



GAME DESIGN DOCUMENT



Spring 2011

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1 Game Overview

1.1 Features

Aero's Quest is a side-scrolling flying game for boys and girls ages 7-9. The game runs on Android smartphones and utilizes the Bodymedia FIT armband to enhance gameplay based on players' daily activity. The FIT keeps a record of players' physical activity, including calorie burn. This stored data can be transferred to the Android game via a Bluetooth connection. When the FIT synchronizes with the Android game, players receive rewards in the form of an in-game currency called Energy based on how many calories they have burned during the current day. A percent/goal model is used to account for individual physiological variation; parents of players can set a calorie-burn goal, and players will be rewarded based on how well the goal is met.

1.2 Gameplay

Once in the game world, players can customize a flying wolf avatar and outfit him with accessories. They can then play through the game's levels, using touch-controls to fly through the world, collecting items and avoiding obstacles and enemies. Players can perform a speed boost, as well as launch Orbs - projectile weapons that can be used to attack enemies. Each level is somewhat open-ended, with branching pathways that can be explored. Part of the challenge, however, is that the player is always moving forward; only part of a level can be experienced on any given play-through. Thus, players are encouraged to replay levels to explore all of the paths.

The player's primary goal is to collect the many Crystals that are scattered throughout the levels. In order to advance to subsequent levels, the player is required to have collected a particular amount of Crystals. Obtaining the Crystals depends upon exploring all of the paths in the level, which means each level must be played multiple times in order to collect everything. Additionally, certain paths are blocked by Obstacles. In order to reach the Crystals on these blocked paths, players can use Energy Orbs to destroy the Obstacles. However, this action consumes Energy. Thus, the player is better equipped to complete the game's objective by having earned more Energy - a resource only obtained via the FIT.

1.3 Involving the FIT



The game is designed to be playable even without involving the FIT, but in a way that possibilities expand vastly if the FIT is utilized. Without earning any rewards for activity recorded by the FIT, players can only progress so far. There comes a point when the enemies become too strong and the collectible items necessary to advance in the game are not accessible. By structuring the experience in this way, players can understand and come to care about the game; once they become invested in the experience, being active to earn rewards becomes more meaningful.

By using the FIT to track calories burned, players gain the ability to destroy those tougher enemies and unlock new paths that will allow all the necessary items to be collected. Thus, only by being active and tracking that activity with the FIT can players progress satisfactorily in the game. Additional benefits of using the FIT in conjunction with the game include access to a wider array of customizable options - thus, players not only become more powerful in the game by utilizing the FIT, they also gain more opportunities to personalize the experience.

1.4 Rationale

A side-scrolling game world provides a medium in which to feature both exploratory and combative content, thereby generating appeal for various types of players, including players of both genders. The flying mechanic and aerial theme emphasize activity and movement, subtly reinforcing exercise and activity as desirable.

An adventure experience also translates well to the theme of physical improvement and offers great opportunities to include player goals that reflect this challenge. Players gain power in the game world by being active, and this power is manifest directly in both physical and tactile ways. The feel of the experience changes when the player is more powerful, and this power is only accessible by being active. By including options to customize one's avatar that are unlocked based on total activity recorded, the appearance of one's avatar comes to correlate with the player's own physical progress. Thus, the player's progress in the game world depends on progress in the real world.

2 Activity-Based Rewards System

2.1 Overview

The game utilizes a system in which players are rewarded with an in-game currency known as Energy in exchange for activity recorded by the Bodymedia FIT armband. While players can play the game without exercising and earning Energy, they will not be able to progress very far. The amount of content accessible without earning Energy serves only to establish investment in the experience, suggesting to the player that s/he will be able to do a lot more in the game by playing it after having earned Energy.

Players' parents can set a daily goal for calories burned, and the player is rewarded based on the percentage of that goal completed. Player rewards are given when the game is started - the FIT synchronizes with the Android and transfers the activity data recorded during the day to the game. Players then receive Energy and can use more powerful techniques in the game, as well as gain access to a wider range of customization options.

2.1.1 In-Game Energy Meter



Energy functions in the game world much like the concept of magic, mana, or MP prevalent in fantasy-style role-playing games. The player has an Energy meter in the game that is drained by performing special actions. Players can fire Basic Orbs at enemies to do minimal damage, or fire Energy Orbs to do twice as much damage. Players can also use Energy Orbs to destroy obstacles that block off alternate pathways. However, Energy Orbs can only be used at the expenditure of 500 Energy per shot. Thus, the more Energy the player has earned before playing, the greater wealth of power s/he has once gameplay begins.

2.1.2 Unlocking Customizable Content

Energy also has a supplemental function with regard to accessing customizable content. The more Lifetime Energy a player has earned from the sum of all his/her plays, the more customizable content, such as Accessories and Creature Editor resources, will be available. Players can modify the appearance of their wolf avatar and outfit him with wearable Accessories, and more options for doing so become available by accumulating more Lifetime Energy. In this way, the player's avatar can look more impressive if the player has been habitually keeping active long enough to unlock the necessary features. A connection is established between the progress of the player in the real world and the progress of the player

in the game world.

2.2 Setting Activity Goals

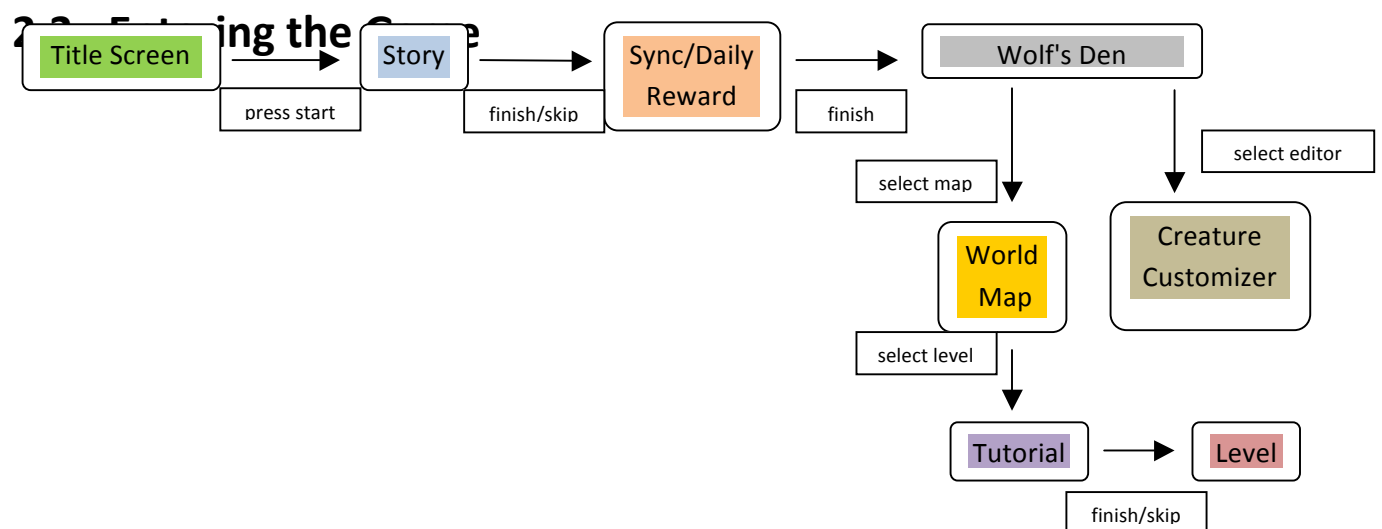
Parents can set activity goals for players by selecting the option on the game's start screen. To set an activity goal a password is required. If no password exists, a password can be set. It is encouraged that parents control this password and take a role in their child's active lifestyle. This parental control feature also serves as a method of preventing children from setting purposely low goals to easily gain rewards.

After logging in, parents adjust the four-digit calories burned per day value using the up and down arrows to modify each digit. Parents can press the green checkbox button to set the goal.

If no goal is set by the parent, a default goal of 2,000 calories will be used.

Rationale

The percentage/goal model is utilized to account for variations in individual metabolic rates. Even within the focused age range of seven to nine years, factors such as height, weight, age, and gender influence an individual's metabolic rate significantly enough that a static benchmark of desired calorie burn would be unfair to female players, lighter players, and younger players who on average burn calories at a less rapid rate than male players, heavier players, and older players. The percentage/goal model allows players' parents to set a goal that is reasonable for the individual player. It also provides room for flexibility to account for players' physiological progression over time.

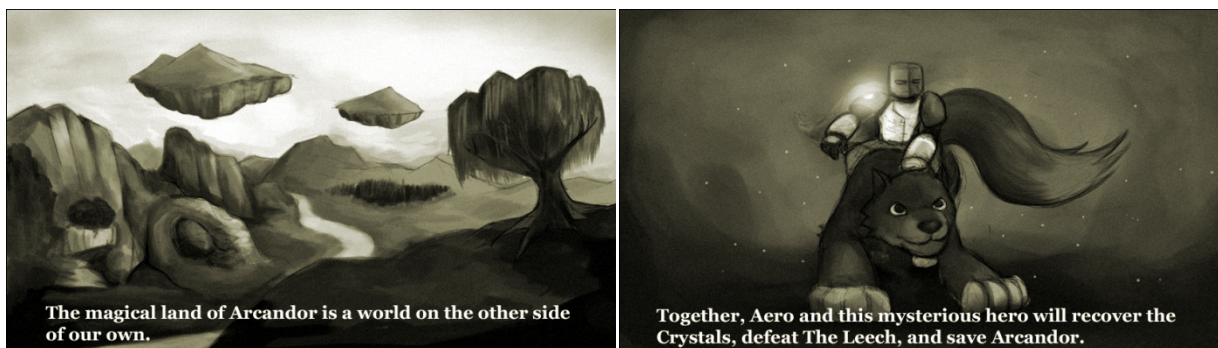


2.3.1 Start Screen



When the game application is run, the start screen appears. The game's title is shown, along with the Energym and Bodymedia logos. A large, friendly-looking "Play" button dominates the center of the screen, and a button labeled "Set Activity Goal" is below the Play button. By selecting "Set Activity Goal," the parental control password screen will appear. Pressing "Play" initiates the presentation of the game's story.

2.3.2 Story Presentation

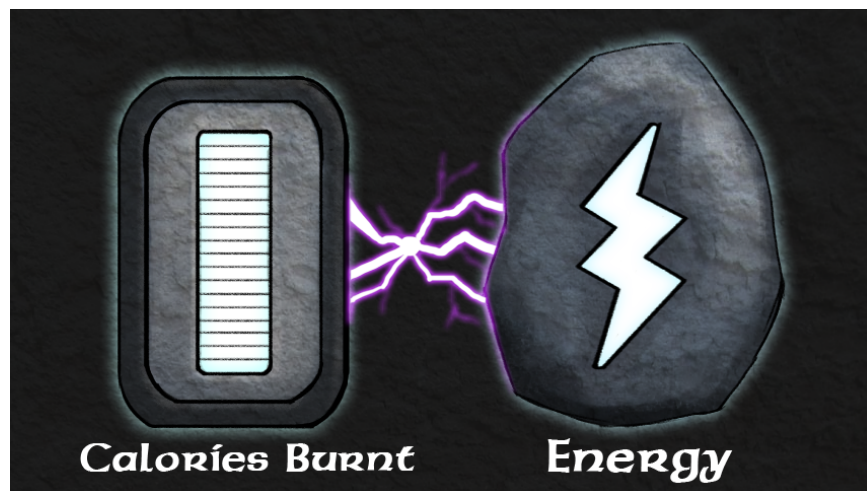


After pressing "Play" on the Start Screen, the story of the game is presented. This is done through a sequence of six illustrations with accompanying dialogue in the form of both text and a voice-over narration. The entire sequence lasts for 30 seconds and can be skipped at any time by pressing the "Skip" button. The story is presented at the start so that the player gains an understanding of the game's world and what the game's objective is. Being given the option to skip the story is provided so that players are not required to view it repeatedly if they are familiar with the game and its story. Once the story is finished or skipped, the FIT Synchronization screen appears.

