Polishing

Jaanus Jaggo

Change log - Game polishing!

JUNE 9 - HUBERT MOSZKA

Jester 2 hours ago
The game is Polish enough

https://www.reddit.com/r/NotKenM/comments/8tpyxu/notkenm_on_game_polishing/
Polishing

“Getting a system from 90 percent to 100 percent. That last 10 percent takes just as long as the first 90.”
Alpha Protocol’s lead programmer Frank Kowalowski

Polishing includes:
● Game balancing
● Making it look better
● Making it sound better
● Optimizing
● Adding little details
Achieving Polish

A team achieves polish by:

- Allocating time for polishing.
- Understanding its quality bar.
- Playing the game over and over.

"I wish we had more time to polish the game before release", says Kingdom Come: Deliverance exec producer

When should you polish your game?

**Too Early** - slows down development - time spent on **insignificant details**.

![Build Polish Build Polish Ship]

**Too Late** - you should not ship a broken product.

![Build Ship Build Polish]

**Just Right** - plan time before and after shipping a product - **use player feedback**.

![Prototype Build Polish Ship Polish]

https://gedd.ski/post/polish/
When should you polish your game?

Polish is not a one-time deal.

Game development is an iterative process.

The game dev loop:
1. Choose a set of features
2. Prototype and test
3. Build it quickly
4. Polish it up
5. Ship it
6. Get user feedback and polish more

https://gedd.ski/post/polish/
When should you polish your game?

Polish is not a one-time deal.

Game development is an iterative process.

Our schedule:

https://gedd.ski/post/polish/
Gameplay polishing

- Create a good core gameplay loop.
- If the game is not fun with just basic shapes, it probably will never be.
- Do not move on, until you are satisfied with it.

Story of Tetris: [https://www.youtube.com/watch?v=_fQtxKmgJC8&t=1273s](https://www.youtube.com/watch?v=_fQtxKmgJC8&t=1273s)
Hooks, Tutorials, Rewards

First 10 minutes of gameplay

The new Player Experience: https://www.youtube.com/watch?v=-fWX6v0NTvl
Hooks

Gameplay

Story

Visuals
Good tutorial

Rule 1: Less text  ➔  Tutorial should feel like gameplay

Plants vs Zombies (GDC 2012):
Good tutorial

**Rule 2: Reinforce Learning Through Play**

Once you reach the Gruz Mother you already know how to wake her up!

https://www.youtube.com/watch?v=vWiDS8SUvds
Good tutorial

Rule 4: Use visuals to guide the player

Shoots peas

Explodes

Eats zombies
Good tutorial

**Rule 2: invisible tutorial**

- **Pick up that can!**
- Used to solve puzzles, kill enemies etc.

Half-Life 2’s Invisible Tutorial: [https://www.youtube.com/watch?v=MMgggenxuZc](https://www.youtube.com/watch?v=MMgggenxuZc)
Playtest your tutorial

If some players are having troubles, it is YOUR FAULT

Something obvious for you might not be so obvious for everyone

Struggle with tutorial: https://www.youtube.com/watch?v=WuSiKpreGIs
Examples of tutorials

Papers Please

http://papersplea.se/

Mission 1

Entrant must have a passport
Aristotzkan citizens only

Mission 20

Entrant must have a passport
All documents must be current
Citizens must have an id card
Workers must have a work pass
No weapons or contraband

Diplomats require authorization
Asylum seekers must have a grant
Entrant must have polio vaccine cert
Foreigners require an access permit
Examples of tutorials

Super Mario first level

You will always hit the powerup block to avoid the enemy!
Examples of tutorials

Cut the Rope
The Witness

https://kotaku.com/tips-for-playing-the-witness-1755531140
Examples of tutorials

Inspiration from:

- Portal
- Stanley Parable

The Button:
http://ludumdare.com/compo/ludum-dare-37/125070/?action=preview&uid=93007
Making the fingers happy

Multiple default controls
Controls remapping

https://gamedevelopment.tutsplus.com/articles/5-important-ways-to-add-polish-to-your-game--gamedev-7642
Save / Load game

Ways of saving a game:
- Automatic save
- Manual save
- Only meta game saved

Players want to know when the game is saved
Save / Load game

1. Make your object classes serializable
2. Make a Game class containing game state
3. Save your Game class to a file

```csharp
class Character {
    public string name;
    public Character () {
        this.name = "";
    }
}
```

```csharp
using UnityEngine;
using System.Collections;

[System.Serializable]
public class Character {
    public string name;
    public Character () {
        this.name = "";
    }
}
```

**Unity tutorial:**
Smooth transitions

Hülgejaht - Jaanus Jaggo
Smooth transitions

Smooth UI and GameObject transitions give fluid game feel.

