in addition to the usual Raptor gear, carries a light pick which can be used in combination with the ratchet mechanism from the baths to raise the portcullis without co-operation with another character.

10) Tomas the surly ghost inhabits this space. He will try to direct Raptors towards one another, referring to them as all being friends. He hates the knights (he maintains that they killed him) He will tell anyone who waits around for long enough that he is buried in the sarcophagus in the middle of the room, with "the marks of his trade". If the top of the box is moved aside (it has a Size of 4) the body is revealed with a wooden mason's square, a pair of dividers and a measuring pole (which can be used as per Warren's pick-axe). At the moderator's discretion, there might also be an entrance to a passageway of 4 spaces' length leading to the space behind Sir Tallum.

8) Sir Tallum waits at the far end of the corridor, and will challenge anyone who enters. He is armoured, and armed with a throwing knife. The player must talk to him about Sir Richard to stop him from just trying to kill them before they can get close enough to get a shot through his armour. The situation is highly volatile, however, and ultimately, they will have to shoot him.

7&9) At 7 is a large dinosaur called a Leo blocking the corridor, it is disinclined to move. At 9 there is a small group of turkey-like dinosaurs called Eugenes huddled in one space. The suggested way to pass the Leo is by shooting one of the Eugenes, then remaining still in the corner. The Leo will come towards the sound, and, distracted while eating the dead Eugene, will be easy to sneak past. If, however, the Leo detects any sound either before or after it fails to eating the Eugene, it will pause, 'look' around by emitting a series of sonar 'pings'(see description), and let out a truly ear-splitting roar, in an attempt to frighten anyone there into moving and betraying their position. If a few seconds elapse and the player does not move, then the Leo will calmly resume its meal.

6) Baths puzzle: There are two chambers in this puzzle. The first is a confessional. On examination, The player will discover that one side holds a skeleton. If they enter the other side, a voice asks them to tell their sins. It is Father Dunstan, a ghost. He tells them to have themselves baptised in the room next door. If they complain that the water is too dirty, or not holy water, he will drain the baths for them (believing that they will refill with clean water), so that when they enter the floor is visible. On the floor is a greek key pattern and a set of symbols as showm in picture 20.

If the player investigates the fish tile on the wall, it rises up, and reveals the pump/ratchet mechanism for emptying the baths. Above the original water level are two bulls of bronze- they are the founts from which the water normally flows. On the floor of the pool is the third, which has fallen from its perch. Three is the correct number of bulls for the Christ mural.

Almost opposite this, and marked on the map, is a picture on the floor of a knight, his feet facing the wall, and his hands raised in warning. On the wall at his feet is an area of paving. This is the reverse of the rotodoor trap in the pink area beond the wall.

5) Chest/crypt puzzle: player first encounters an ornate devotional shrine - a few yards further along the corridor there is a mural of the canonized Sir Vincent, under a tombstone. Almost opposite this, and marked on the map, is a picture on the floor of a knight, his feet facing the wall, and his hands raised in warning. On the wall at his feet is an area of paving. This is the reverse of the rotodoor trap in the pink area beond the wall. In Vincent's hand is a symbol which is repeated on the shrine(the double-barred cross), which, when pressed, swings the shrine away to reveal a staircase down to the crypt which has 4 gothic sarcophagi in it. The one which bears the same heraldic device as the mural figure is Vincent - on the side is a date printed in Roman numerals. The date is MCLXI. Returning to the mural, the player scans down the numbers on the book he holds and picks out the ones which repeat the number on the coffin. When the sequence is completed, the numbers glow brightly, and the number of lions at Sir Vincent's feet reduces to 4, the correct number for the Christ mural.

At the junction of the green and pink levels is the Portcullis puzzle: this requires co-operation between Raptors, or the pump tool from the baths puzzle. The way is blocked by a heavy portcullis, which requires the strength of two Raptors to lift. Once raised, there is a short delay before it falls back down again, so that both Raptors have a chance to get through. Alternatively, the pump tool can be used on the portcullis, but for this a player also needs the rod found & carried by Warren or the measuring stick in Tomas' tomb.

