Titor's Equilibrium Project
Formal Game Proposal - Sketch

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1.1 Introduction

1.1.1 Background

In SS06 we worked, as group, to the winning project of the class Physically Based Simulation. The project was called Chuck Box (in honor to Chuck Norris) and was a real time 3D rigid body simulation, where the user could use some ”Force Power” (inspired to both ”Star Wars” and ”Cell Factor”) to move around simple objects (cube, spheres, ...), everything inside a simple box arena. Despite the simplicity of what we had as ”game-play”, ChuckBox was real fun, and quite addictive. We are therefore interested on pushing that concept further, by creating a real game

Our game is called ”Titor’s Equilibrium”. The first word refers to John Titor, a person(s?) that in 2000/2001 was quite active in the internet time related communities, claiming to be a time traveler from the year 2036. He was supposedly sent back to 1975 to retrieve an IBM 5100 computer which he claimed was needed to ”debug” various legacy computer programs in 2036. Besides the fun of the thing, we got inspired to the concept of time handling and we planned to put it into the game (slow motions and, if possible, time reversing). The second word refers to the physical concept of equilibrium, which we, as Titor, are going to break :)

1.1.2 Game ID Card

- Arcade game type (simple actions, fun reactions!)
- World is virtual, physically based and bounded in space.
- Goals are to destroy/hurt targets, survive for some time or carry object somewhere.
- ”Score system” and ”end-match statistics” based on player(s) actions.
- Visually clean and high tech (mixture of Tron and The Cube)
- Electronic ambient music and sound effects.

1.2 General Description

The game takes place inside a virtual reality run by an ancient artifact (ideally a IBM 5100). The virtual reality entails:

- An arena, composed by:

  - infinite mass objects (boundary and obstacles)
  - finite mass object (rigid bodies)
  - special volumes (force fields, inaccessible areas, ...)
- Ghosts (Human and Computer guided players)

The players are supposed to be ghosts that can move around freely in the playing area and infest rigid bodies. Ghosts will be able to cast physically related powers to alter the dynamic of the simulation.
There are two main factors that determines the game possible situations:

- Time (Running/Stopped)
- Ghost Status (Free/Bound to object)

When time will run, the simulation of the rigid bodies will take place. The arena structure will not be affected by the collisions. The force fields involved will be gravity, plus specific force field meant to make the arena more interesting. When time is stopped, the simulation will simply freeze, while the game will still be running. Some actions, such as rotate the camera, will be always feasible. Other, such as power casting, will require the time to run to be accessible.

1.2.1 Arenas

The arenas will be mainly composed by a single area, with a defined boundary, and some obstacles. The arena will also have some special volumes which will affect the physical simulation and other game-play aspects. (gravity and torque fields, inaccessible or regenerative areas, ...)

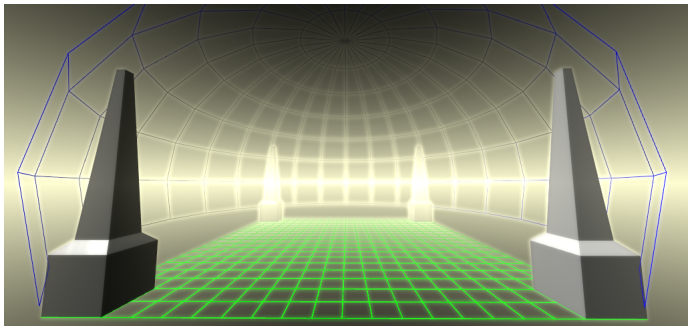

Figure 1: Arena sketch

1.2.2 Rigid Bodies

Rigid bodies are the things a ghost can interact with, both by using them as host, or by casting powers on the. They are mainly cubes and spheres (cylinders?), with defined sizes. They will interact during the physical simulation. They will be available as host to the ghosts.

1.2.3 Ghosts

A ghost has two main status: free and bound to object. **Free**(**F**) means that it is not attached to any rigid body. In this status the ghost is free to fly around the arena. Visually speaking it is no more than a will-o-the-wisp, a light particle(s). Moreover the ghost is supposed to have a bar specifying:

- Energy

In free status energy is nothing more than a slowly decaying bar. If it reaches zero, the ghost is dead. This will force the ghost to look for a rigid body if it wants to survive. In addition to this, in the free status, the ghost is *not allowed* to cast any physical power, i.e. the only interaction with the game is either die or infest a rigid body.

