

StarBall

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10. März 2015



Game Concept

Ideas

- Survival racing game
- High speed gameplay
- Surreal space aesthetic



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Game Concept

This translates into...



Game Concept

Effects

- High speed gameplay
- Surreal space aesthetic



Game Concept

Effects

- High speed gameplay
- Motion blur
- Surreal space aesthetic



Game Concept

Effects

- High speed gameplay
- Motion blur
- Surreal space aesthetic
- Glow



Lighting

Rationale

- We require the outputs of **Several frames** for our effects.
- We want to handle multiple light sources.
- Our solution: deferred lighting.



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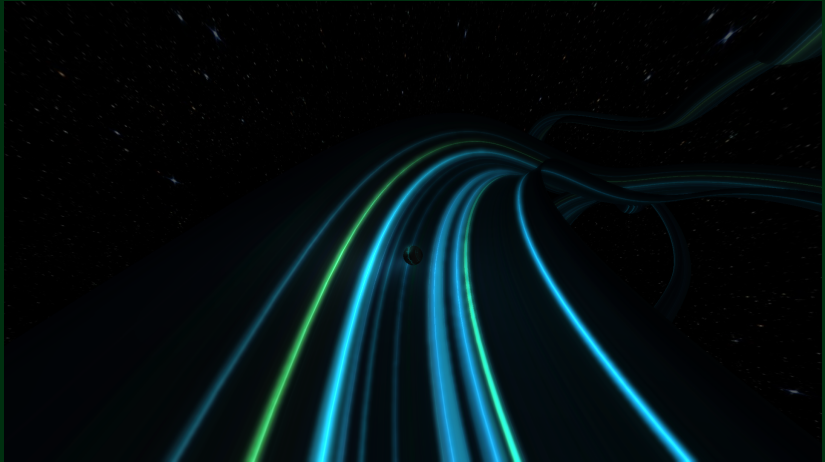
Lighting

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- We want to handle multiple light sources.
- Our solution: **deferred lighting**.



Lighting



Effects

Glow

- Fundamental effect
- Ensuring high-quality glow is a priority
- Technique: Render glowing parts of frame to small target
- Blur glow target, scale and add to frame



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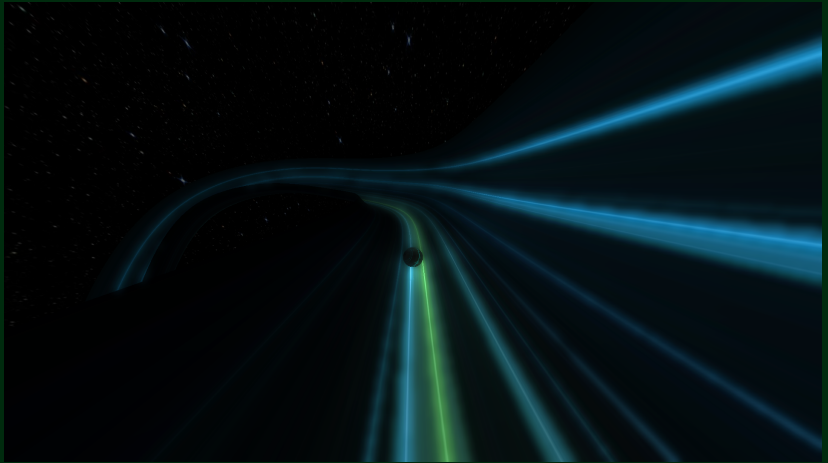
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Effects

Glow artifacts



Effects

Resolution artifacts

- Problem: Low resolution might cause moving discontinuities in glowing regions
- Solution: Add previous frames to glow (effectively a slight motion blur)
- Doesn't solve artifacts completely, but makes effect a lot smoother
- The blurring of the glow looks nice as you move :)