3&4) The pink area in which a Leo dinosaur roams. There is no scripted way to pass this Leo, except by remaining still in its presence, no matter what it does, until it goes past the player. This Leo is larger and nastier than the one on level 2. It will not simply blunder into the player if the player is wise enough to leave another space in which it may pass. It will, however, play for dramatic tension, and do its full roaring, sonar scan act, before moving on. A sadistic moderator might have the Leo enter the same space as a player, and then describe it as roaring directly into the player's face, causing the player to lose all hearing for the next 7 turns.
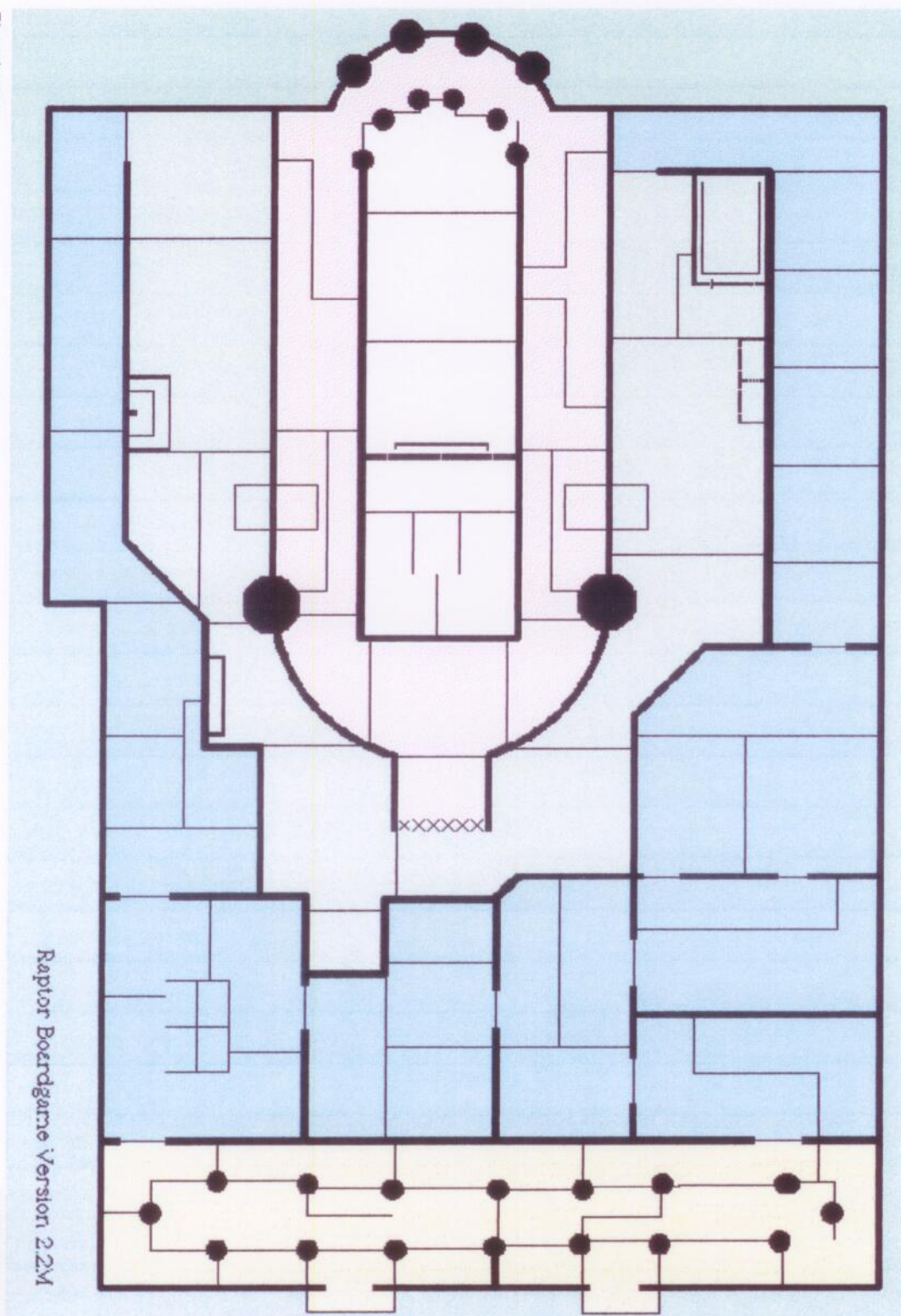