2.3.3 FIT Synchronization



Once the FIT Synchronization screen appears, the player will be prompted to synchronize the Bodymedia FIT with the Android smartphone. Once a connection is established, the amount of calories burned during the day recorded by the FIT is transferred to the game, and the screen displays bars representing the amount of calories burned and the amount of Energy earned. The calories burned bar depletes as the Energy earned bar rises, and the audio supports the exciting jackpot-receiving experience. As the Energy bar reaches the top, the rate at which it fills decreases so as to increase anticipatory tension and make the reward feel gratifying.



2.3.4 Daily Reward



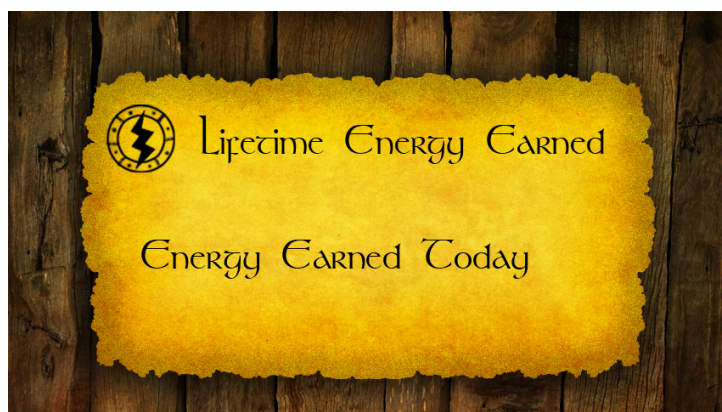
The calorie burn value is measured against the goal set by the parent and the percentage of that goal completed is calculated. If no goal has been set, the game will measure the amount of calories burned against a default goal of 2,000 calories. The screen then displays the corresponding amount of Energy the player has earned and plays a fanfare sound corresponding in degree of grandiosity to the reward.

The player receives an amount of Energy equal to 100 times the percentage of the goal reached, plus a bonus for reaching milestone percentages. Accompanying text congratulates the player for a high level of activity or encourages the player to keep at it, depending on the level of activity.

2.3.5 Weekly Reward

The screen then displays a table consisting of five slots, each representing consecutive days. The player's % of Goal Completed for each day are displayed in the slots, and if the player achieves at least a particular rating for five consecutive days, an additional Energy reward is given. This reward is added to the player's Energy for the day; that is, Energy earned as a Weekly Reward feeds directly into the player's Energy Meter for that day's play. Thus, every fifth day, the player has an excellent opportunity to power up more than usual.

2.3.6 Lifetime Energy Earned



The amount of Energy earned is added to a value representing a player's Lifetime Energy Earned. The Lifetime Energy Earned is used to determine which Energy Orbs are available, as well as which Items are available in the Accessory Closet and which customization options are available in the Creature Editor; the more Lifetime Energy Earned, the more options available. This value is updated on the Daily Reward screen after the Daily and Weekly Rewards are given. It can also be accessed on the Wolf's Den screen.

2.4 Activity-Rewards Economy

Base Daily Reward

The player earns an amount of Energy equal to 100 times the percentage of the calories burned. For example, if a child's goal is to burn 2,000 calories, and the child burns 1,500 calories (75%), the child earns a reward of 7,500 Energy because s/he completed 75% of the goal.

***** 1% of Goal earns 100 Energy *****

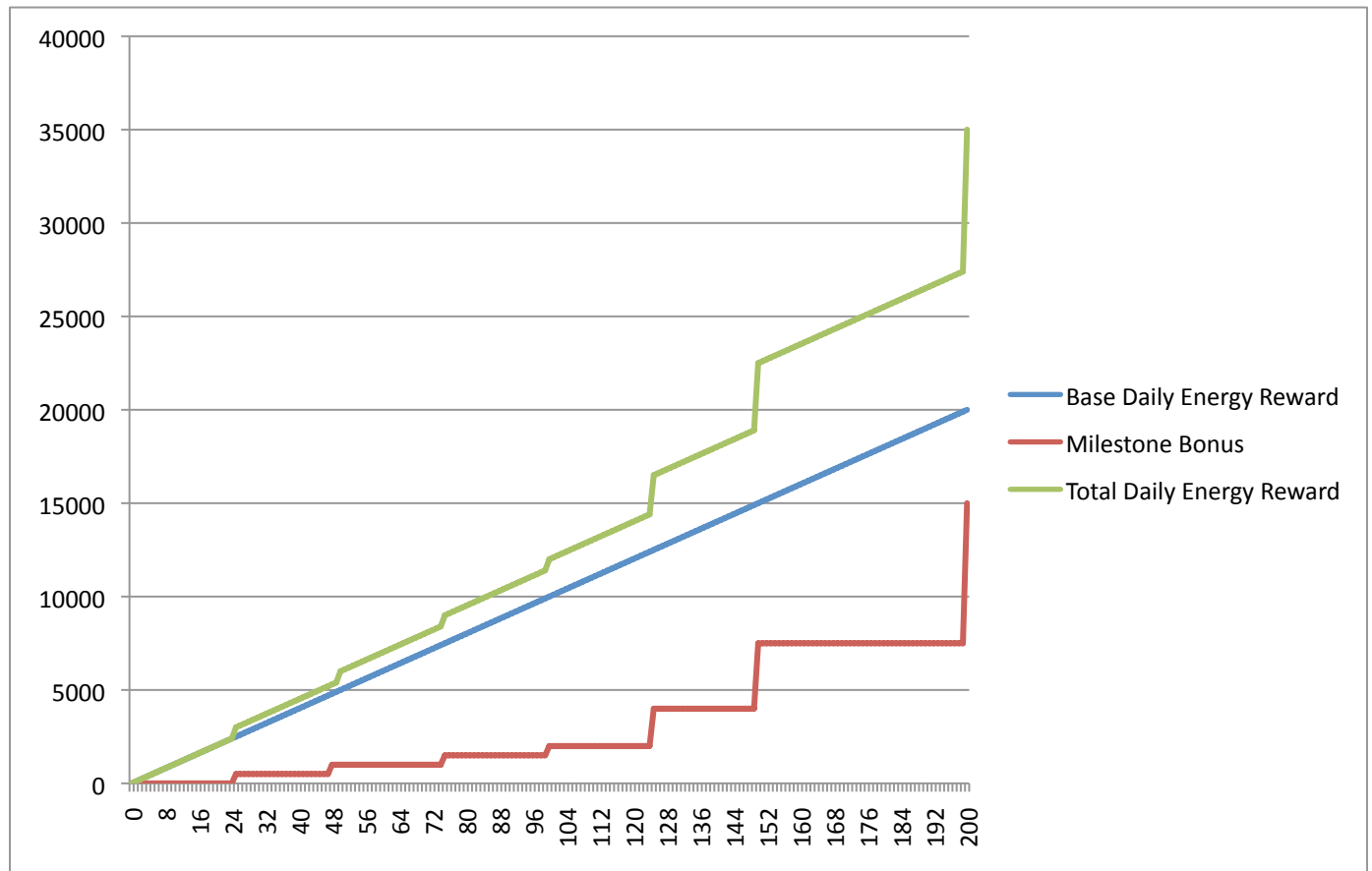
Milestone Bonus

In addition, players obtain bonus Energy if they surpass certain milestone percentages. For example, attaining half (50%) of the goal earns the player an additional 1,000 Energy. Meeting the goal (100%) earns an additional 2,000 Energy. These milestones give players additional incentive to work hard and attain their goals.

DAILY REWARDS

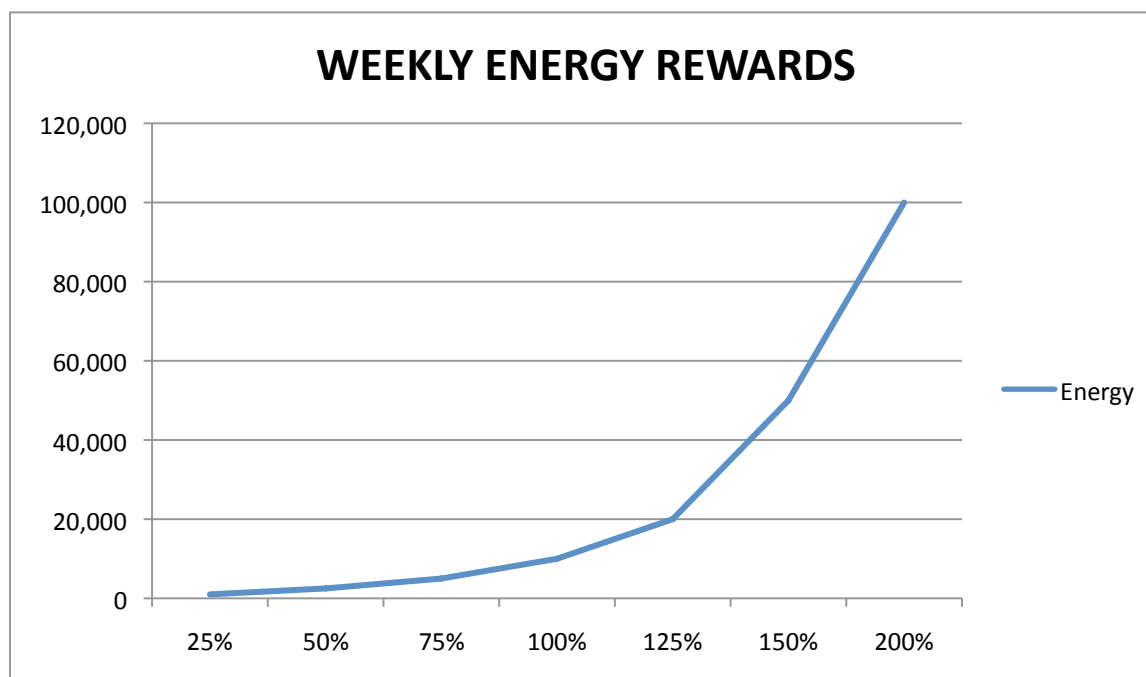
Daily Calories Burned	Base Daily Reward	+Milestone Bonus	= Total Daily Reward
Less than 25% of Goal	0-2,400 Energy	+0 Energy	0-2,400 Energy
At least 25% of Goal	2,500-4,900 Energy	+500 Energy	3,000-5,400 Energy
At least 50% of Goal	5,000-7,400 Energy	+1,000 Energy	6,000-8,400 Energy
At least 75% of Goal	7,500-9,900 Energy	+1,500 Energy	9,000-11,400 Energy
At least 100% of Goal	10,000-12,400 Energy	+2,000 Energy	12,000-14,400 Energy
At least 125% of Goal	12,500-14,900 Energy	+4,000 Energy	16,500-18,900 Energy
At least 150% of Goal	15,000-19,900 Energy	+7,500 Energy	22,500-27,400 Energy
At least 200% of Goal	20,000+ Energy	+15,000 Energy	35,000+ Energy

The rewards are spread in such a way that the curve grows exponentially as more of the goal is attained. This is designed so that the reward reflects the increased difficulty of completing more of the goal.



WEEKLY REWARDS

Weekly Activity Rating	Energy Earned	MAX Energy Orbs Earned
5 Consecutive Days of at least 25% of Goal	+1,000 Energy	+2 Orbs
5 Consecutive Days of at least 50% of Goal	+2,500 Energy	+5 Orbs
5 Consecutive Days of at least 75% of Goal	+5,000 Energy	+10 Orbs
5 Consecutive Days of at least 100% of Goal	+10,000 Energy	+20 Orbs
5 Consecutive Days of at least 125% of Goal	+20,000 Energy	+40 Orbs
5 Consecutive Days of at least 150% of Goal	+50,000 Energy	+100 Orbs
5 Consecutive Days of at least 200% of Goal	+ 100,000 Energy	+200 Orbs



2.5 Applications of Energy

The Energy that the player is awarded is used to perform powered-up actions in the game world. Energy is represented by a meter in the levels that is depleted when Energy-consuming actions are performed. Energy cannot be replenished within the game world; it is solely generated by the player's activity during the day. However, Energy not consumed on a day carries over to the next play-through. Thus, players do not need to consume all of their Energy each day. If some Energy remains, players will be make use of it on their next play-through.