Example: http://gfycat.com/ImmenseHalfItalianbrownbear

Unity functions:

- Mathf.Lerp(min, max t)
- Mathf.SmoothStep(min, max, t)

https://www.leadwerks.com/community/blogs/entry/1466-polishing-games/
Add ambiance

Make sure there is always something moving or happening on the screen.

- Torches
- Clouds
- Wind (animated flags)
- Leaves flying
- Grass
- People walking
- Ambience sound
- Light changing

https://www.reddit.com/r/PS4/comments/5warjy/gif_horizon_zerodawn_is_one_of_the_best_looking/
Add ambiance

World Remade - Jaanus Jaggo
Add particles

Orbital Craft - Jaanus Jaggo
Add particles

Custom particle editor - Jaanus Jaggo
Color grading

Movies

The House On Pine Street

Color In Storytelling: https://www.youtube.com/watch?v=aXgFcNUWqX0
Color grading

Games

Miniature city - Jaanus Jaggo
A/B Testing

The Complete Guide to A/B Testing: [https://vwo.com/ab-testing/](https://vwo.com/ab-testing/)

**Step 1:** Set your goals

**Step 2:** Create 2 variants

**Step 3:** Conduct your test
Balancing

**Goal of balancing:** avoid broken gameplay

When you’re designing a game you want to create positive experiences. When gameplay is not providing positive experiences, your game is broken.

**Balancing requires testing!**
Enrico Fermi solution for precise answer:
- ● 1 expert
- vs
- ● average of 100 random people

Balancing

The power curve

Extra Credits: Herathstone power creep  https://www.youtube.com/watch?v=M3b3hDvRjJA
Accept that you are **never** going to get the **balance right** on your **first attempt**!

**Triple tapping:**
- Intentionally overshoot the target (card cost 100 mana)
- Correct it on the other direction (card cost 60 mana)
- Now find the right value in between (card cost 85 mana)

At one point you will need excel sheets

Simply assigning values and tweaking them would take too much time!

RPG: Balancing = creating sense of progression

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Ground Forge spreadsheet for balancing monster health and player equipment
Diagrams for game items

Ground Forge diagram for balancing item crafting
Perfect imbalance

Unbalanced design creates balanced play.

Part of the fun is to figure out what works the best!

https://www.youtube.com/watch?v=e31OSVZF77w

https://www.youtube.com/watch?v=e31OSVZF77w
Balancing

**Asymmetric games** - harder to balance, but more fun

Symmetric factions

Asymmetric factions
Design safeguards

No matter how good you are at balancing, players will outmatch you!

In powergrid, players bid for powerplants and resources.

In Heartstone randomness allows everyone to sometimes win.

Polish is when “You take a game from ‘this is functional’ to ‘this is art.’”

Dragon Age lead designer Mike Laidlaw

http://www.midsummergames.com/author/erik/
Game optimization

"Good optimization means that the game works at the same framerate across a wide range of hardware specs, including low-end configurations."

**SYSTEM REQUIREMENTS**

**MINIMUM:**
- Requires a 64-bit processor and operating system
- OS: 64-bit Windows 7, Windows 8.1, Windows 10
- Processor: Intel Core i5-4430 / AMD FX-6300
- Memory: 8 GB RAM
- Graphics: NVIDIA GeForce GTX 960 2GB / AMD Radeon R7 370 2GB
- DirectX: Version 11
- Network: Broadband Internet connection
- Storage: 30 GB available space

**RECOMMENDED:**
- Requires a 64-bit processor and operating system
- OS: 64-bit Windows 7, Windows 8.1, Windows 10
- Processor: Intel Core i5-6600K / AMD Ryzen 5 1600
- Memory: 16 GB RAM
- Graphics: NVIDIA GeForce GTX 1060 3GB / AMD Radeon RX 580 4GB
- DirectX: Version 11
- Network: Broadband Internet connection
- Storage: 30 GB available space
Game optimization

Steam hardware survey 2018

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https://store.steampowered.com/hwsurvey/videocard/
Game optimization

