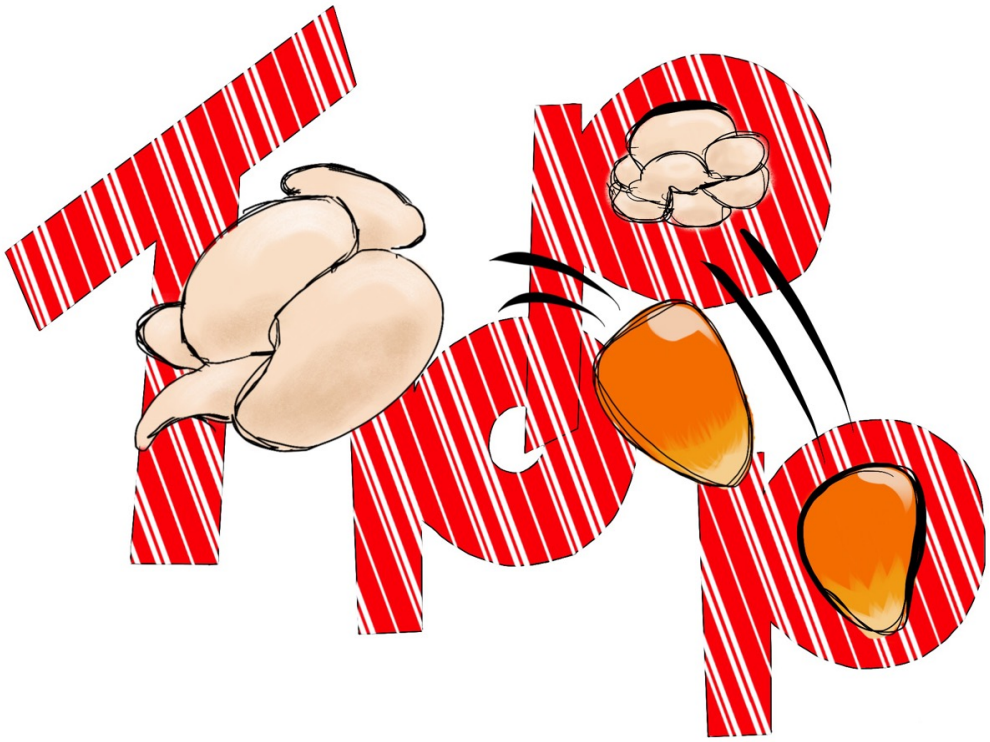
Toppop

Game Proposal



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1 Game Description

1.1 Story Line

The corn kernel is a social creature. In its natural environment, individuals can be observed dozing on densely populated cobs throughout the day. However, corn kernels held in captivity have evolved into another species entirely: popcorn. Though most specimens remain oblivious to being removed from their cobs and their high risk of being eaten, popcorns that have become aware of these conditions become highly volatile and ready to explode at any time, they will stop at nothing to escape their fate.

1.2 Gameplay

1.2.1 Setting

The game is a puzzle game and will be split into levels which are 2.5D (3D Models on a 2D plane) environments consisting of:

- **Characters:** Players will control corn kernels with two basic actions: *rolling* and *popping*. Characters have two states: *base* and *popped*. At the beginning of levels characters start in the base state which is the unpopped corn kernel. This state is more compact and is affected less by wind but does not bounce. After Popping, the character transforms into the popped state which bounces but is also strongly affected by wind.
- **Platform:** Characters navigate through the levels by interacting with platforms. Interactions include rolling on, bouncing off, breaking and pushing. The effect of each interaction is determined by the type of the platform.
- **Goals:** The location that the character has to reach to complete the level.
- **Switches:** When triggered, switches move platforms, thus allowing or denying access to parts of the level. Different types of switches can also toggle air vents.
- **Power-ups:** They change the properties of the character and thus affect their interactions with platforms.
- **Air vents:** Determine air currents that help or hinder the character. They can be activated or deactivated by switches.

The completion of a level requires the player to manoeuvre the character from its starting position to the goal by making use of the layout and objects provided within.

1.2.2 Core Mechanics

Only two actions are available to the player: *rolling* and *popping*.

Rolling is a horizontal non uniform linear motion which allows the player to position the character in terms of location, direction and speed. It is the supporting mechanic: all three aspects determine the character's trajectory and thus serve as setup for the popping action. Rolling will also provide a spin on the character to improve the visuals of popping.

Popping provides the player with vertical motion. This action can only be performed once per character. This limitation is what creates the puzzle aspect of the levels. Popping also changes the state of the character, making it more elastic, and will allow it to bounce off platforms and objects. As the central focus of the game, its animation will ideally be fun and amazing to watch.

1.2.3 Progression

Levels

While the character will fundamentally retain its physical properties throughout levels, levels will progressively introduce more interactions. The first few levels should serve as tutorial levels, which introduce players to the basic types of interactions individually. Later levels will combine the previously established interactions to create puzzles.