Once a ghost enters into a rigid body, it becomes **bound to an object**(**BTO**). When bound to the object, ghost and host rigid body become one. If the rigid body collide with something and is pushed away, the ghost is also moved. If a torque is applied to the object, the ghost view will also be affected (however not with a one to one mapping, because we son't want the player to throw up any two minutes of game ;). In "bound to object" status the ghost will also gain characteristics and powers. The characteristics will be:

- Bound Strength
- Energy

Two bars will show the amount of each quantity. When a ghost infest a rigid body, the bound strength bar is fully replenished. During the game the damage inflicted by the other players will lower the strength, and if the "Bound Strength" goes to zero the ghost is kicked out the rigid body and goes back to the free state. The only way to recover bound strength is to quit the current object and look for an other, or in the case of blue objects, use a special ability. The ghost is *allowed to leave its host rigid body at any time*. However to get back into an object, the ghost must be close to it.

The energy is used to cast powers. There is an amount of initial energy granted to the ghost when it first enters into a rigid body. Every time the ghost cast a power

a certain amount of energy is drained. When the energy is spent, no more powers can be casted. There are three ways to recover the energy. One is to wait enough time so that the energy is recovered (small regeneration rate). One is to quit the current object and look for an other (energy goes to initial quantity). The last one is to get damages (high regeneration rate). This method is the only one that can brings the energy to a higher level than the initial one (energy charge override). Therefore there is an implicit healt/energy trade-off.

1.2.4 Powers

There will be two types of powers: Online vs. Offline. **Online** powers can be casted while the simulation is running. They are immediate and relatively simple, and will require less resources. **Offline** powers will be available only when the time is stopped. They will consume more energy, but also have more interesting effects.

In general online powers will make use of gravity fields, will deal damage to the enemies in various form (provoking collisions, through energy beams, ...), or will be used to reflect damage, recover health, or do other game-play stuff. They will be casted during the simulation actions, when the game is in first person view. The classic way to cast an online power will be the following:

1. select it from the powers (the HUD will display a MaxOSX like bar for the powers, see HUD Figure in Mockup section).

2. Turn the view (aim) toward a target (this makes sense for directional powers only)

3. Push the power activation button

So for instance is the power consists in a ”Force push” (push away anything is facing the ghost), the player (or the AI) will have to look at the wanted direction and cast the powers. Online powers will affect both the physical simulation and the game-play elements. In general red powers (damage) will mainly provoke directional collision and damage.

Online powers still need to be defined in details. There will be powers more related to the physics and other related to other game play factor. Here we summarize some ideas, but we have to admit that the development of the damage rules (which still need to be discussed in details) and the testing might bring the game to a different assets.

- Physically Based

  - Directional
    * Gravity Rail: A beam is shot straight forward. An invisible cylinder around it will generate a gravity field which will violently push (or pull) anything inside it.
    * Gravity Missile: A gravity nucleus is shot. When it reaches an obstacles it explodes, giving an impulse to anything within a certain radius.
    * Mass Missile: a mass modifier nucleus is shot. If it reaches a rigid-body, the mass of that will change to a certain level for a certain amount of time.
    * Possession: A strong point of gravity is created just before the caster (say at one meter from you). This gravity field will capture anything, except the caster, within a certain radius. The effect will last until the caster releases it.
  - Universal
    * God's wrath: A gravity bomb is casted at your position, pushing away everything.
    * Newton's incubus: The arena gravity direction is inverted.
    * Time manipulation: speed up or slows down the simulation speed.

- Attribute Based
  - Directional
    * Fatigue Missile: A drain energy nucleus is shot. If it reaches a host rigid body (an object with a ghost bounded to it), the energy of the ghost will be reduced (eventually passed to the ghost shooter)
    * Healing Missile: A healing nucleus is shot. It will increase the "bound strength" or simply the "health" of anything it collides on.
  - Universal
    * Chuck Norris blessing: (god mode) ghost in BTO state cannot be damaged for a certain amount of time.
    * Vampire blow: an energy drain bomb explodes around the caster. If other ghost are inside the radius, part of their energy will be stolen (given to the caster).
    * God's kiss: a healing bomb explodes around the caster, healing any live target inside the radius.

Offline power should make use of physical options. The casting of offline power will entail:

1. The power is selected and activated.
2. The simulation stops and the player camera passes to scene orbital
3. Depending on the kind of power some parameter selection might be asked (for instance target selections, magnitude tuning, etc)
4. If needed the camera can be switched to object orbital.
5. An ”OK” is given.
6. The camera goes back into ”free look” mode, and the simulation is started again.

