Real-Time Analytic Antialiased Text for 3-D Environments

tis nobler in the mind to suffe s and arrows of outrageous fortune that flesh is heir to : 'tis a consummation. beroutly to be wish'd. To die, to sleep; kep, perchance to dream - ay, there's et sleep of death what dreams shuttled off this

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The Future of AR



Text in AR



Source: https://arvrjourney.com/the-current-state-of-the-text-in-augmented-reality-eb65fdfe6703

IT'S DANGEROUS TO GO ALONE! TAKE THIS.



A New Hope

Episode 2

Signed Distance Fields



- Creates clean edges
- Texture indirection [Qin06]
- Alpha channel [Green07]
- Multi-feature issues
- Overly rounded appearance
- Authoring is not trivial
- [Rougier18] discusses issues



Vector Textures





- Various types of guided sampling
- Respecting silhouettes [Sen04]
- General Textures [Tumblin05]
- Resampling [Tarini05]
- Improved resampling [Reshetov16]
- Bound by texture resolution
- A bit complex
- Solving a harder problem

2D Ray casting



- Winding number based ray casting
- Precision issues [Esfahbod12]
- Faster precision issues [Dobbie16]
- Even faster w/o issues [Lengyel17]
- Somewhat sample bound

I'M TIRED OF THESE #8.1%\$ SHAPES ON MY #8.1%\$ PLANE

Preprocess Truetype



Preprocess Truetype



Pixel-Shape Integration



- How much shape covers a pixel
- Pixel differentials are skewed
- This makes integration difficult
- Lot's of literal "corner cases"
- It is not done in general

Pixel Matrix



- Calculate pixel transform ullet
 - (dUdx dUdy) dVdx dVdy)

- Map pixel to footprint
- Assume gaussian footprint
- Observe bulk is radial symmetric
- i.e. Rotation is not very important

Rotation is not very important

- $P \Rightarrow QR$
- $Q \Rightarrow \begin{pmatrix} cos & sin \\ -sin & cos \end{pmatrix}$ • $R \Rightarrow \begin{pmatrix} a & b \\ 0 & d \end{pmatrix} x shear$



- $R^{-1} \Rightarrow x shear$
- Discard Q
- Maintain x axis alignment!

Transformation Pipeline















Curve Integration Kernels











Evaluation: Paper

bether 'tis nobler in the mind to suffer The slings and arrows of outrageous fortune. Or to take arms against a sea of troubles And by opposing end them. To die - to sleep, more; and by a sleep to say we end The heart - ache and the thousand natural shocks That flesh is heir to : 'tis a consummation Devoutly to be vish'd. To die, to sleep: To sleep, perchance to dream - ay, there's the rub; For in that sleep of death what dreams may come, when we have shuffled off this mortal coil, Must give us pause - there's the respect That makes calamity of so long life. For who would bear the whips and scorns of time Th'oppressor's wrong, the proud man's contumely. The pangs of dispriz'd love, the law's delay, The insolence of office, and the spurns That patient merit of th'unworthy takes, When he himself might his quietus make With a bare bodkin? Who would fardels bear, To grunt and sweat under a weary life, But that the dread of something after death, The undiscovere'd country, from whose bourn *No traveller returns*, puzzles the will, And makes us rather bear those ills we have *han fly to others that we know not of?*

Implementation (As simple as possible)

- HVVR
- Cuda
- Uniform Textbox grid
- Uniform Glyph grid
- Titan Maxwell

Ours

Ours [Top] vs 16x [Bottom]

Whether 'tis nobler in the mind to suffer The slings and arrows of outrageous fortune, Or to take arms against a sea of troubles And by opposing end them. To die - to sleep, Whether 'tis nobler in the mind to suffer The slings and arrows of outrageous fortune, Or to take arms against a sea of troubles And by opposing end them. To die - to sleep, Whether 'tis nobler in the mind to suffer The slings and arrows of outrageous fortune, Or to take arms against a sea of troubles And by opposing end them. To die - to sleep,

Ours [Top] vs 1024x [Bottom]

Whether 'tis nobler in the mind to suffer The slings and arrows of outrageous fortune, Or to take arms against a sea of troubles And by opposing end them. To die - to sleep, Whether 'tis nobler in the mind to suffer The slings and arrows of outrageous fortune, Or to take arms against a sea of troubles And by opposing end them. To die - to sleep, Whether 'tis nobler in the mind to suffer The slings and arrows of outrageous fortune, Or to take arms against a sea of troubles And by opposing end them. To die - to sleep,

Evaluation: Lengyel '17 (SLUG) vs Ours





Perf vs SSAA



■ Ours ■ SSAA1 ■ SSAA4 ■ SSAA16

Perf vs SLUG



DEMO TIME?