Difficulty

Levels will increase in difficulty in three ways:

- **Puzzle:** The direction and location from which players should pop becomes less obvious.
- **Reflex:** The range of allowed speed, direction and location for successfully reaching a goal decreases.
- **Complexity:** Later levels will introduce more objects (switches and power-ups) and multiplayer aspects.

1.2.4 Extended Mechanics

While switches, power-ups and air vents are already an extension of the base game, further extensions can/could include:

- **Level properties:** E.g. Levels with no gravity.
- **Shell Expulsion:** Additional mechanic where the corn kernel expels its shell in any direction to perturb its trajectory.
- **Portable Power-ups:** Power-ups that are picked up upon touching them that can be activated at any time.
- **Base powers:** In some levels the player could be enabled to use some powers (like inverting gravity or changing air density) in a small region or during a small timespan.

- **Multiplayer:** Levels designed for more than one player will focus on synchronising pops to reach the goal. Separate target regions may be available for each player.

1.3 Thematic Relevance

The game's entire focus is on the acrobatics of the corn kernel in its popping when heat is applied. Though in the game no heat is necessary to make the corn pop and an additional rolling movement is introduced, the player should receive the most satisfaction from planning out and then popping their corn in the right moment. By only allowing the corn to pop once, the mechanics stay true to real corn and keep the action from becoming stale.

1.4 Sketches

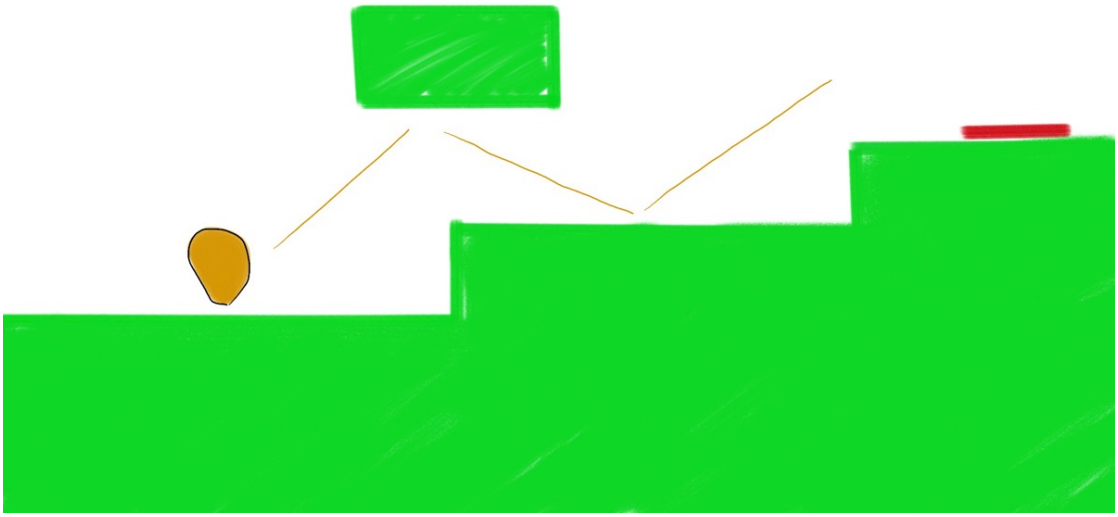

Figure 1: Easy level that requires bouncing against a platform.