We do not have detailed plans on these powers. As rough ideas we mention the ability of binding rigid bodies together using different type of joints, ability to put special effects volumes (such gravity and torque field) inside the arena or ability to create new instances of rigid bodies (such dropping a bunch of cube right above the enemy). Due to the fun requirement, we are going to formalize these kind of effects in a later moment. Although this seams irresponsible, we plan to build a system that allows this kind of interactions (allows in terms of interfaces and classes structure), so that creativity won't be affected by the state of the system. The main reason for this choice is that we want to focus on online powers at the beginning, and secondly we want to have a game-play base on which the creation of these power will have more sense.

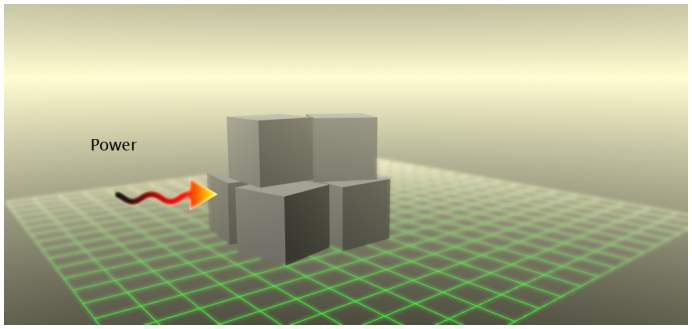

Figure 2: Power Sketch

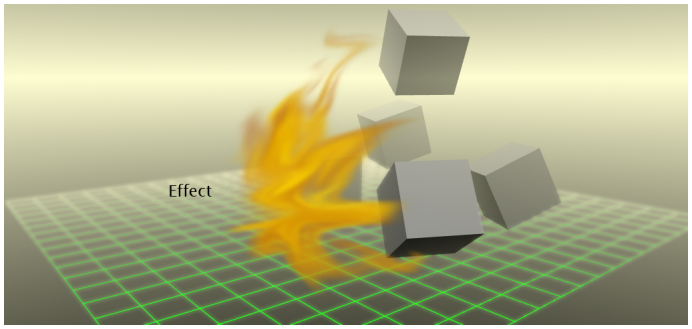

Figure 3: Effect Sketch

1.2.5 Time Handling

Time will affect both the physical simulation and powers availability. To stop the time, the player will need to have a certain amount of energy. Once the time is stopped, offline powers can be casted. Those powers will require a planning (selection of the target, eventual parameter specification, ...) and will also require the player to pass some skill test (mainly based on controller possibilities, such fast pushing, or stick aim precision, ...). Once the offline power is set, time start running again.

1.2.6 Goals

The game will be structured in matches, whose duration should be less than 10 minutes. Every match will display its goal before the game is started. The goals will follow the color philosophy, i.e. e based either on damage, on deflection or on gravity. Damage goals will be to kill some enemies, or to destroy certain structures. Deflection goals will be to survive a certain amount of time, or to defend some structures. Gravity goals will be to push enemies out of a ring, or to carry some special items to a specific location.

1.3 Visual Aspects

1.3.1 Game look

The virtual reality components are supposed to look very high tech and very ”virtual”. While fix elements of the arena will be represented mostly by wire frames and energy grids, the rigid bodies will present smooth and clean shapes, few surface details, bright gray colors and, hopefully, nice visual appeal. Moreover, the rigid bodies will present some luminescent parts, whose color will affect the game-play, as explained in the next section.

1.3.2 Colors

We are interested on giving a certain meaning to the colors inside the game. See Figure 1.

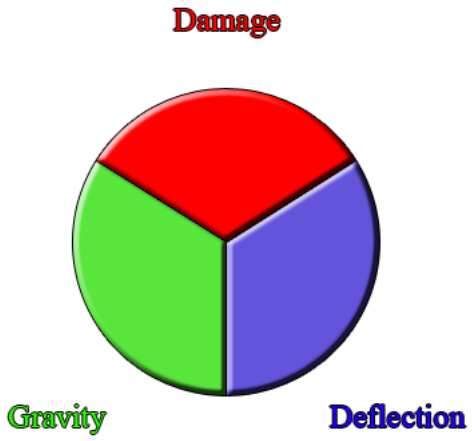

Figure 4: Colors define both powers and mission goals

The idea is that the availability of **powers** (both online and offline) depends on the color of the rigid body that the ghost is infesting. when a ghost enters inside a rigid body, it gain new powers, when it leaves it will loose them. This will force the player to look for an other object to infest, depending on the power he or she need to cast.

Not only online powers, but also **mission goals** will be defined with respect to these three concept (damage, deflection and gravity). For instance a mission goal could be to do the maximum amount of damage in a certain time. An other example would be to push the enemy out of a ring, or simply to resist as much as possible. Knowing the goal, the players will try to get the right color.