Also in each of these areas is a 'rotodoor' trap. At the trap is a mural of a knight, standing erect with his hands raised in a gesture of warning. If a player continues towards the mural, they are thrown out into the chamber on the other side of the wall. This is heralded by a scraping grinding noise. It is possible to attract the attention of the Leo, then run across the trap, and spring the Leo out of the room that way.
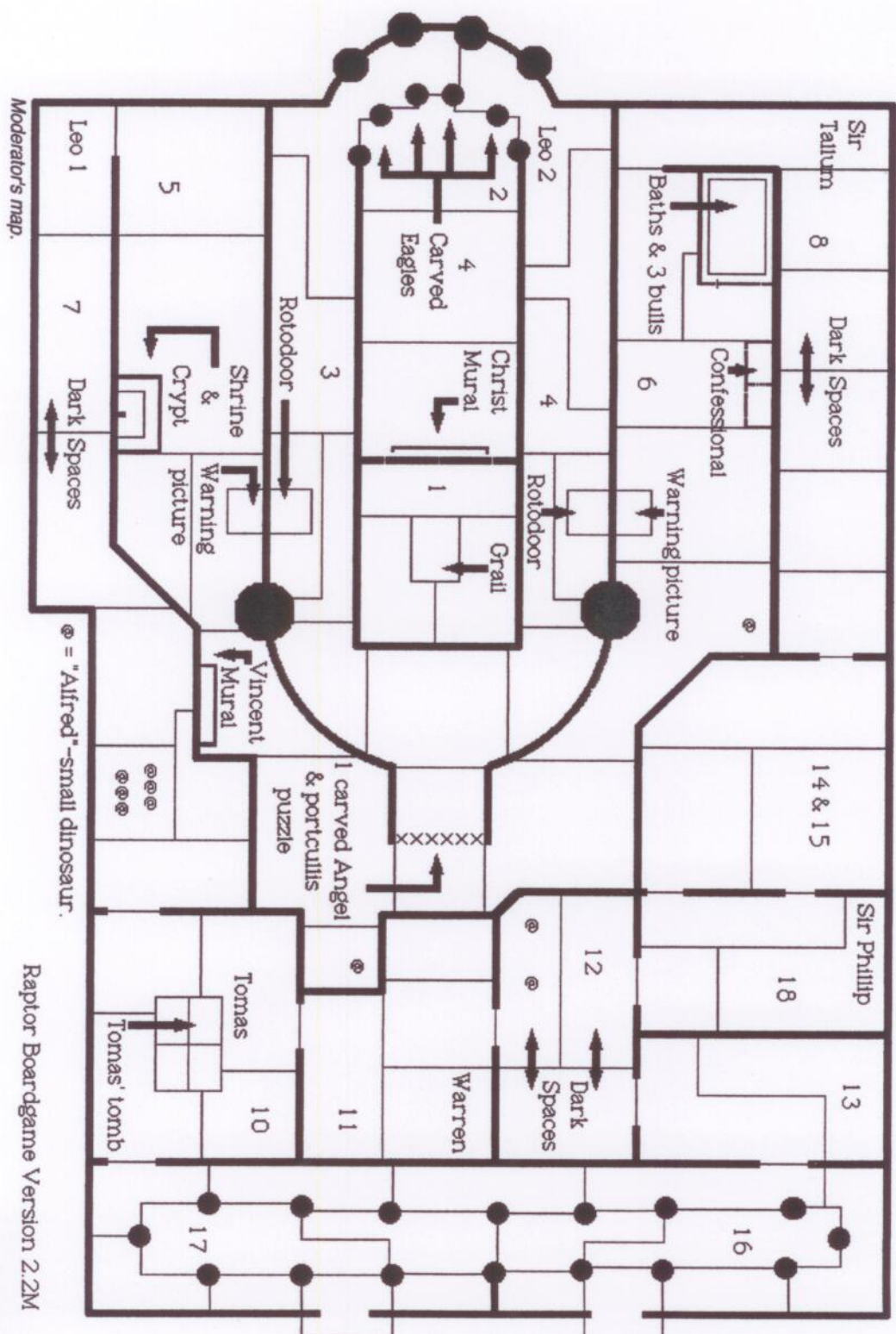
2) Atrium. On the four pillars which face the doors to the grail chamber are four eagle figures, their wings spread in a gesture of benediction. On the door to the grail chamber is a mural showing a figure of Christ, surrounded by Eagle, Bull, Lion & Angel. He holds a book in his hand. The other hand indicates the angel.