Orbs are projectiles the player can shoot at enemies and obstacles while playing the game. Players possess a Basic Orb that does minimal damage to enemies, as well as an Energy Orb that is twice as powerful and can be used to eliminate obstacles in the level. The Energy Orbs consume 500 Energy each time they are used, and the Basic Orbs do not. Thus, the player can play the game with only Basic Orbs, but with more Energy to support the use of Energy Orbs, the player has more power and can do more.



***** Energy Orbs consume 500 Energy per use *****

Eliminating Obstacles

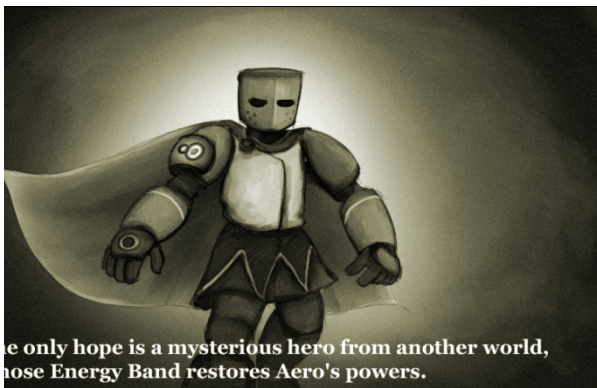
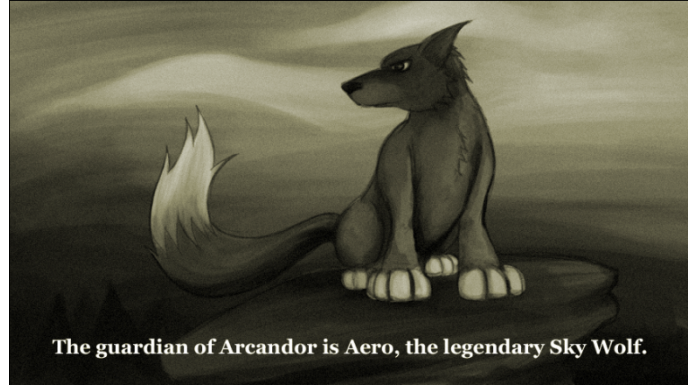
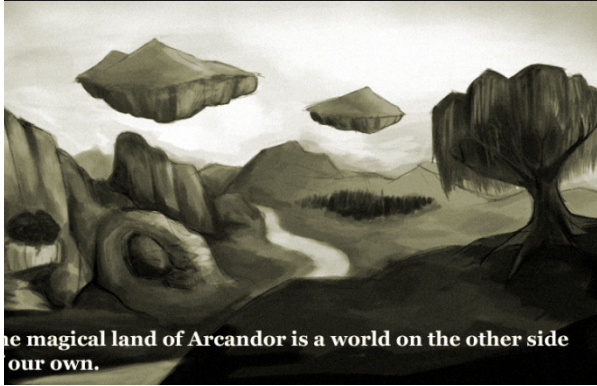
Many paths in the levels are barred by obstacles such as Ice Blocks, Bonfires, Clouds, Rock Walls, and Mirror Switches. The player needs have enough Energy to shoot Energy Orbs to be able to destroy those obstacles and access those paths. Access of those paths is important because certain Crystals, along with a number of Shards, can only be found on those paths. If the player wants to complete a level, he/she will need to collect all of the Crystals, and if a player wants a 100% completion rating, he/she will also need to collect all of the Shards. Thus, the use of Energy Orbs is vital to completing the game.

Selecting Type

When a player selects a Level to play, s/he will be presented with a screen asking which type of Energy Orb to use for that level. Only one type of Energy Orb can be used for each play-through of a level; players can replay levels with different Energy Orbs to eliminate different kinds of obstacles and explore the paths beyond them. At first, the player will only be permitted to use Fire Orbs, but by accumulating more Lifetime Energy, more types of Energy Orbs will become available. When a player has unlocked the availability of additional Energy Orbs, a notification will be displayed on this screen congratulating the player on the achievement.

Tier 1 (0 Lifetime Energy)	Tier 2 (50,000 Lifetime Energy)	Tier 3 (250,000 Lifetime Energy)	Tier 4 (1,000,000 Lifetime Energy)
 Fire Orb  Ice Orb	Wind Orb	Thunder Orb	Light Orb

3 Story



3.1 Characters

The Leech



The game's main antagonist. The Leech is a massive shadowy creature that gains power by sapping others' Energy. He has stolen the Energy Crystals and seeks to take over Arcandor with their power.

Aero



The legendary guardian of Arcandor. With enough Energy he can use incredible superpowers. He will need all of those powers on his quest to recover the stolen Energy Crystals.

The Hero



A brave young warrior from our world who uses the Energy Band to help keep Aero energized.

4 Game World

The magical realm of Arcandor is comprised of five Regions - Plains, Sea, Desert, Cave, and Altar. Each realm contains several Levels, each of which is a side-scrolling flying challenge in which the player must maneuver Aero around obstacles while defeating enemies and collecting Crystals. Realms also contain a Wolf's Den that serves as a base where the player can access customization modes. These various areas are shown on a World Map - a main screen where the player can select an area to go to.



4.1 Structure

The game world is structured in such a way that levels require a certain amount of collected Crystals in order to be played (These amounts are displayed on the World Map alongside the level icon). Thus, the player's main objective in playing each level is to collect as many Crystals as possible. To do this, levels must be played multiple times in order to obtain Crystals located on different paths. Certain Crystals will be located on paths that are blocked by some sort of Obstacle; to get these Crystals the player will need to have the proper Energy Orb and enough Energy to use it. Because Crystal collection is made easier by logging activity with the FIT, by tying progression through the game world to Crystal collection, the game necessitates that the player continues to log activity in order to access more content.

Players need not complete each level in order to unlock the next; the only requirement for

accessing levels is the amount of Crystals collected. This fosters a sense of freedom inhibited only by a lack of Crystals, and so focuses the player on that goal of collecting Crystals. Still, later levels are designed to be more challenging than earlier levels, and later levels may require an Energy Orb the player has not yet unlocked in order to access certain paths, so there is some advantage to playing the game's levels in numerical order.

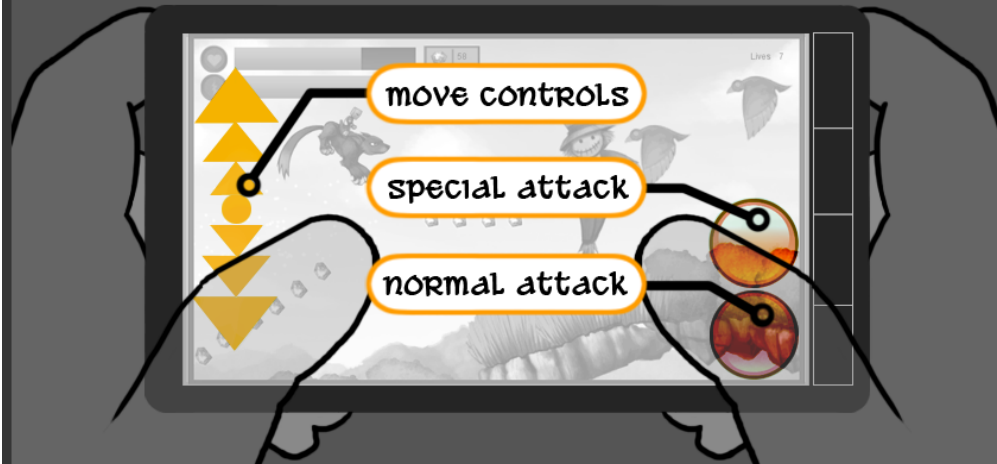
4.2 World Map

The World Map is a network of all accessible areas in the game world, including the Wolf's Den and all of the levels. The screen displays a bird's eye view of the geographical region encompassed by the game world. Levels are like hubs - points on the map represented by red diamond icons and connected by thin white lines. Only after completing certain levels do other levels become accessible; red diamond icons only appear for levels that are currently accessible. To select an area to access, the player taps the area's corresponding red diamond icon. Alongside each icon is a number corresponding to the number of Crystals required for access.

There are five Regions comprising the World Map - the Plains Region, the Sea Region, the Desert Region, the Cave Region, and the Altar Region. The World Map displays only one Region at a time. Once the requisite number of Crystals is obtained, the next Region may be accessed. Players can move between regions by pressing the red arrow that appears near the edge of the screen by the last or first level of a Region.

When a level is selected, the tutorial will begin. The tutorial consists of two screens - one explaining how to hold the Android and play through the level, and one explaining how to charge up Energy. The tutorial can be skipped at any time by pressing the Skip button.

GAME CONTROLS



HOW TO CHARGE YOUR ENERGY BAND



do **any sports or exercise** while wearing your energy band

4.3 Wolf's Den

The Wolf's Den serves as a home base where the player can customize aspects of Aero's biology and outfit him with Accessories. It is the first location the player is taken to when the game is begun. The Wolf's Den is also visible on the World Map and represented by a red diamond. The player can tap the red diamond to access the Wolf's Den. Once inside, a new screen is displayed, offering the player options to access either the Creature Editor or the Accessory Closet, or to return to the World Map. The player can also revisit the FIT Synchronization screen from the Wolf's Den.



All of the customization opportunities available in the Wolf's Den make use of the player's Lifetime Energy value. As such, the player's Lifetime Energy earned appears for reference on the corner of the Wolf's Den screen. Different customization options become available as the player accumulates more Lifetime Energy, allowing the value to function as a player level statistic.

4.3.1 Creature Editor

[image of Creature Editor]

The player can modify Aero's biology in the Creature Editor. Aero's physical form is centered around a static base, but players have access to 5 types of body parts which can be upgraded. Each body part has 12 variations (2 styles X 6 colors), some of which are only available once the

player has accumulated a certain amount of Lifetime Energy. The availability of parts is decided by 4 Tiers, which are unlocked after accumulating certain amounts of Lifetime Energy.

Tier 1 (0 Energy)	Tier 2 (50,000 Energy)	Tier 3 (250,000 Energy)	Tier 4 (1,000,000 Energy)
Head - Basic Colors 1, 2	Head - Basic Colors 3,4	Head - Basic Colors 5, 6	Head - Advanced Colors 1-6
Torso - Basic Colors 1, 2	Torso - Basic Colors 3, 4	Torso - Basic Colors 5, 6	Front Legs - Advanced Colors 1-6
Front Legs - Basic Colors 1, 2	Front Legs - Basic Colors 3, 4	Front Legs - Basic Colors 5, 6	Hind Legs - Advanced Colors 1-6
Hind Legs - Basic Colors 1, 2	Hind Legs - Basic Colors 3, 4	Hind Legs - Basic Colors 5, 6	Tail - Advanced Colors 4-6
Tail - Basic Colors 1, 2	Tail - Basic Colors 3, 4	Tail - Basic Colors 5, 6	
	Torso - Advanced Colors 1-3	Torso - Advanced Colors 4-6	
		Tail - Advanced Colors 1-3	

4.3.2 Accessory Closet

Accessories are wearable vanity items (clothing) that the player can use to customize Aero's appearance. Expensive Accessories serve as a badge of honor, indicating that the player has earned enough Energy rewards to have accessed such a special item. Accessories are available in the Accessory Closet area of the Wolf's Den.

The purpose of Accessories is to incentivize players to be active enough to earn the Energy to acquire them. Accessories allow the player to personalize the look of the avatar and acquire status symbols.