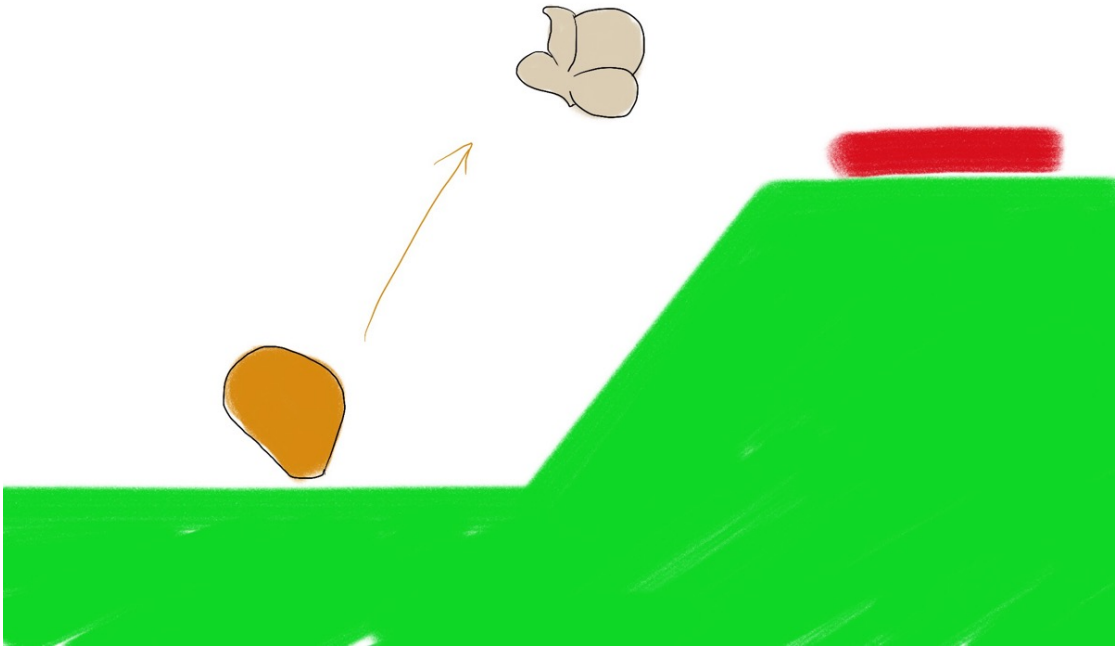

Figure 2: Tutorial level that introduces popping.

2 Technical Achievement

The most central part in our game is the interaction of the popcorn with its environment and/or other popcorns. Thus our main goal will be to develop a physical model, which produces a plausible and believable behaviour of (popping) popcorn while still allowing to extend the levels creatively with items, power-ups, terrain and/or regions, which prescribe behaviors not seen like this in nature.

Optimally, the physical model should include torque, inertia, momentum, advection, gravity (or acting forces in general). The focus lies on the ways the environment influences the movement of the player's popcorn e.g. changing direction and/or velocity.

This flexibility while designing levels can keep the player(s) motivated for a long time: all levels will be different and may require a non obvious combination of movement, timing and interaction with the environment.

We would also like to include a multiplayer mode. The key for multiplayer levels is to

construct them in a fashion, which requires all players to cooperate and find a creative solution, which would not be feasible with only one popcorn. This gives an additional challenge for each player and enforces some communication between the players. This can increase the fun while gaming exponentially.

Many popular games nowadays include the possibility for users to design their own levels and thus add a huge replay value to the game. With a level editor, the game's building blocks can be combined in ways never imagined/intended before to realise our ultimate goal: Building a game which is fun to play for hours.

We are aiming to include a level editor into our game, with which all players (and developers as well) can easily and intuitively create such new levels. The editor will support placing the basic elements and new features are added as they are implemented into the game.

3 "Big Idea" Bullseye

Figure 3: "Big Idea" Bullseye.

4 Development Schedule

4.1 Layered Development Description

1. **Functional Minimum:**
   - Singleplayer
   - General
     - Key binding
     - Stationary camera
   - Popcorn moving and jumping
     - Horizontal acceleration / deceleration with button press
     - Vertical acceleration and deceleration with gravity
     - Object translation according to speed
   - Simple graphics (2D) (very, very basic only for testing)
     - Corn kernel
     - Popcorn
2. **Low target:**
   - Camera
     - Moving camera
     - Zooming
   - Basic physics: Plausible/believable rolling, bouncing and popping physics
     - Rolling
     - Bouncing
       - Collision detection
       - Reflection angle
     - Popping
   - Basic levels: Platforms and target area to reach
     - (Paper) level design
     - File format for levels
     - Implemnt levels
       - 1 tutorial level
       - 1 basic level
       - 1 cool level
   - Basic background music and sound effects

  - Corn popping sound
  - Bounce sound
  - Background sound/noise/music

3. **Desirable target:**
   - Improved physically plausible/believable rolling, bouncing and popping physics
     - Torque
     - Inertia
     - Momentum
     - etc.
     - Physics on 2D mesh of 3D model
   - Level editor with basic elements (start position(s), target(s), platforms)
     - Object placing tool
     - Object deletion tool
     - Drawing tool (basic 2D shape as pencil)
     - Saving/loading levels
   - Interface
     - Main menu
     - Level selector
     - Level editor
     - Display controller layout
   - Cooperative multiplayer mode (X player levels need X players to complete)
     - Player $\leftrightarrow$ Player interaction (climbing on top of each other)
     - Adapt camera to follow player 1 or center of gravity of players
     - Players outside camera view die after a few seconds if not returning
   - Nice 2.5D graphics (3D objects on 2D plane) and popping animations
     - Corn kernel
     - Popcorn
     - Goal area
     - Platforms
     - Popping animation

4. **High target:**
   - More complex elements for the level editor
     - Additional objects/power-ups

  - Setting material/properties of objects/environments
  - Connecting objects (e.g. switch to open door)
  - Resizing of level bounding box
  - Cut out tool (e.g. cut out a hole/gap into a platform)
  - Rotation/resizing/changing of pencil shape
  - Merging meshes
  - Clear and intuitive menu/tool-box with suitable subcategories/submenus