The Solution is to select the numbers on the book which correspond to the numbers of creatures you find in the complex— 1 angel over the portcullis, 4 eagles on the pillars in the atrium, 3 bulls in the bathhouse, 4 lions on the mural of St. Vincent, then enter them as a Roman numeral date as per the mural of Sir Vincent at (5), to make MCDXXXIV

1) Grail room. The first character to reach the centre space is the winner.

Raptor Boardgame Version 2.2M

Moderator's map.

Leo 1

5

7   Dark Spaces

Sir Tallum

8   Dark Spaces

Baths & 3 bulls

Confessional

6   Warning picture

Leo 2

2   Carved Eagles   4

Christ Mural   4

Rotodoor   3

1

Rotodoor   Grail

Shrine & Crypt   Warning picture

Vincent Mural

xxxxxx

1 carved Angel & portcullis puzzle

14 & 15

12   Dark Spaces

Warren

Sir Philip

18   13

16

Tomas

Tomas' tomb

10   11

17

@ = "Alfred"-small dinosaur.

Raptor Boardgame Version 2.2M

Character Stats and Descriptions.

Sir Phillip de Beavauls.

Body level 4. Equipped with a sword and 1 throwing knife.

Sir Phillip is paralyzed by indecision. He will speak in a friendly manner to all non-hostile players, and will volunteer the information about Sir Tallum, while constantly interrupting himself with doubts about whether he should talk to these unknown folks who are so strangely dressed...

Sir Tallum Broadhand.

Body Level 5. Wears armour which automatically reduces all damage by 1.

Equipped with a sword (shackled and welded shut to his wrist) and four throwing knives. When the player's HUD identifies him, it will distressingly report the presence of 67 metal items.

Sir Tallum is now only just capable of reasoning enough to speak. He will challenge the player as soon as he senses them(at a range of 5 spaces)and unless answered immediately to his satisfaction will start to throw his knives, advancing each turn. If placated by the mention of Sir Richard, he will become slightly confused, but will reet to his usual murderous psychotic state within a few turns. If the player says any-thing inappropriate or unwise, he will turn against them immediately.

Tomas

Tomas has no physical stats. He will speak readily enough to any-one who challenges him, trying to disturb them by being unnecessarily graphic about his execution and the state of his corpse. He will side with any who denounce the knights, and will offer his tools that were buried with him if he's convinced that the player will use them to thwart the guardians.

Father Dunstan.

This ghost has become confused about his own situation, and will offer to take confession from anyone who enters the confessional. He will act in a Kindly manner, and carry on a conversation easily, but will swiftly recommend that the player be baptized n the baths nearby.

Eugenes / Alfreds

Body level 2. If alone, will skulk in the shadows. If in a group, will hog the brightest area of light. , These are scavengers, and if left alone with an immobilized player for three turns, will start to eat them at a rate of 1 damage per turn. If they are injured, they will start to emit a loud hooting noise, audible over 12 spaces, and will not shut up unless their circum-stances change. If there is a group of them, and one of them is attacked, they will all start to hoot. When a Leo enters their space, they will all immediately fall silent. Also, when in a group, they will retaliate if dis-turbed by attacking for a total of 1 damage per turn.

Leo 1 in the blue area.

Body level 7. Teeth +3 damage.

This is an enormous carnivorous albino dinosaur, with a large sonar-sensitive fan ear across the back of its head instead of eyes. It will not move unless drawn forwards by a loud noise. As soon as it senses anything, it will emit a series of high pitched sonic 'pings' looking for signs of movement. If it detects a movement but cannot aquire a definite 'fix', it will let out an ear-splitting roar audible over 15 spaces, endeav-ouring to frighten any creatures present into moving, which will enable it to 'see' them again.

Leo 2 in the pink area.

Body level 8. Teeth +3 damage. Impervious to gunfire except for the fan across the back of its head, which counts as body level 2 for both targeting and damage purposes. This one will move directly towards any source of sound. It can detect footsteps up to 2 spaces away, and speech at double normal range. It will react to nothing, however, until the portcullis is raised, in which case it will advance towards the noise this causes.