To outfit Aero with an Accessory in the closet, the player taps the desired Accessory's icon. An image of Aero displayed on the screen will be updated to show how he looks with the Accessory equipped.

Accessories do not cost Energy, but to obtain an Accessory, the player must have accumulated a certain amount of Lifetime Energy. Different Accessories will appear in the Accessory Closet based on the player's Lifetime Energy earned (for a complete breakdown, see the table below). When a player has unlocked the availability of additional Accessories, a notification will be

displayed on this screen congratulating the player on the achievement.

By staggering the availability of Accessories, players will have additional incentive to exercise.

By knowing that there are more Accessories to unlock but not what those items are, players will be driven by curiosity to earn more Energy and unlock new Accessories.

Tier 1 (0 Energy)	Tier 2 (50,000 Energy)	Tier 3 (250,000 Energy)	Tier 4 (1,000,000 Energy)
Cotton Vest	Leather Vest	Iron Vest	Gold Vest
White Cape	Blue Cape	Green Cape	Black Cape
	Red Cape	Purple Cape	Silver Cape
	Straw Hat	Orange Cape	Monocle
	Spectacles	Feathered Hat	
		Sunglasses	

4.4 Level Layout and Content

4.4.1 Screen, Perspective and Camera



Screen Behavior

The game world is viewed from a side-scrolling perspective like those employed by traditional "platformer" games. The screen consists of both background and foreground elements that scroll to the left at a constant rate. Only foreground objects interact with the player. To make this fact clear to the player, foreground objects exist in bold contrast to the background elements. At the beginning of each level, a zoomed-out image of the level's layout is briefly

shown in order to acquaint the player with the location of important objects in the level.

[zoomed-out level screenshot]

Avatar Behavior

The player controls Aero the Sky Wolf, who is situated on the left side of the screen. Aero is always moving forwards at a constant rate in such a manner that he remains at the same horizontal location while the scene scrolls to the left.

User Interface

UI elements include a Health Meter, an Energy Meter, and a Lives Counter in the top-left corner of the screen; a Crystals Counter and Shards Counter in the top-right corner of the screen; an Up/Down pad (used to control the player's vertical movement) situated in the bottom-left corner and represented with a vertical arrows; and two Orb Buttons (used to shoot Basic and Energy Orbs) situated in the bottom-right corner.

[screenshot here]

4.4.2 Gameplay, Rules, and Controls

Player Attributes

The player possesses attributes that include HP, Energy, Lives, Crystals, and Shards. The player begins the game with 50 HP (Hit Points), 5 Lives, 0 Crystals, and 0 Shards, and these values become modified over the course of each level's gameplay. The value for each of these attributes is represented graphically in the top-left and top-right corners of the UI.

Energy



The amount of Energy the player begins play with is equal to the amount of Energy received as a Daily Reward before play.

If a player has recorded data on the FIT from a previous day but did not play the game (and thus did not yet use the data from that day), that data can carry over for as long as it remains in the FIT's memory. If a player is not playing the game for the first time of the day, only data recorded on the FIT since the last play is converted into an Energy reward. Energy that was received as an award but not consumed in the game may be used on subsequent plays during the same day, but will not carry over to subsequent days.

Energy cannot be replenished during gameplay, only by earning more as a Daily Reward for activity. HP and Lives can be replenished by flying through pickup Items such as Water and 1UPs.

Movement

The player can move up or down by sliding his/her finger up or down on the bottom-left corner of the screen, and the player is always moving forwards (to the right) at a constant rate, but this rate can be increased by dragging one's finger to the right.

Increasing forward speed is a good way for players to move quickly through easier areas, and in tighter areas that require greater precision, the player can revert to a slower pace more geared towards careful maneuvering.

Basic Orbs



The player can press the purple Basic Orb Button in the bottom-right corner to shoot a projectile which does low damage to enemies. The projectile moves in a straight line to the right at the height which the player was at when the button was pressed. It will continue to move to the right until it collides with a game object, such as terrain, obstacles, or enemies. If it hits an enemy, the enemy takes one hit worth of damage.

Energy Orbs



The player can also press the orange Energy Orb Button directly above the Basic Orb Button to shoot a more powerful projectile. This projectile moves in the same way, but if it hits an enemy, the enemy takes two hits worth of damage instead of only one. If the projectile hits a particular type of obstacle, it will destroy that obstacle. Energy Orbs deplete 500 Energy from the Energy Meter when used.

Damage

The player takes damage if s/he collides with enemies and obstacles, and different types of objects inflict different amounts of damage. Colliding with terrain does not damage the player. If a player's HP reaches 0, the Lives total is decreased by 1 and the player is returned to the beginning of the level. Whenever a level is begun anew, HP is full. When Aero collides with a damaging object, he momentarily loses its solidity, blinking to indicate this. During this time no additional damage can be taken and Aero will not get stuck on objects or continually receive

damage from the same object.

Objective

The player's objective is to collect all of the Crystals in the level and progress to an exit safely (without incurring so much damage that all Lives are lost) by avoiding enemies and obstacles and collecting beneficial pickup Items. The player is also encouraged to explore and discover secret paths and hidden items. The player must collect enough Crystals to advance to the next level.

Players are able to choose between multiple pathways and explore hidden areas to obtain items. All paths are riddled with enemies, traps, and obstacles that the player must navigate around or eliminate to traverse safely through each level. Certain pathways contain the important Crystals but are blocked by Obstacles. Thus, the player must possess both the proper Energy Orb to eliminate that Obstacle and also enough Energy in order to access that path and collect all of the Crystals.

Levels can be replayed in order to explore different portions. Returning to earlier levels later in the game (after unlocking more Energy Orbs) is a good way to increase the Crystal count - some levels may have Crystals hidden behind Obstacles that are only vulnerable to Energy Orbs that have not yet been obtained.

Advancing



Each level requires a certain number of collected Energy Crystals in order to be played. The first level requires no Crystals. Players should attempt to collect as many as possible in each level. Some levels do not require many Crystals, but later levels may require that the player collect all of the Crystals leading up to that point.

In accessing a level, Crystals are not exchanged or spent - the prerequisite is merely a qualification check, not a cost.

4.4.3 Items

Items are small goodies that populate the levels. The player should aim to collect these items by flying through them. Once collected, Items do not regenerate. If the player loses a life and returns to the start of the level, obtained Items retain their obtained status. Revisiting a level that has already been played through will not result in regenerating Items.

Crystals



Each level contains a number of Energy Crystals that must be collected in order to advance to subsequent levels. However, not all Crystals will be accessible on one play-through of the level. Crystals are placed along different pathways in the level, some of which are barred by obstacles. Certain obstacles can only be destroyed by particular Energy Orbs, and Energy Orbs are unlocked as the player accumulates more Lifetime Energy. Thus, some Crystals will not even be accessible until the player has earned enough Lifetime Energy. Furthermore, some Crystals are only assembled by gathering 100 Shards.

Shards



Levels are filled with many Shards, tiny collectible pieces of Crystals that inhabit the various paths in the level. Shards earn the player an extra Crystal for every 100 collected. Collection is similar to how it is with the whole Crystals – the player must explore all paths in the level, even those barred by obstacles, to find all of the Shards. Shards also serve a directive function; the layout of Shards coincides with a successful route through a path. The player can aim to follow the Shards to find his/her way.

Energy Orb



Once a player has unlocked an Energy Orb by accumulating the requisite amount of Lifetime Energy, that Energy Orb will appear as a Pickup Item in the next level that is played. The player must then fly through the Energy Orb to obtain it. Once the Energy Orb is obtained, the player can select it for another play-through of a level.

Water

[icon]

Small droplets of water are placed more sparsely in the levels – the player can fly through these to replenish 10 HP of Health.

1UP



1Ups are rare and give the player one extra life when flown through.

4.4.4 Enemies

Enemies are antagonistic entities that populate the levels of the game world, display distinct movement patterns and behavior, and damage the player. Enemies come in several types and can be evaded or defeated through the use of Orbs. Basic enemy types can be easily defeated by a single Orb, but some enemy types require multiple hits or a hit from a particular type of Orb to be defeated.

Zombird



Description - A zombified bird created by the Leech when it removed the Energy from the land.

Behavior - Flies straight (to the left) at a constant speed.

Damage Dealt - 10 HP on collision

Destroyed By - 1 hit from a Basic Orb or any Energy Orb

Armored Zombird



Description - A Zombird outfitted with tough defensive armor.

Behavior - Flies straight (to the left) at a constant speed.

Damage Dealt - 20 HP on collision

Destroyed By - 1 hit from any Energy Orb (invulnerable to Basic Orbs)

Zombat

Description - A zombified bat created by the Leech when it removed the Energy from the land.

Behavior - Moves up and down while flying to the left at a constant speed.

Damage Dealt - 10 HP on collision

Destroyed By - 1 hit from a Basic Orb or any Energy Orb

Armored Zombat

Description - A Zombat outfitted with tough defensive armor.

Behavior - Moves up and down while flying to the left at a constant speed.

Damage Dealt - 20 HP on collision

Destroyed By - 1 hit from any Energy Orb (invulnerable to Basic Orbs)

Gobglob

Description - A small gelatinous monster spawned from the Leech.

Behavior - It leaps from the ground to attack and will attach itself to its prey to suck its life away.

Damage Dealt - 5 HP on collision; 5 HP per second it remains attached (player can shake off Gobglob by flying up and down quickly)

Destroyed By - 2 hits from a Basic Orb; 1 hit from any Energy Orb

Gobgloblin

Description - A goblin spawned from a Gobglob.

Behavior - Stands motionless on terrain platforms and launches globule projectiles at the

player.

Damage Dealt - 10 HP on projectile collision

Destroyed By - 2 hits from a Basic Orb; 1 hit from any Energy Orb

Bomgoblin

Description - a Gobgoblin that throws Bombs.

Behavior - Stands motionless on terrain platforms and launches Bomb projectiles at the player.

Damage Dealt - 20 HP on projectile collision (same as Bomb obstacle damage)

Destroyed By - 4 hits from a Basic Orb; 2 hits from any Energy Orb

Toxiccloud

Description - A poisonous cloud monster generated from the Leech.

Behavior - Floats upward slowly and is not solid; player will pass through while taking damage.

Damage Dealt - 10 HP on collision

Destroyed By - 1 hit from Wind Orbs only

4.4.5 Obstacles

Obstacles are non-antagonistic entities that bar the player's way and/or damage the player upon collision. Some obstacles, particularly those that bar the player's way, can be eliminated by using Orbs, while others must simply be avoided.

Terrain

Terrain consists of land masses - solid structures that constrict the player's movement without causing damage. They cannot be destroyed. The lower limit of the screen is comprised entirely of terrain.

Fog

The upper limit of the screen is comprised of fog, which is not solid and can be passed through. However, if the player remains within the fog area for more than 3 seconds, he/she will get lost and be returned to the start of the level (without losing a life).

Ice Block

Ice Block obstacles are solid, deal 10 HP damage to the player upon collision, and can be eliminated with a Fire Orb. Ice Blocks often bar pathways leading to Shards, Crystals and other Items.

Bonfire

Bonfire obstacles are solid, deal 10 HP damage to the player upon collision, and can be eliminated with an Ice Orb. Bonfires often bar pathways leading to Shards, Crystals, and other Items.

Cloud

Individual clouds that are separate from the fog at the top of the screen populate the higher portions of the game's levels. Clouds are solid and do not cause damage; they serve to bar the player's way and also to conceal Shards or other good Items hidden within. Clouds can be eliminated with a Wind Orb to reveal the Items inside and clear a path

Metal Wall

Metal Wall obstacles are solid, deal 10 HP damage upon collision, and can be eliminated with a Thunder Orb. Metal Walls often bar pathways leading to Shards, Crystals, and other Items.