Time will be represented by the color yellow-orange.

1.3.3 Special Effects

The game is supposed to express the physical simulation. Therefore possible eye candies will be welcome. It's hard to tell at the moment what will be implemented, but the idea would be to express object movements, as well as power effects. One aspect we are interested to mark is time bending. Some field of view manipulation, as well as motion blur and color enhancement will be considered while casting offline powers.

1.4 Interface

1.4.1 Camera Modes

- Free (Ego) View
- Scene Orbital
- Object Orbital

Free View is the one the player has while the animation is running. The eye is positioned at the player position, and the game controller will allow the player to look around freely. **Scene Orbital** is the first view in the time stopped mode. It basically displays all the scene, allowing the player to circle around it, to better chose how to cast offline powers. **Object Orbital** is then set when a particular offline power require to go closer to a specific object.

1.5 GUI Mockup

Figure 5: HUD schetch

2 Development Schedule

2.1 Layered Development Description

2.1.1 Functional Minimum

- Physics: chuck box like (just cubes, spheres, collisions, and gravity)
- Graphics: basic texturing and lighting.
- Sound: no sound
- Game-play: one mission goal, chuck box like powers. No score system

2.1.2 Low Target

- Physics: slow motion
- Sound: basic sounds for powers and effects.
- Game-play: more mission goals, more powers. Basic score system

2.1.3 Desirable Target

- Physics: intersection test reduction algorithm (space coherence). Joints.
- Graphics: shaders for arena and objects.
- Sound: Ambient music.
- Game-play: 2-player screen split mode. Simple AI for computer controlled entities. Joint based powers. Advanced scores and Match statistics.

2.1.4 High Target

- Physics: static geometry (bsp tree for complex arena static elements)
- Graphics: shaders for viewport. Background/External environment.
- Sound: advanced sound editing (slow motion sounds)
- Game-play: Advanced AI. Rigid bodies structures. system

2.1.5 Extras

- Physics: Time reverse
- Graphics: Gross' Pauly's and Buhmann's faces sculpted in a background orbiting asteroid.
- Sound: Marino singing "Hard Rock Hallelujah" wearing only underwear.
- Game-play: Map Editor.

2.2 Task List

This table contains a guessed development workflow. We cannot say at the moment when each thing will be ended, but our idea is to to follow the class deadlines.

Task	Description	Who	Hrs	Actual
1	Brainstorming	All	5	8
2	Func. min. Physics	Marino	20	?
3	Func. min. Modelling/Texturing	Chino	3	?
4	Func. min. Graphical Engine	Chino	20	?
5	Func. min. Game Class Structure	Riga	30	?
6	Testing	All	10	?
7	Low + Desir. Physics	Marino	30	?
8	Desir. graphics	Chino	20	?
9	Low + Desir. Sound	Riga, Chino	15	?
10	Low + Desir Game-play	Riga	20	?
11	Testing	All	10	?
12	High physic	Marino	30	?
13	High graphic	Chino	20	?
14	High game-play	Riga	30	?
15	Testing	All	10	?
16	...	All	?	?

2.3 Milestones

We are basically interested on developing one layer at the time. Of course the code structure will take in account further development, but we would like to be able to do the testing task and at a certain time be able to tell "we are done with this layer". Of course it might be convenient sometimes to delay or anticipate certain specific tasks but we would like to follow the structure presented. We dare

to put as first milestone the functional minimum for the next 2 weeks, of course without any guarantee :). The successive two layers sounds to be more complex and require 4-5 weeks. Further planning goes beyond any possible guess.

3 Assessment

We believe that this game has potential because of the fun of ChuckBox. People is not used to have the screen full of rigid bodies going everywhere, and Jedi powers are indeed cool for everybody. Moreover we think that the combination of online and offline powers can really be fun. We would like to make the control easy and add an arcade score system, so that beginners can have fun and the geeks can try to reach new records. The ideal user of this game should be the average console player who likes arcade game-play.

Our team is well assembled. We have already worked together and we know each other pretty well. In terms of skill we are quite differentiate. Marino Alge has huge experience on c++ programming, and is focused more on the physics. He was the main coder for ChuckBox. Gioacchino Noris has some experience in modelling and texturing for games. He's going to do the graphic related task, and visual design. Alessandro Rigazzi knows more about console video-games than anyone else, and has good math and programming skills. He will focus on game-play implementation. Briefly said, we quite match the Tech-Art-Fun paradigm.

Besides that we all likes video-games, and we still don't believe that we have this opportunity.