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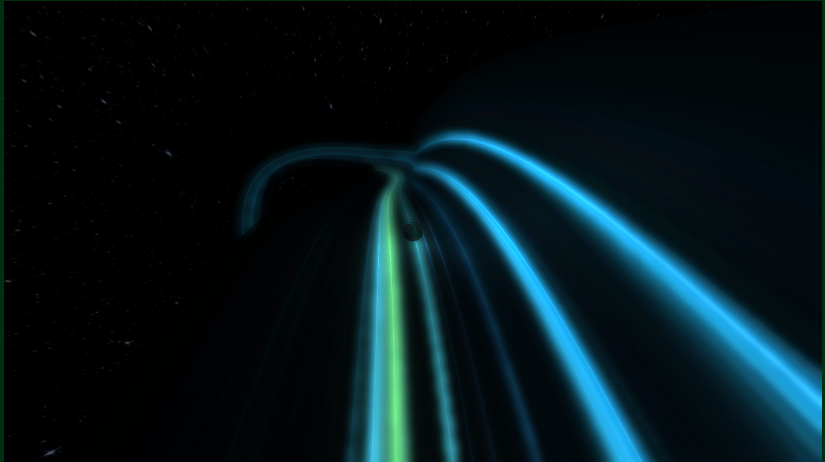
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Effects



Effects

Distance artifacts

- Problem: Low resolution causes heavy artifacts in the distance
- Solution: add black fog to glow



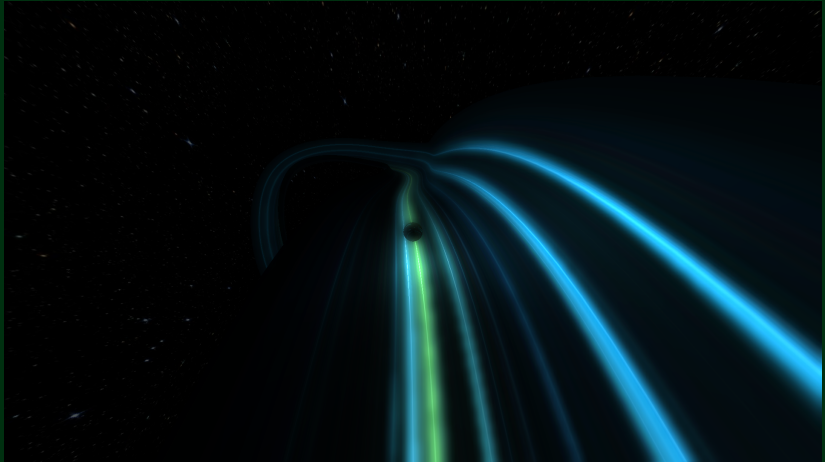
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Effects



Effects

Motion Blur

- Imparts sense of speed
- Achieved by adding previous frames (with scaled colors) to current frame
- Effect intensity computed according to ball speed



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Effects

Motion Blur Calculation

- After a frame is rendered, the previous frame is multiplied by a scale factor and added to it
- If speed is below an amount b_{min} , the scale factor should be 0.
- If speed is above an amount b_{max} , the scale factor should not increase anymore.
- The scale factor f is computed from current speed s as follows:



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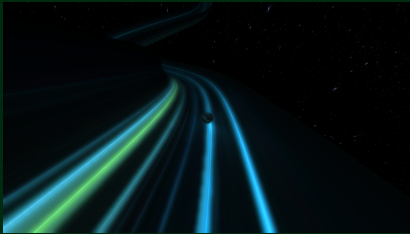
$$t = \frac{s - b_{min}}{b_{max} - b_{min}}$$

$$f = k_b t^2 (3 - 2t)$$

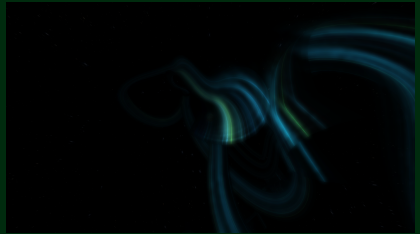


Effects

Low speed



High speed



Physics

Physics engine

- The physics library used is Bullet.
- The physics engine runs a simulation based on objects
- The track is imported directly from the mesh via a custom loader



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Game Objects

- Player
- Track
- Eventboxes



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Physics engine interface

- The main interface into the physics engine is **the update function**.
- Handles key events
- Checks eventboxes
- Steps physics simulation
- Returns player state



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