Mirror Switch and Gate

Gate obstacles are solid, do not deal damage, and can be opened by striking a corresponding Switch with a Light Orb. Gates often bar pathways leading to Shards, Crystals, and other Items.

Spikes

Spikes appear on certain terrain, deal 5 HP damage upon collision, and cannot be destroyed.

Bomb

Bombs float in midair or can be hurled by Bomgoblin enemies. Bombs explode and are eliminated upon collision but deal 20 HP damage in doing so. Bombs can be safely detonated from afar by launching any Orb at them.

Lightning

Lightning emerges from the fog at the top of the screen at 1-second intervals and deals 20 HP damage upon collision.

4.5 Secret Areas

Within each level, there may be one or more Secret Areas - "rooms" hidden behind obstacles that are filled with lots of good items and no enemies. To access a Secret Area, a player may shoot a Fire Orb at an Ice Block that is bordering a wall. The wall will display a secret entryway that the player can fly into in order to enter the Secret Area. Once inside, the player will find HP boosts, 1UPs, and many Shards. Finding the Shards in the Secret Areas is a good way to increase the Crystal count, so the player should try to find as many of these Secret Areas as possible.

4.6 Bonus Levels

Each Region contains one Bonus Level. Bonus Levels consist of small mini-games featuring gameplay different from the standard levels. For example, the player may be required to feed vegetables to a dragon of corresponding color using the touch-screen interface. To access a Bonus Level, the player must collect all of the Crystals in the corresponding Region. By completing a Bonus Level, an additional Crystal is won. These Crystals are considered part of the game's total Crystal count and must be collected in order to ultimately access the final boss level.

The Bonus Levels provide another reason to accumulate Energy. Much in the way each Level can only be accessed after the Crystals from the previous Level are collected, each Region can only be accessed in the same way. The Bonus Levels add Crystals that the player can only attempt to win if enough Lifetime Energy has been earned.

4.7 Region Layout

Region 1 - Plains

Level 1 - Vulture Valley

Level 2 - Firebolt Field

Level 3 - Rushing River

Level 4 - Creepy Cave

Level 5 - Wicked Woods

Region 2 - Sea

Level 1 - Bluewater Bay

Level 2 - Cascading Cove

Level 3 - Submerged Shipwreck

Level 4 - Ragged Reef

Level 5 - Dimmest Depths

Level 6 - Leviathan's Lair

Region 3 - Desert

Level 1 - Seaside Sands

Level 2 - Waterless Wastes

Level 3 - Barren Badlands

Level 4 - Rockslide Ravine

Level 5 - Carrion Canyon

Level 6 - Belligerent Buzzards

Level 7 - Desperate Dash

Region 4 - Cave

Level 1 - Malicious Mountain

Level 2 - Cloistered Cavern

Level 3 - Precarious Pathway

Level 4 - Brutal Boulders

Level 5 - Treacherous Tomb

Level 6 - Frozen Fountains

Level 7 - Hollow Halls

Level 8 - Vacuous Vault

Region 5 - Altar

Level 1 - Regal Ridge

Level 2 - Glorious Gorge

Level 3 - Baleful Bog

Level 4 - Majestic Mesa

Level 5 - Hallowed Harbor

Level 6 - Cursed Crypt

Level 7 - Solemn Spire

Level 8 - Tricky Treetops

Level 9 - Paramount Pillar

5 Experience Metrics

5.1 Energy Expenditure

Energy is the central currency of *Aero's Quest*. Energy is what gives the player power and the ability to progress in the game from level to level. Without Energy, the player will not be able to defeat the strong enemies or find secret Energy Crystals hidden by Obstacles. With enough Energy, the player can exercise the will to explore.

The only way that the player can obtain Energy is by logging activity with the FIT armband. Energy is not available anywhere within the game world - only at the moment when the FIT and the game synchronize at the start of play. Thus, this moment is a crucial one, and one which the player should grow to anticipate. This anticipation should serve as the motivation to log activity in advance.

The accumulation of Energy is manifest twofold - in terms of the daily resource that fills the player's Energy meter, allowing more Energy Orbs to be used, and in terms of the recorded sum value that acts as a measure of the player's progress. The Lifetime Energy value is added to with every synchronization and every Daily Reward. This value is analogous to a player's "EXP" or "experience points" in popular role-playing games, in that it serves as the currency that unlocks new content.

5.1.1 Reaching Tiers

Aero's Quest employs four "Tiers" corresponding to a player's Lifetime Energy. A Tier is like a level, or a ranking. A player that has reached Tier 4 (the highest Tier) has progressed optimally - by logging activity. Progression through the Tiers is not affected by in-game actions; only by accruing Energy (which only is earned via activity).

These Tiers dictate the content that is available to the player in terms of customization options and arsenal upgrades.

More Accessories and Creature Customizer options become unlocked when a new Tier is reached (when the Lifetime Energy value reaches a certain point). These customization bonuses directly link the player's in-game image (avatar) to actual progress with regards to activity. This link provides a visible reward for the player.

But the unlocking of Tiers goes beyond cosmetic alterations. The acquisition of Energy Orbs -

the player's primary tool for clearing away Obstacles and accessing all of the Crystals in all of the Levels - is also tied to the player's Tier.

Tier 1 (0 Lifetime Energy)	Tier 2 (50,000 Lifetime Energy)	Tier 3 (250,000 Lifetime Energy)	Tier 4 (1,000,000 Lifetime Energy)
Fire Orb Ice Orb	Wind Orb	Thunder Orb	Light Orb

This means that the player can clear a wider array of Obstacles after accumulating enough Lifetime Energy to reach higher Tiers.

Any Crystals blocked by an Obstacle destroyed only by a Light Orb will only be accessible once the Light Orb is unlocked - that is, once Tier 4 is accessed (once 1,000,000 Lifetime Energy has been accumulated).

In order to reach the end of the game, every Crystal in the game must be collected. Thus, reaching the highest Tier is a prerequisite for beating the game. It is to be emphasized that this is a prerequisite fulfilled not by in-game actions, but by activity logged in the real world via the FIT armband.

Obviously, accumulating one million Lifetime Energy is no easy task. It will take the player a long time to reach that point. How long, exactly, depends on how active the player is. Because Energy Rewards correspond to how well the player meets the Activity Goal set by a parent, the player can reach Tier 4 faster by being more active over a sustained period of time.

Referring back to this table:

Daily Calories Burned	Base Daily Reward	+Milestone Bonus	= Total Daily Reward
Less than 25% of Goal	0-2,400 Energy	+0 Energy	0-2,400 Energy
At least 25% of Goal	2,500-4,900 Energy	+500 Energy	3,000-5,400 Energy
At least 50% of Goal	5,000-7,400 Energy	+1,000 Energy	6,000-8,400 Energy
At least 75% of Goal	7,500-9,900 Energy	+1,500 Energy	9,000-11,400 Energy
At least 100% of Goal	10,000-12,400 Energy	+2,000 Energy	12,000-14,400 Energy
At least 125% of Goal	12,500-14,900 Energy	+4,000 Energy	16,500-18,900 Energy
At least 150% of Goal	15,000-19,900 Energy	+7,500 Energy	22,500-27,400 Energy
At least 200% of Goal	20,000+ Energy	+15,000 Energy	35,000+ Energy

It can be seen how much Energy the player is awarded based on how much of the Activity Goal was reached. Thus, assuming a sustained daily rate (without accounting for any Weekly Rewards the player may earn), the minimum duration in which a player can reach each Tier is as follows:

Time Taken to Reach Tiers

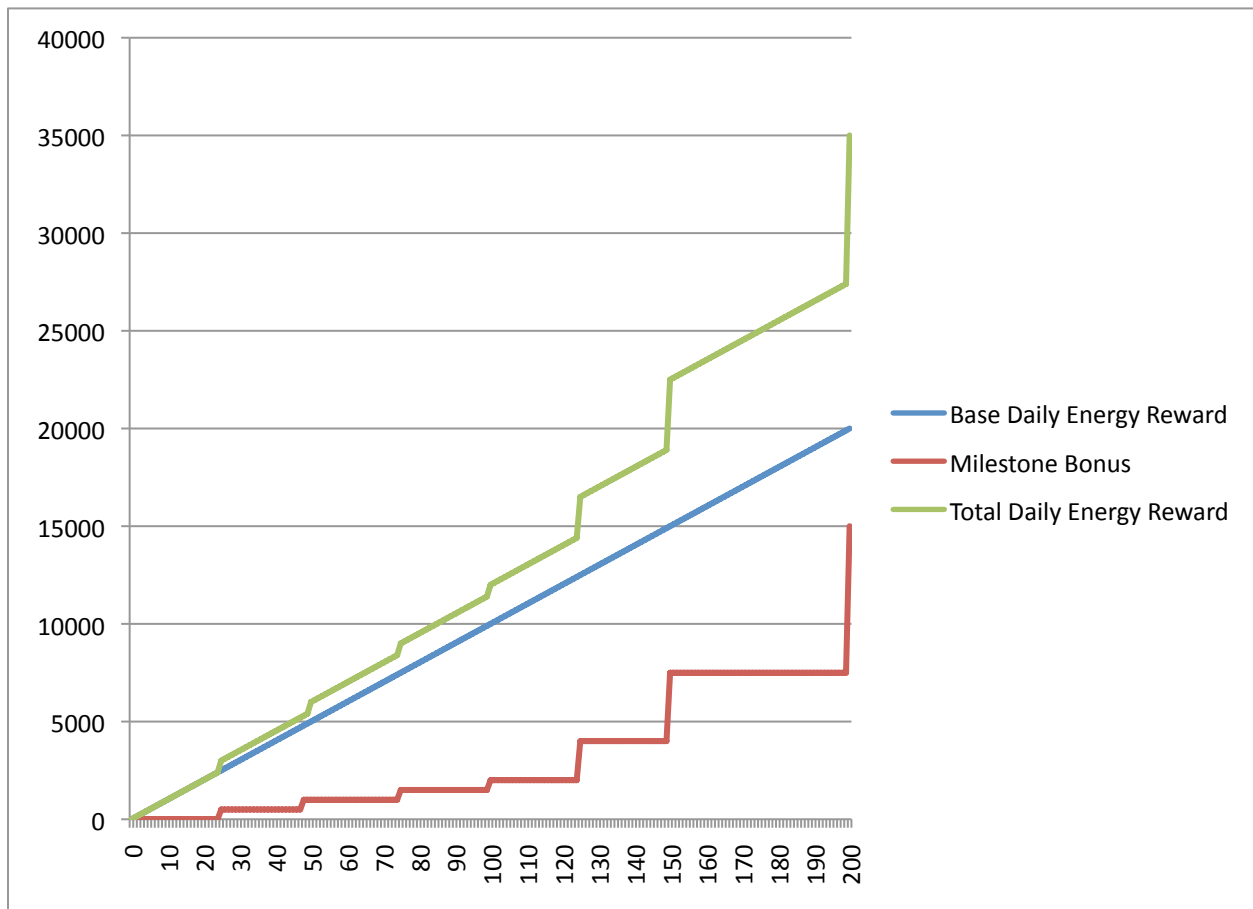
% of Goal	Tier 1	Tier 2	Tier 3	Tier 4
1%/Day	0 Days	500 Days	2,500 Days	10,000 Days
25%/Day	0 Days	17 Days	84 Days	334 Days
50%/Day	0 Days	9 Days	42 Days	167 Days
75%/Day	0 Days	6 Days	28 Days	112 Days
100%/Day	0 Days	5 Days	21 Days	84 Days
125%/Day	0 Days	4 Days	16 Days	61 Days
150%/Day	0 Days	3 Days	12 Days	45 Days
200%/Day	0 Days	2 Days	8 Days	29 Days

The above table indicates that a player who completes 100% of the Activity Goal each day will reach the maximum Tier of unlockable content after 84 days, approximately three months. The fastest a player can reach this Tier (given a daily rate of 200% goal completion) is 29 days, about one month.