Glossary

Ad-lib
The original PC-compatible sound card. The Ad-lib play synthesised music, but has no capacity for playing sampled sound.

Aeternis
The underground temple in Raptor. The name is derived from the Latin for 'eternity'.

AIDS2
A mutation of the AIDS virus which threatens to destroy the world.

Alias
A powerful 3D graphics creation program which runs on Silicon Graphics workstations.

Array
A data structure used frequently in computer programming to store information as a table.

Assault Rifle
A weapon with a high energy cost to the player, which inflicts considerable damage but has limited range.

Bit Blt
A routine which takes a piece of graphics stored in memory, and actually moves it onto the screen (or into another part of memory).

Bitmap
This is how a computer stores a picture, as a series of dots, or pixels.

Branching Dialogue
A system used by Intelligent Games to store conversations and game occurrences as a tree-like data structure with dialogue fragments chosen according to their priorities (which are decided by other game events).

C++
A high-level, object oriented programming language which compiles efficiently for fast executable programs. C++ is ideally suited to game development, and is used extensively by Intelligent Games.

Cache
An area in memory or on hard disk used to store data temporarily to avoid many of the speed problems associated with CD-ROM games.

CD-ROM
Compact Disk Read Only Memory. A method of storing computer data on compact disks, like those used in the audio world. CD-ROM allows around 600 megabytes of data per disk (compared to 1.5 megabytes on a floppy disk) but is considerably slower than a PC's built-in hard disk drive.

Console
Any home video game system which is not classed as a home computer (this generally means that it does not have a typewriter keyboard). This includes systems made by Nintendo, Sega, Atari and the 3DO licensees.

Cursor
An on screen pointer, generally controlled with a mouse.

DAT recording
Recording audio signals onto Digital Audio Tape (DAT) the standard media for high-quality audio work.

Depth Cueing
The technique of displaying objects at a brightness related to their distance from the viewer. This not only looks impressive, but can cut down the number of sprites which need to be displayed.

Dunstanburgh
The home of Aeternis, in Northumberland, England.

Empathy
A measure of an NPC's general trust and liking for the player (or for another NPC).

Eugene
A relatively harmless scavenger, about the size of a turkey. Eugenes can cause trouble by making a loud noise when distressed, attracting other, more harmful creatures.

EVM

Event Manager - A part of Intelligent Games' OVM library, which deals with mouse, joystick and keyboard use.

Finite State Machine

A means of representing the behaviour of a character or object as a series of states. The character or object can pass from one state to another, depending upon its stimuli.

FLI

An efficient animation format for computer graphics. This method only stores the differences between successive frames of animation.

Grailstone

A phosphorescent rock with strange healing powers to which prolonged exposure may result in mutation - the material of which the Holy Grail is made.

Gravis Ultrasound

A relatively new PC sound card. The Gravis Ultrasound offers higher music and sound effects than those possible with a SoundBlaster or Ad-lib card.

Guardians

The Templar Knights guarding the Grail.

High granularity movement

The ability to move freely around a game world. This is not a feature of most CD-ROM games, which restrict the player's movements and hence his/her gameplay.

Holy Grail

A goblet fashioned from Grailstone like that found around Aeternis, which has since passed into Christian history.

HUD - Head-Up Display

A Terminator/Robocop-style overlay, which overlays important information onto the player's real-world view.

Hunter/Seeker

The tracking device attached to a raptor's MS-2 helmet.

Hypertext

A visual method of associating pieces of information (pictures, text, animation and sound) - the user may select certain 'hot links' in one passage which may lead onto another topic. Raptor uses a hypertext-like system for displaying the knowledge data-base on the HUD.

Icon

A small picture (or piece of text) on a computer screen which may be clicked upon (often with a mouse pointer) whose appearance suggests its function. For example, a 'save game' icon may be represented by a small picture of a floppy disk.

Inventory

This contains all objects in the player's possession.

Joypad

The game controller which now comes with all consoles. It has superseded the traditional joystick in function, allowing the player to control an 8-directional movement pad with one thumb, and providing between three (Sega and 3DO) and six (Nintendo) fire buttons.

Knowledge Database

The system of information storage available to raptors via the MS-2 helmet.