  Examples to choose from (not necessarily all included in the final game):
  - Switches, moving platforms, air streams (advection), portals, traps, ...
  - Environment/platform properties (sticky, bouncy, zero/higher gravity regions, ...)
  - Switches/power-ups affecting environment/platforms
  - Power-ups for faster rolling, higher jumping
  - Additional movable objects (rigid bodies and collisions)
- Physics adapted for new elements
  - Energy absorption (damping) / energy addition
  - Linear/angular damping depending on material
  - Advection for air streams
  - Sound dampening for game elements outside of camera view
- Shell expulsion
  - Change of shape
  - Change of direction
  - Changing popcorn properties (momentum, mass) $\rightarrow$ new physical behaviour
- Different popcorn shapes for more variety
  - Multiple corn kernels
  - Multiple popcorns
  - Shape of shell and remainder for each popcorn
- Well fitting background music / sound effects
  - Corn popping sound
  - Different bounce sounds for different materials
  - Sounds for new game elements (e.g. air vents)
  - Background sound/noise/music

5. **Extras:**
    - Alternative game mode: rescue all popcorns in a level by reaching a connected target (e.g. switch) to free and continue with the next popcorn
    - Some levels with multiple solutions and the player is awarded points based on the difficulty of the way and/or time taken for the level
    - Singleplayer possibility for multiplayer levels (control all pop-corns by rewinding time or other fitting UI control mechanisms)
    - Procedurally generated shape of the popcorn for more variety
    - Procedurally generating levels using given elements
    - Dynamically changing environments
    - 3D physics with position constrained to 2D plane (allows rotation in more interesting ways)
    - Online Multiplayer
    - Multiplayer with communication only via gestures or other non-verbal form of communication (especially no writing/talking)
    - Online Level database (levels created by community)

4.2 Task Allocation

Task	Description	Who	Hours	Actual
Global Tasks				
1	Final Game Proposal	All	10	
2	Physical Prototype	All	15	
3	First Playable Demo	All	15	
4	Interim Report	All	10	
5	Alpha Release	All	15	
6	Playtest results	All	25	
7	Release (final public presentation)	All	20	
Functional Minimum				
8	General	DMS	15	
9	Popcorn moving and jumping	DMS	20	
10	Simple Graphics (2D) (very, very basic only for testing)	F	10	
Low Target				
11	Camera	M	20	
12	Basic Physics: Plausible/believable rolling, bouncing and popping physics	DM	25	
13	Basic Levels: Platforms and target area to reach	S	20	
14	Basic background music and sound effects	F	5	
Desirable Target				
15	Improved physically plausible/believable rolling, bouncing and popping physics	DM	40	
16	Level editor with basic elements (start position(s), target(s), platforms)	DS	30	
17	Interface	SF	30	
18	Cooperative multiplayer (X player levels need X players to complete)	MS	20	
19	2.5D graphics (3D objects on 2D plane) and popping animations	F	15	
High Target				
20	More complex elements for the level editor	All	60+	
21	Physics adapted for new elements	DM	20	
22	Shell expulsion	DF	20	
23	Different popcorn shapes for more variety	F	20	
24	Well fitting background music / sound effects	F	10	

Table 1: Task Allocation. D = Dominik, F = Francine, M = Marie, S = Serge

4.3 Timeline

Task	15.3	22.3	29.3	5.4	12.4	19.4	26.4	3.5	10.5	17.5	24.5	31.5
Global Tasks												
1	All											
2		All										
3				All								
4							All					
5									All			
6										All		
7												All
Functional Minimum												
8			DMS									
9			DMS									
10			F									
Low Target												
11				M								
12				DM								
13				S								
14				F								
Desirable Target												
15					DM	DM						
16					DS	DS						
17					SF	SF						
18						MS						
19					F	F						
High Target												
20							All	All	All			
21							DM					
22								DM				
23							F	F				
24									F			

Table 2: Timeline. D = Dominik, F = Francine, M = Marie, S = Serge

5 Assessment

The idea and rules of our game are very simple. The player should immediately recognize what is at stake in this game, and what the goal is. The difficulty of the game is only increased by a visually appealing level design, additional objects and different locations; for the most part, the main character is not changed in its two basic forms. The most important aspect is the popping up of the corn kernel. The player should like to do this again and again and therefore both entertainment of the animation as well as sound effects are very important. The game is suitable for both single as well as multiplayer(2-4 players). In multiplayer the timing and teamwork will be of great importance. In both game modes, the players will think about physical problems and must consider the exact

target path to win. This creates a buildup to the exciting action. The platform design should be simple but also contain decorative elements that set the atmosphere as well as obscure the solution to the level. A detailed 2.5D platform (pseudo 3D) in which the foreground, background and the plane of motion is different is very suitable for this project.