The first Tier jump that a player makes will occur within the first week of play, given 100% Goal Completion. Thus, the player will be able to make some progress rather quickly, but achieving the ultimate goal remains a more time-consuming task. To satisfy players who demand instant gratification, the first two Energy Orbs (Fire and Ice), along with a few basic customization options are available right from the start. This way, players get a taste of all of the things they can do from the beginning, and Tier unlocking is a way of expanding that freedom rather than establishing it in the first place.

While players do earn some minimal Energy for very minimal percentages of goal completion, these amounts will take an unbearably long time if such activity becomes habitual. This way, players are required to make some form of effort to log activity (Additionally, allowing for a malleable, parental-controlled goal permits the player to log activity at a comfortable pace). However, the spread of corresponding Energy Rewards to Activity is structured to progress exponentially (through the offering of Milestone Bonuses for certain percentages), so the more the player is active, the more the amount the rewards increases is also increased.

Daily Energy Rewards



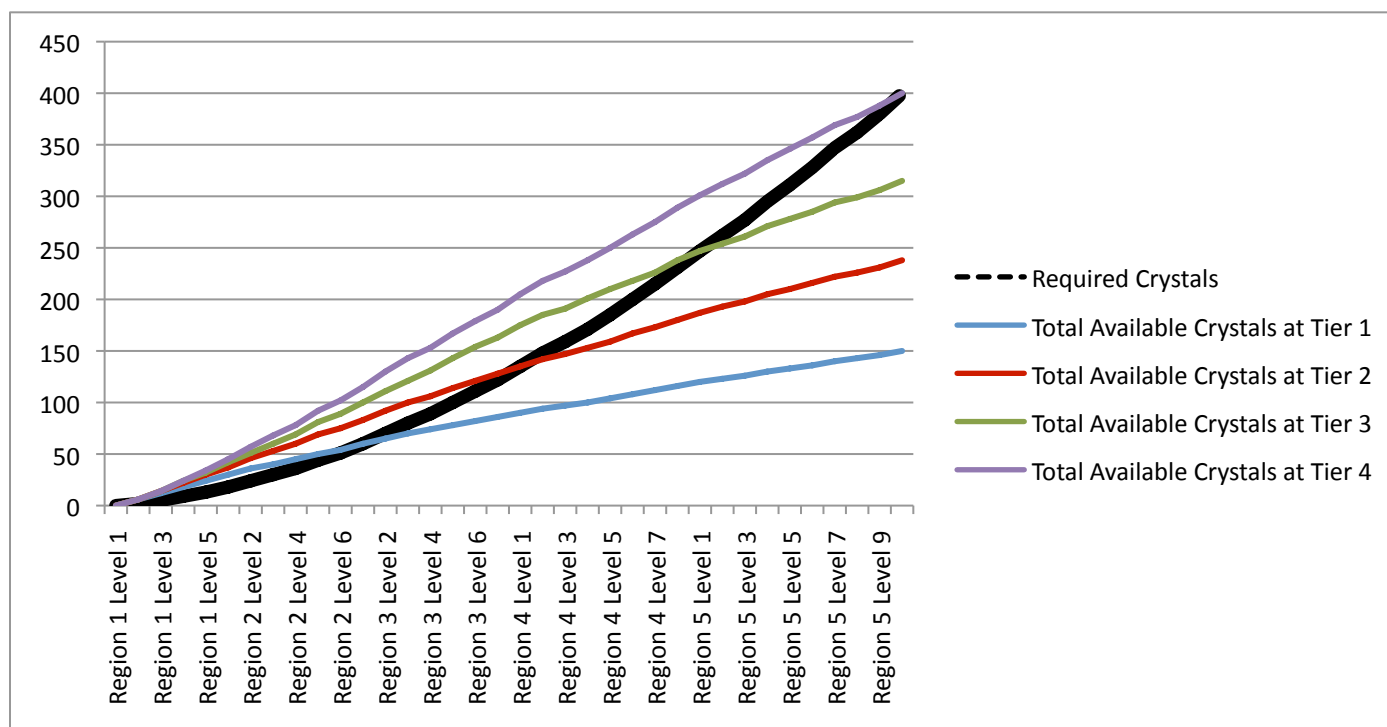
5.1.2 Crystal Collection

The other construct defining the rate of player progression through the game is Crystals. Where unlocking Tiers is defined by the player's logging of activity in the real world, collection of Crystals is defined by the player's actions in the game world. Collecting Crystals is also tied to earning Energy - this connection is what connects the actions in the real world with the actions in the game world.

Players must possess a certain amount of Crystals to access each level. The amounts required are structured in such a way as to align with the player's expected Tier by that point. For example, a player is expected to be no farther than Tier 1 on the first Region of the game world. Thus, the amount of Crystals required to progress beyond that first Region reflects only Crystals that are available while at Tier 1. The player will not be expected to obtain Crystals only accessible at Tier 2 before it can be reasonably assumed that Tier 2 has been reached. If the player has advanced to other Regions, however, it can be inferred that the player has played

the game many times and has thus earned a Daily Reward many times. The expectations of each Region, then (in terms of Crystals required to advance) is aligned with a particular Tier.

Crystal Requirements/Crystals Available by Level



The player is required to possess all Crystals accessible at Tier 1 in order to advance past Region 2, all Crystals accessible at Tier 2 in order to advance past Region 3, and all Crystals accessible at Tier 3 in order to advance past Region 4. To reach the final boss level at the end of Region 5 (the final Region), the player must have collected all Crystals in the game (including those at Tier 4) - this also includes Crystals given as rewards for completing a Bonus Level.

5.2 Gameplay

As the player progresses through the level, s/he is guided by the paths made by Shards. These paths may sometimes diverge - the player may be led upwards or downwards. Essentially, three main paths exist in each level - at the top, middle, and bottom - though paths occasionally intermix or subdivide. The presence of terrain, enemies, and items in the level is designed to force the player to weight at various intervals which path is worth taking. Because the player cannot travel backwards in a level, these choices are significant. Enemies and items are placed in ways so as to force the player to make decisions about what is more valuable - taking an easy route and obtaining little reward, or risking a more difficult route in order to obtain benefits, such as Crystals, HP replenishment, or an extra life.

When replaying a level, items collected on previous playthroughs remain collected. Thus, players' strategies will differ in terms of which way to go. Players will have an understanding of which areas of the level were not explored and aim to scour these parts for more Shards and Crystals.

When playing a level for the first time, a player may simply explore, choosing paths that look appealing. But after becoming more experienced, players may aim to traverse a different path on each play-through, remaining dedicated to that path so as to simplify item collection. However, the presence of Obstacles, along with the presence of enemies to avoid may thwart the player's attempts at compartmentalizing the navigation.

It should take the player a minimum of three playthroughs of a level to obtain all of the Crystals in a level, as there are three main paths. Depending on the stage of the game the player is at, more or fewer Crystals are required to advance to other levels, so the player may or may not decide to collect all of the Crystals in a level immediately. In the early stages where fewer Crystals are required, the player can travel to different levels for relatively little effort, allowing the beginning of the game to possess a more fluid, fun, exploratory feel. Later in the game, the difficulty is heightened, and the player will be required to exercise more discipline in collecting Crystals, spending more time on each individual level to collect them all.

6 Process

The primary goal for this project was to develop a demonstrable prototype of an Android game that utilized the Bodymedia FIT armband and was fun and compelling enough that boys and girls ages 7-9 would be motivated to wear the FIT and engage in an active lifestyle. Several challenges were inherent in this task. Foremost was the issue of how children perceive medical devices and the challenge of motivating them to wear the FIT armband. Another key issue was the challenge of designing for both boys and girls. To meet these challenges, the team researched popular kids' games, along with existing health-based games, and held a focus group with children in the demographic to determine what direction held the most appeal.

6.1 Research

6.1.1 Health Games

Early in the semester the team played several health-based games available online to gain an understanding of how existing products deal with the challenge of motivating children through play. Many of the games found were overly simple, featured poor control schemes, and involved virtually no metaphor for healthy choices. The games themselves were about making healthy choices (in a virtual context) and were too obviously education-focused to be appealing to kids. From this research the team realized that the game must not be about health; it must be inherently fun. If children become invested in the game, they can be motivated to do whatever it takes to succeed at the game.

6.1.2 Appeal Factors

To determine what children consider fun, the team researched the most popular kids' games for smartphones and across all platforms. Nurturing mechanics, found in games such as Pet Society, Pokemon, and the Tamagachi, have been successful in appealing to children, particularly girls. The idea of nurturing a pet also fit well with the paradigm of physical activity - as the player progresses in logging activity, the pet progresses in a way that reflects this. Collection mechanics also have been shown to be enjoyed by both boys and girls.

These directions were reinforced by a meeting the team held with the Lead Designer of a recent ETC project with a similar goal. Crechur, a Fall 2010 ETC project was a game that met the challenge of providing appeal for diabetic boys and girls in a way that motivated them to test their blood sugar levels. Because the goal of Energym's project was also to motivate kids to live healthily through play, the team understood it would be beneficial to learn from the process of the Crechur team. From the meeting, the team learned that Crechur successfully catered to

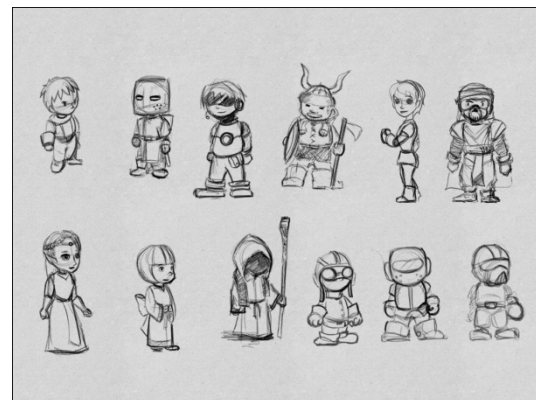
both genders by including both a battle feature and a customization feature, both of which were enhanced by proper real world behavior. The more times a child tested his/her blood sugar, the better they would be able to fight or decorate, whichever they preferred.

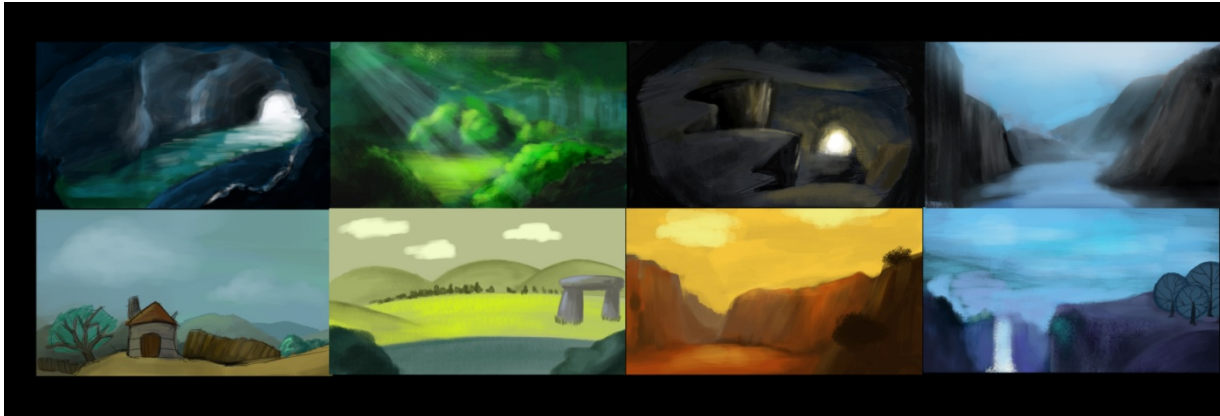
6.1.3 Motivation Models

While simultaneously researching Facebook games, the team found that popular games bring players back through the use of a daily reward system, where players gain in-game resources in exchange for simply logging into the game. It was decided that this model would translate well to the team's game, only instead of being rewarded simply for logging in, players would be rewarded for the activity logged with the FIT. This daily reward paradigm fit well with the envisioned logistics for this game - the child would wear the FIT during the day, at school, and when the parents returned from work in the evening, the child would play with the parent's smartphone, capitalizing on the data logged earlier.