“Premature optimization is the root of all evil”

instead be extremely effective at

getting things done

Most code is

not

performance-sensitive

Jonathan Blow, the creator of Braid and The Witness:
https://www.youtube.com/watch?v=JjDsP5n2kSM&index=12&list=PL_5CVXzMqD7ZTRdf9B4allwX47ZuWw7Oq
Game optimization

Three things to optimize:

- Optimize for speed
- Optimize for space (memory, disk space)
- Years of my life per program implementation

https://imgur.com/gallery/RtfHa
Unity profiler

60FPS ~ 16ms in total
Ways to improve Unity performance

CPU:
- Object **caching** and **pooling**
- Optimize code in **update loop**
- Reduce the number of **updated game objects**
- Reduce the number of active **RigidBodies**

GPU:
- Make objects **static** (bake lights and occlusion)
- Enable **Static** and **Dynamic batching**
- Reuse **materials** and **textures**
- Reduce the number of **post-processing effects**
- Use **LOD meshes** for larger scenes

https://www.cgcookie.com/articles/maximizing-your-unity-games-performance
Ways to improve Unity performance

Object pooling

```csharp
public class ObjectPool : MonoBehaviour {

    public GameObject bullet;
    public int pooledAmount = 20;
    private List<GameObject> bullets;

    // Use this for initialization
    void Start () {
        bullets = new List<GameObject> ();
        for (int i = 0; i < pooledAmount; i++) {
            GameObject obj = Instantiate (bullet) as GameObject;
            obj.SetActive (false);
            bullets.Add (obj);
        }
        InvokeRepeating ("Fire", .05f, .05f);
    }

    void Fire ()
    {
        for (int i = 0; i < bullets.Count; i++) {
            if (!bullets [i].activeInHierarchy) {
                bullets [i].transform.position = transform.position;
                bullets [i].transform.rotation = transform.rotation;
                bullets [i].SetActive (true);
                break;
            }
        }
    }

    // End
}
```

https://www.cgcookie.com/articles/maximizing-your-unity-games-performance
Garbage collection spikes

Your project likely creates object every frame:

- Eliminate temporary lists
- Replace classes with structs
- Restructure your code
The art of screenshake

https://www.youtube.com/watch?v=AJdEqssNZ-U&t=9s
APT Game Jam

- **Time:** 2-4 Nov (Friday 18:00 to Sunday 21:00)
- **Location:** Liivi 2
- **Registration link:** https://goo.gl/forms/Ay2hwWTbgrccgBnW2
- + 5 points to this course

Team size 3-5 people
No old projects
Can reuse old code and assets
NEXT WEEK - milestone 1 presentation

Milestone 1 (29 October -> 15p)

- Project plan
- UI Mockups + Scheme
- Color Scheme description
- Game Loop implementation (has one gameplay mechanic)
- Win and Lose conditions implementation
- Presentation

Presentation (5 minutes):

You don’t have to prepare slides but you can. Cover following things:

- Remind us about your game idea
- Demo your game (live or recorded)
- Tell about what went well and what went wrong
- What are you going to change compared to your original idea
NEXT WEEK - milestone 1 presentation

You will receive your game wiki page today in courses!

https://courses.cs.ut.ee/2018/gamedev/fall/Main/Projects

Projects

Teams

1. Wellfare Adventure - Andreas Sepp, Marko Täht (markotaht@gmail.com), Diana Algma
2. Project Helios - Daniel Nael (Daniel.Nael.002@gmail.com), Paul Liibert, Raigo Kõvask
3. Scrap it - Hiie-Helen Raju (hiiehelenraju@gmail.com), Toom Lõhmus, Jens-Stefan Mikson
4. Librarics - Daniel Kütt (daniel.kuutt@gmail.com), Jim Raudsepp, Silver Kirotar
5. Travellia - Andreas Baum, Martti Kakk, Petra Cendelínová
6. Sacred way - Andry Nõgols, Rauno Umborg (rauno.umborg@gmail.com)
7. Time Catcher - Richardas Keršis, Mykola Rybak

https://courses.cs.ut.ee/2017/gamedev/fall/Main/Projects - Last year teams
NEXT WEEK - milestone 1 presentation

You will receive your game wiki page today in courses!

https://courses.cs.ut.ee/2018/gamedev/fall/Main/Projects

Fill in your courses page, add following things:

- Short game description
- Project plan
- UI Mockups + Scheme
- Color Palette