Knowledge database

The player's store of acquired knowledge, held in the MS-2 helmet for convenience.

Leo

A large, eyeless, sonar-tracking, translucent albino dinosaur. The successful player will learn to steer clear of these.

Link

A path between nodes. NPCs may exist at any point along a link.

Lip Synch

The accurate synchronisation of speech to animation, to give the impression that the words are being spoken by an animated character.

MIDI

Musical Instrument Digital Interface - A means by which electronic musical instruments (synthesisers, sequencers, samplers etc.) can communicate.

Miles Sound Drivers

A set of programs for PC-compatible computers, allowing a variety of different sound cards to be used with no additional programming.

Mogs

Primitive, human-like creatures residing in Aeternis.

MS-2 helmet

A state-of-the-art virtual reality helmet worn by the player's Raptor to provide information about the environment.

MurphSpective

Intelligent Games' system allowing sprites to appear behind or in front of background objects, without using layered background planes.

Node

A point at which the player may stand in the game. At each node, the player may rotate his/her view through a full 360 degrees.

NPC - Non Player Character

Any character encountered in the game.

Nyquist Limit

A value which places an upper limit on the frequency of samples which can be taken at a certain sampling rate.

OVM - Object Virtual Machine

Intelligent Games' code library which allows games to be ported to a variety of machines with no additional coding.

PCX

A file format for still-frame pictures.

Pixel

The smallest measurable point on a computer screen. Each pixel can be displayed in any of 256 colours on a PC VGA or SVGA screen.

Puzzle

A puzzle in the game represents any problem which the player must overcome in his/her quest. Some puzzles are part of a test prepared by the knights Tobias and Geffreye. Some puzzles require co-operation.

Raptor

A professional plunderer.

Ray Tracing

This is a process which traces light beams back from the viewpoint, through each pixel on the screen. Each ray is followed back into the virtual world until its source is found - the resulting colour of the pixel is then calculated. Ray tracing allows transparency, reflections and shadows.

Remote Sensor

A small, circular movement sensor which the player may attach to walls to detect other characters in the game.

Render

The process of creating a photorealistic image using a 3D modelling package.

Renderman

A package which runs on a variety of different computers, which can render 3D images.

Sample

A piece of audio data, stored in digital form inside a computer.

Silicon Graphics

The company which manufactures high-end graphics workstations, such as the Indy, Indigo and Reality Engine.

Sniper

A weapon available to raptors. Has a lower energy cost to the player, and can be used over a longer range than the assault rifle, but it inflicts less damage upon an opponent.

Sound card

An add-on card for the PC, which extends the computer's functionality to allow the production of sound of higher quality than is achievable with the PC speaker.

SoundBlaster

The 'standard' sound card for the PC. The SoundBlaster uses FM synthesis (as used in Yamaha synthesisers in the early 1980s) for music, and supports 8-bit sampled sound.

Sprite

An animated, graphical figure used to represent a character in the game. Conventionally, sprites are 'flat', existing in two-dimensional game worlds (such as in a platform game). Raptor uses 3D sprites, rendered from eight viewpoints, to give a real feeling of depth and freedom.

State Machine

See finite state machine.

Super VGA - SVGA

A set of high resolution graphics modes for the PC, which supersede those defined as VGA. Intelligent Games' library includes full SVGA support for mode 101, which has a resolution of 640*480 pixels with 256 colours.

Templar Knights

An ancient order of knights charged with guarding the Holy Grail.

Texture Mapping

The process of applying bitmaps with texture information to 3D models, to give added realism. This will be used in conjunction with ray-tracing when generating the game's backgrounds and sprites.

Theo

Man-sized translucent chameleon descendent with long feelers and a highly developed sense of hearing.

Transition

The movement of a finite state machine from one state to another.

Underworld

A dangerous area under Aeternis, to which entrance has been barred (to keep its inhabitants out of Aeternis, rather than vice versa).

User interface

The level of a computer program at which the user interacts. User interface design is an intriguing mixture of art, psychology and science.

VGA

A graphics mode supported by all modern PCs.

VideoWrap

Intelligent Games' system of texture mapping live action video onto a three-dimensional model. VideoWrap will be used extensively in Raptor, for generating realistic faces on NPC sprites.