6.1.4 Focus Group

The team also held a focus group with three children from the age demographic (one male, two female) in order to learn what they find appealing in entertainment. The primary purposes of this session were to determine whether children wanted to play with an animal, vehicle, or human being as an avatar, and to determine what kind of theme they preferred - including art style, game world mythos, and story genre - as well as what type of gameplay they found fun. The team presented concept art for various avatars and held comparative analyses of different art styles, along with asking the children about their current favorite games, television programs, movies, books, and sports. What was found was that children liked the idea of playing as a flying creature, particularly the wolf. This preference was held across both genders. The children also expressed enthusiasm for magical, fantasy-style settings, and being able to perform magic or have superpowers. Flying was also a popular superpower mentioned. From this feedback, the team was able to commit to an art direction and a game theme involving a flying wolf in a magical, fantasy setting.





6.2 Challenges

6.2.1 Making the FIT a "Badge of Honor"

The FIT is a tool for aiding individuals in tracking their activity, but among children there is the risk of stigmatizing; the team had to remain very careful not to allow the armband to become a "badge of dishonor" marking children who wear it as requiring help, or abnormal in any way. Indeed, the FIT is intended for anyone who wants to monitor their activity, not only those seeking to lose weight. Our game, then had to follow the same purpose.

The strategy for dealing with this challenge was twofold. First, the team took advantage of the power of thematic elements in games and the allure of a fantasy world. Using the game story to transform the FIT into a magical "Energy Band" that the player heroically uses to recharge the

powers of the fantasy world's guardian, a way was found to not only connect the physical device with the game world, but also to put a more positive spin on the armband. Secondly, the team has developed ideas for skinning the physical device to remain consistent with the Energy Band from the game story. Children may not take to wearing medical devices well, but they do enjoy being able to outfit themselves in the gear of their idols.

6.2.2 Creating Appeal for Boys and Girls

The other primary challenge was designing a game that held appeal for both boys and girls. Especially at the young age of 7-9 years, the interests of members of different genders can differ widely. This hurdle meant that the team's game would need to have gameplay elements that both genders could enjoy, as well as an art style that did not alienate either gender. The research told us that generally speaking, boys tend to focus more on combat in games, while girls enjoy customization. Using these parameters as guidelines, a direction became clear.

6.2.3 Hardware and Logistical Limitations

An initial point of question was whether the game would involve the FIT as a controller, or instead use it as a kind of activity "bank." It seemed that using the FIT as a direct controller for the game would be more engaging and more effectively connect the armband to the game, but it soon became apparent that this was not an option.

The FIT takes record of a variety of different biofeedback parameters, but only the steps taken by the wearer update in real-time. There are logistical concerns with walking or running while keeping one's eyes focused on a smartphone, so using the FIT in this way was not viable.

The team also considered incorporating a flying mechanic in which the player would flap his/her arms while wearing the FIT so as to generate a step count. However, there were several concerns with such an approach, including the accuracy of readings when using the FIT in a way other than it was intended to be used, the inability of the player to see the screen while waving arms, and the potentially awkward feel of such a method of input.

The alternative direction of using the FIT as a bank was then a more appealing concept than the concept of using it as a controller. The team's research had already revealed numerous "bank" type models in games that are extremely successful at motivating players to return. Many Facebook games currently employ such models. Because of this fact the team was confident that a similar bank model would be effective; the drawback of this model was the distance the armband now took from the game itself. The team sought to compensate for that disadvantage by theming the game's story in a way that glorifies the FIT in a fantasy context and explains a

direct connection between real world activity and in-game action.

6.3 Rejected Concepts

Early in the semester the team was forced to discard various ideas and concepts that had been considered due to factors such as scope limitations, thematic inconsistencies, and a lack of connection with the target demographic. This iterative process of generating and developing concepts, evaluating them, and deciding to discard or retain them allowed the team to explore different directions before committing to development. The process also was helpful in focusing the team on priorities, such as devising an effective link between activity logging and gameplay and maintaining appeal for both genders.

6.3.1 Mutagen

A concept we seriously considered involved a much more complex and dynamic customization system - one in which cosmetic changes to the player's avatar corresponded to direct alterations in functionality, thus affecting gameplay.

6.4 Client Feedback



Feedback from the client, Bodymedia, served to direct the team at various intervals throughout the semester. The April 11 meeting included a presentation of a playable version of the product (which would undergo additional revisions following later playtests). The client expressed satisfaction with the concept that had been developed and enthusiasm about some of the future directions in which it could be taken, particularly towards a social paradigm. Regarding the build, the client was pleased by the feel of gameplay, as well as the art style. The mechanism for motivating players to exercise and wear the FIT armband was also well received.

Concerns included the worry that the game's story might be too sophisticated for the 7-9 age

demographic, and so efforts were taken to simplify the story that appears in the game. The client also expressed curiosity about documentation of the team's decision-making process throughout the semester, and so efforts were taken to address this as well.

The client was pleased that the team had chosen to use the calorie-burn measurement, a unique feature of their product, as the central measure of activity, and was able to assist the team with a concern regarding generalizing this value to an audience for whom metabolic rate is a variable. Because this rate varies based on individuals' age, gender, and weight, the team was concerned about a direct calorie-burn value rendering the reward system unfair towards those with slower metabolisms. The client suggested that a percentage-goal model could solve this problem, and so this suggestion was taken and included in the final design. Players' rewards now are determined by the percentage of a calorie-burn goal that is specifically tailored to their metabolism and set by a parent or guardian. In this way, the client's expertise was particularly useful, as not only was the problem solved, but also a new opportunity was provided for involving parents in the players' activity logging experience.

6.5 Playtesting

During the semester, the team performed four formal playtest sessions, along with a few additional informal tests. These tests allowed the team to discover how elements of the game were received by players, particularly those in the 7-9 year age demographic. Particular points of concern were fun, usability, and intuitiveness of the interface. Feedback allowed for modifications to be made as needed. Additional suggestions made by playtesters for desirable elements beyond the scope of this semester provided excellent additions to the design as well.

6.5.1 Peer Usability Testing - April 6

The team performed an initial test with peers at Carnegie Mellon's Entertainment Technology Center to determine whether the control system was usable and which type of navigation UI was preferred. Ideally, participants would have been children from the age demographic, but due to the logistical difficulty of accessing children and the need to obtain feedback as soon as possible, peers were selected. Anticipation of playtests in the near future with children rendered this session as merely preliminary.

Two options for UI were tested - a slider, which featured arrows, and a joystick, which only allowed for upward and downward movement.



Unfortunately, the test demonstrated no clear preference for controls; testers were split on which type of interface they felt more comfortable with. However, the team did receive some valuable open-ended feedback. Testers commented on the joystick, saying they expected to be able to move left and right as well as up and down, because of what it looked like. Others did not immediately understand the slider mechanism. Nearly all testers expressed demand for a speed boost option.

This feedback was taken into account, and the team eventually decided to incorporate the slider, but only after reworking its look so as to stand out and be more intuitive. A joystick (which inherently implies four-directional movement) that only allows for upward and downward movement seemed to present greater opportunity for frustrating players, while the slider seemed conceptually more sound, merely less intuitive. Thus, the slider was revamped with the hopes that a clearer design would be easier for players to understand when first confronted with it.

6.5.2 Male Demographic Testing - April 13, April 16

The team got its first opportunity to test the game with children in the target age demographic on April 13, with help from Schell Games in Pittsburgh. The team was able to test with seven males aged 6-12 who were already visiting the game studio to serve as playtesters. This iteration of the game featured the revamped slider control, and was the game's first exposure to members of the target demographic. As such, the primary goals for this session were usability of the controls and the overall fun of the experience. Suggestions for desired additions were also sought.



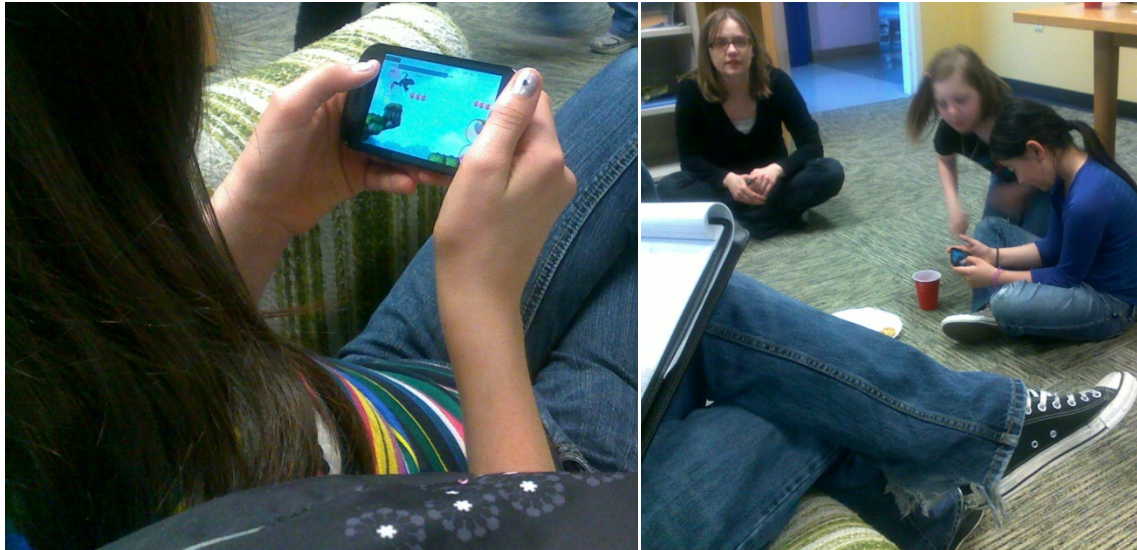
The playtesters all described the game as fun, which was very reassuring feedback. Most were able to intuitively play the game, though there was some confusion, particularly among younger players. Confusion was generated from the lack of definition and visibility of UI elements such as the slider arrows and the projectile buttons. Several players also displayed the initial reaction of attempting to tilt the Android phone. In situations where players did not know what to do, the team explained the controls, and with an explanation, all players, even those with initial confusion were able to play the game. This phenomenon indicated that a tutorial may be necessary.

Additional trends included the desire for a speed boost ability and the tendency to follow Aero's avatar with one's finger while playing. Players did not report frustration at a lack of speed, but generally agreed the inclusion of some action to move faster would improve the gameplay. Because players tended to follow the avatar, the team decided to make this finger gesture the input that activated the speed boost.

The most significant lessons learned from this session were the need for polished UI, the need for tutorials, and the need for a speed boost. Because players reported the experience as fun, some even saying they would download it from the app store at that point, the team was able to move forward with confidence that the core experience was effective, needing only to be perfected.

6.5.3 Female Demographic Testing - April 22, April 29

A later playtest with three girls between the ages of 6 and 12 was held with the intention of discovering whether the experience was received similarly by female players as it had been by males. The version tested included a modified level design, improved UI, and the first build of the Wolf's Den and the Creature Customizer mode.



The feedback received indicated that while girls prefer different aspects of the gameplay than boys do, members of both genders are able to have fun playing the game and respond to the UI similarly.

Some feedback validated the game's current design - the paths made by Shards guide the player well; vertical movement controls were clear; items intended to be beneficial looked as such; players quickly learned how to play; players had fun and expressed willingness to endure duller tasks such as chores and exercise in exchange for playing the game.

Feedback also reinforced the need for changes already being worked into the game - the girls wanted a faster forward pace, were expecting to control forward movement, did not always notice attack buttons, and occasionally needed an explanation for how to play.

Additionally, the girls' experience with the Wolf's Den and Creature Customizer produced useful feedback. Girls were able to guess what elements of the Wolf's Den UI were interactive, but the interactive status was not intuitive; as such, the team took note to add a glow to the interactive elements so as to make them more easily distinguishable. The girls also expressed strong desire to be able to decorate the Wolf's Den with posters, furniture, and other accessories, as well as keep pets and unlock music and decals for fur patterns. While implementation of these features would exceed the scope for this semester, this feedback provided valuable insight into what girls specifically want from the game and bolstered the game's design.

6.5.4 Conclusions

As a result of these playtest sessions, the team was able to identify the strengths and

weaknesses of the design and make changes to eliminate weaknesses and reinforce strengths. The reworking of the UI on both the level and the Wolf's Den, along with the incorporation of the speed boost have greatly benefitted the game.

Research on the gameplay preferences of boys and girls was reinforced by playtesting - the boys tended to enjoy the shooting of projectiles while girls were content to ignore the option and instead evaded enemies. Girls also expressed great interest in decorative options. Still, the similarities in responses between genders indicate that the product is compelling for both boys and girls. Both found the game fun, liked the idea of a speed boost, desired bonus areas, and thought it would be fun to choose between different creature avatars. Significantly, both boys and girls were able to intuit the general vertical navigation controls, while both also made the same misinterpretations regarding forward movement and the functionality of buttons.

Following the several playtest sessions and the changes made based on feedback, the product has shown to be fun and compelling to the point where both boys and girls enjoy the game and are willing to perform laborious actions in exchange for play.

7 Glossary

1UP

An object encountered in the level that the player can fly through to increase the Lives counter by one.

Accessory

A piece of clothing or some other wearable item that is unlocked in the Accessory Closet and used in the Creature Editor to customize the avatar's appearance.

Accessory Closet

One of the areas within the Wolf's Den. This is the place where new Accessories are unlocked (based on Lifetime Energy accumulation) and where obtained Accessories can be viewed.

Activity Goal

A numerical value (in Calories burned) that a parent of the player sets via password. This is held as the standard to which the player's Actual Calories Burned (as recorded by the FIT) is compared. Daily Rewards are given to the player based on the ratio of Actual Calories Burned to the Activity Goal.

Actual Calories Burned

A numerical value recorded by the FIT representing the number of Calories the player burned while the FIT was worn. This value is transferred to the game and measured against the Activity Goal set by a parent in order to determine the player's Daily Reward.

Aero

The name of the Sky Wolf who is the legendary guardian of Arcandor. During gameplay, the player controls Aero's avatar.

Arcandor

The name of the fantasy world which is under threat from The Leech and that Aero must protect.

Armored Zombird

An armored version of the standard enemy type. This version can only be damaged and destroyed by using Energy Orbs; Basic Orbs have no effect on this enemy.

Avatar

A graphical in-game representation of the entity the player controls. In this game, the player controls Aero the Sky Wolf. The avatar is the graphic that represents Aero, is modified through customization, and interacts with objects in the levels of the game world.

Basic Orb

The Basic Orb does not consume Energy but serves as a standard projectile attack (with no limit) that can be used to defeat standard enemies. Basic Orbs have no effect on armored enemies and Obstacles, however. Basic Orbs allow the player to have some power when playing without Energy, but their limitations (and the implication that upgrades exist in exchange for being active) encourage players to be active so as to gain the additional power necessary to make significant progress.

Bonfire Obstacle

The fire obstacle, destroyed by Ice Orbs.

Bonus Energy

An additional reward the player earns by reaching milestones in the percentage of the Activity Goal completed daily. For burning 25%, 50%, 75%, 100%, 125%, 150%, or 200% of the calories set as the Activity Goal, the player earns a corresponding amount of Energy as a bonus in addition to the Daily Reward.

Cloud Obstacle

Destroyed by Wind Orbs. This obstacle is to be differentiated from the Fog that serves as the top-of-screen boundary.

Creature Editor

One of the areas within the Wolf's Den. This is the place where biological alterations can be made to Aero's avatar and where obtained Accessories can be equipped in order to customize the avatar's appearance.

Customization

The act of modifying aspects of an avatar. In this game, customization is in terms of biological assets (color and design of the avatar's head, front legs, hind legs, tail, and torso) and in terms of wearable assets (Accessories such as Vests, Capes, Hats, and Goggles). This action is the means for the player to personalize part of the experience.

Daily Reward

The in-game asset received by the player at the beginning of play in exchange for having been active while wearing the FIT and burning calories in a the period of one day. The in-game asset is Energy, which is the currency for performing special actions during gameplay (shooting Energy Orbs and using the Speed Boost). The amount of Energy received as a Daily Reward is determined by the percentage of the Activity Goal that was reached.

Enemy

An antagonistic entity that populates the levels of the game world as an object. Enemies come in various forms and have different qualities, but all enemies serve as obstacles that threaten to damage the player. Enemies can be destroyed by the player's actions sometimes, though this depends on the player's skill and available weapon resources.

Energy

An in-game resource that serves as a currency for player actions. This resource is received by the player solely in exchange for burning calories while wearing the FIT (outside of the game). Energy is primarily received as a Daily Reward when the FIT and the game synchronize at the start of play and is supplemented by goal-milestone and weekly-streak related bonuses. The amount of Energy received as an award correlates positively (and exponentially) with the amount of Actual Calories Burned. Using Energy as a resource in the game, the player can perform special actions (shooting Energy Orbs and using the Speed Boost) that enhance the player's power and allow for a more expansive experience. Thus, the Energy concept is the cornerstone of the mechanism that motivates players to maintain an active lifestyle and monitor activity by wearing the FIT.

Energy Band

The in-game representation of the FIT. In the game's story, the hero (representing the player's actual identity) enters the game world bearing a magical object (this Energy Band) that has the amazing ability to recharge the powers of the world's guardian (Aero the Sky Wolf). The story is structured so as to include the FIT as something with inherent appeal to players. By manifesting the FIT as something more than it is, as some magical object that has extraordinary capabilities, the player understands the FIT as something appealing and empowering rather than something binding or stigmatizing.

Energy Crystal

In the story, these are the objects that give the Sky Wolf his superpowers (and that were stolen by the antagonist, The Leech, rendering the Sky Wolf powerless until the hero appeared with the Energy Band). In terms of the gameplay, the Energy Crystals (abbreviated as "Crystals") are rather rare objects that populate the game's levels and are to be collected by the player in

order to unlock future levels. The Crystals are placed throughout the levels in such a way as to require multiple playthroughs (and thus many days of being active) in order to access. Many Crystals are blocked by Obstacles which require Energy-consuming Orbs in order to reach, thereby necessitating that the player possess enough Energy in order to perform the actions required to eliminate the Obstacles and so obtain the Crystals. Thus, the Crystals are the reason Energy is important within the game world.

Energy Meter

The GUI element representing the player's possessed Energy. The Energy Meter fills at the start of play to a point equal to the Energy obtained as a Reward, and is depleted when Energy-consuming actions (shooting Energy Orbs and using the Speed Boost) are performed.

Energy Orb

A special form of ammunition that damages armored enemies, damages standard enemies double, and eliminates particular Obstacles in the level. An Energy Orb depletes 500 Energy from the Energy Meter when used. There are five types of Energy Orbs (Fire, Ice, Wind, Thunder, and Light), each matching a particular Obstacle (Ice Block, Bonfire, Cloud, Metal Wall, Mirror Switch) in a lock-and-key fashion. Energy Orbs are used by pressing the Energy Orb button. The different types become unlocked as more Lifetime Energy is accumulated by the player.

FIT

The Bodymedia product that measures and stores data relating to wearer's physical activity (including calorie burn) and synchronizes via Bluetooth with the Android game. By wearing the FIT to record daily calorie burn values, players gain the ability to use that data in the game and earn rewards that make the experience even more enjoyable.

Fog

A mass of clouds at the top of the screen representing the top boundary of the screen. If the player cross the Fog, s/he will be able to move through it for a few seconds before becoming lost and returning to the start of the level (without losing a life)

Hero

In the story, the reference to the player.

HP (item)

Players can replenish health by flying through Water objects in the game levels.

HP (stat)

A player attribute representing the amount of current health possessed. Health is depleted when the avatar collides with enemies and obstacles, replenished by flying through Water objects, and represented graphically by an HP Meter on the UI.

HP Meter

The GUI representation of the player's current health.

Ice Block Obstacle

A game object destroyed by the Fire Orbs.

Lifetime Energy

The aggregate amount of Energy received by the player to date. Every time the player's FIT and game are synchronized, the player receives a Reward in terms of Energy that serves as a resource to be used toward play. But Energy has another application with regard to customization. The amount of Energy awarded to the player after each synchronization (including any milestone Bonuses and Weekly Rewards) is added to a value tracked by the game representing the player's Lifetime Energy. This value can be viewed in the Wolf's Den. When the Lifetime Energy value reaches a certain amount, Tiers become unlocked and more customization options, including Accessories and body part modifications for the Creature Editor, become available.

Obstacle

A game object that populates the levels and is designed to prevent the player from accessing certain areas (which contain desirable items). Obstacles also cause the player damage if collided with but do not attack the player as enemies may. Obstacles come in five forms (Ice Block, Bonfire, Cloud, Metal Wall, and Mirror Switch) and are destroyed by Energy Orbs (Fire, Ice, Wind, Thunder, and Light Orbs). By destroying obstacles, players can access the paths they had blocked and obtain all of the Crystals and Shards there. Because Obstacles can only be destroyed by Energy-consuming Orbs, the Crystals blocked by Obstacles can only be accessed after earning enough Energy by being active.

Orb

A projectile weapon the player can use to shoot at and destroy enemies in the game's levels. Orbs come in Basic form (which do not run out, cost no Energy, and can only do minimal damage) and an Energy form (which cost 500 Energy per shot, can only be used if the requisite Energy is possessed, do greater damage to enemies, and can eliminate obstacles).

Reward

In-game resources (Energy) received by the player in exchange for the number of calories burned as recorded by the FIT.

Shard

A Shard is a piece of a shattered Energy Crystal. Shards are common objects in the game's levels and can be collected easily by flying through them. Collecting 100 Shards assembles a new whole Crystal, but like the whole Crystals, Shards inhabit multiple pathways in the levels, some of which are blocked by Obstacles.

Sky Wolf

The type of creature the avatar is.

Speed Boost

An action the player can perform in order to move forward faster.

Story

The narrative presented at the start of the game.

Terrain

Land masses that populate the levels - colliding with these will not damage the player, but the Terrain does serve to limit the areas the player can move.

The Leech

The game's main antagonist. The Leech is a massive shadowy creature that gains power by sapping others' Energy. He has stolen the Energy Crystals and seeks to take over Arcandor with their power.

Tier

A division of subsets applied to the accessibility of unlockable customization options. In the Creature Editor and Accessibility Closet, body parts and Accessories are assorted across four Tiers. Each Tier has a corresponding value of Lifetime Energy. When that value of Lifetime Energy is accumulated by the player, the corresponding Tier becomes open and the body part modifications and Accessories in that Tier become available.

Unlocking

The process by which new content becomes available as a result of player achievement is known as unlocking.

Water

A game object that can be encountered in the levels. By flying through Water objects the player can restore a potion of health (10HP/50HP).

Weekly Reward

After receiving a Daily Reward, the player's weekly progress is presented. If a player meets certain activity levels for five consecutive days, the player receives a Weekly Reward, which comes in the form of an amount of Energy larger than Daily Reward amounts.

Wolf's Den

An area in the game world that serves as a home base for the player. Here the player can access the Creature Editor and the Accessories Closet and view Lifetime Energy. The Wolf's Den can be accessed from the World Map.

World Map

A screen displaying the locations for all levels and other areas in the game world. Players touch specific points on the World Map screen to access those areas.

Zombird

The standard enemy type that populates the levels. Zombirds are the most common minion of The Leech and can be destroyed by merely one hit from a Basic Orb.

