

DUKENUKEMIFYING
THE CHARGEN

MICHELANGELO OF TURTLES
OF HIIHTOLIITTO

GDC RUUVESI 2024

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HIHTOLIITTO

THE FINNISH HOLY UNION OF SKI'ING

- FOUNDED IN 2017
- ACTUAL DESTINATION OF THE SUITCASE FROM THE GAS STATION
- ANNUAL SKI OR DEATH EVENT AT HIMOS
 - ◆ SKI'ING AND MIND EXPANSION
 - ◆ PIRKKA III BEER
 - ◆ THE DEMOCRATIC PROCESS
 - ◆ METALLICA
 - ◆ SCENE ADJACENT ACTIVITIES

SKILANDER

AN UPCOMING SKI SIMULATOR VIDEO GAME

- AN IMMERSIVE 3D SKI'ING SIMULATOR FOR THE IBM PC COMPATIBLES
- DEVELOPED IN PARTNERSHIP WITH HACKERS MEDIA INDUSTRIES 
- USING INDUSTRY STANDARD TECHNOLOGIES:
 - ◆ BUILD ENGINE (1994)
 - ◆ LUA SCRIPTING (1993)
 - ◆ OPEN GL 2.1 (2006)
 - ◆ STATISTICAL METHODS (1662)
- BUILT ON HIIHTOLIITTO'S CORE VALUES:
 - ◆ FUN
 - ◆ EXCITEMENT
 - ◆ BEING CORRECT ON AVERAGE
 - ◆ PROPER MIX OF SKI AND DEATH

DEVELOPING A VISUAL STYLE

- APPROACHING FROM TECHNICAL DIRECTION
= STYLE DEFINED BY LIMITATIONS
- NEEDS TO HONOR THE MOTIFS PRESENT
IN CLASSIC BUILD ENGINE GAMES
 - ◆ TEK WAR
 - ◆ DUKE NUKEM 3D 1.3
 - ◆ BLOOD
- OTHER TECHNICAL AFFECTORS
 - ◆ PALETTE WITH DISCRETE GRADIENTS
 - ◆ SECTOR BASED GEOMETRY
- OUR FOCUS TODAY: THE CHARACTER SET

THE CHARACTER SET

- DUKE NUKEM 3D HAS A VISUALLY UNIQUE "THICK" CHARACTERS
 - ◆ FILLED WITH RED GRADIENT
 - ◆ DARK OUTLINES
- PERFECT FOR US TO ACHIEVE THAT CLASSIC "BUILD" LOOK!



THE CHARACTER SET

- PROBLEM:
WE ARE NOT A
DUKE NUKEM 3D MOD!
- WE CAN USE KENBUILD
ASSETS. MUSICAL
INSTRUMENTS ARE FINE,
BUT TILES ARE NOT
SUFFICIENT FOR US
- WE ARE NOT THIEVES
WE CAN'T JUST RIP
LIKE SOME PEOPLE DO



ROAD BLOCK:
WHAT TO DO?

SOLUTIONS

- WE COULD SUMMON AN ARTIST.

BUT:

- ◆ ARTISTS ARE EXPENSIVE
- ◆ THEY ARE HUMANS WITH HOPES AND DREAMS
- ◆ THEY OFTEN HAVE MORAL DILEMMAS AND EVEN "ETHICAL PROBLEMS" ESPECIALLY WHEN REPLICATING
- ◆ THEY USE A LOT OF ENERGY (CA 200W) AND THIS ENERGY MUST COME IN VERY SPECIFIC FORM

SOLUTIONS

- "AI" IMAGE GENERATORS
 - ◆ OBVIOUS CHOICE IN 2024
 - ◆ CAN DO WIDE VARIETY OF ARTSTYLES
 - ◆ NO ETHICAL DILEMMANS WHEN PROPERLY TRAINED

BUT:

- ◆ NEEDS VERY SPECIFIC PROMPTING
- ◆ A HUMAN MUST CONSTRUCT THE PROMPT. SO, WE ARE BACK AT THE HUMAN ARTIST PROBLEM.

SOLUTIONS

IS THERE ANYTHING WE CAN DO?

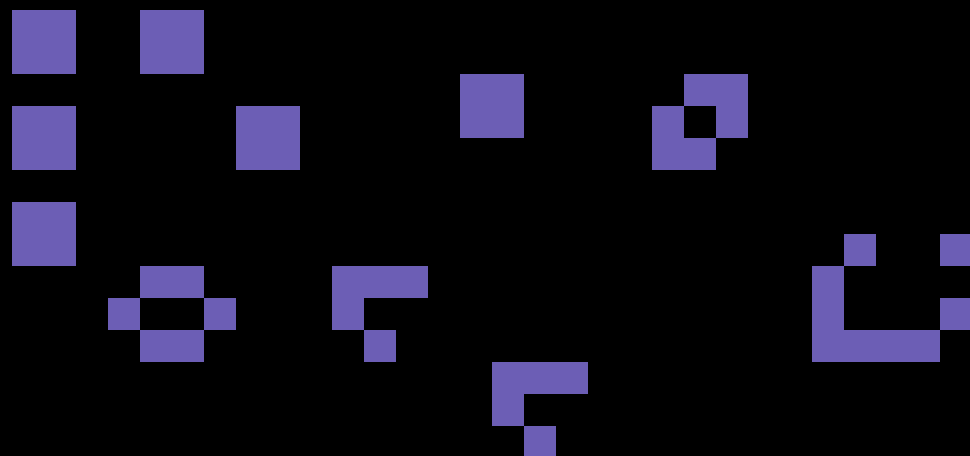
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SOLUTIONS

OF COURSE!

- OUR SOLUTION: WE GROW THE GLYPHS!

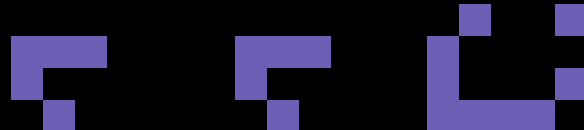


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A CELLULAR AUTOMATA

- MOST FAMOUS EXAMPLE: GAME OF LIFE
 - ◆ JOHN CONWAY, 1970
- WORKS ON A GRID: EACH CELL ONLY LOOKS AT IT'S NEIGHBORS.
 - ◆ CONVOLUTION = PERFECT FOR MODERN GAME ACCELERATORS
- COMPLEX, CHAOTIC, EMERGENT BEHAVIORS
 - ◆ PERFECTLY ALIGNS WITH THE SPIRIT OF SKI AND DEATH



A CELLULAR AUTOMATA

- BUT GAME OF LIFE DOESN'T RESEMBLE THE DUKE FONT AT ALL. HOW CAN IT PRODUCE ANYTHING THAT LOOKS LIKE THAT?
- SIMPLE:
 - ◆ REPLACE THE 1 BIT CELLS WITH FULL FLOATING POINT NUMBERS. AND DON'T BE LIMITED TO JUST ONE. USE RGBA AND IN FACT 32 CHANNELS IN TOTAL.
 - ◆ REPLACE THE B3/S23 RULESET WITH A NEURAL NET! SOME MATRIX OPERATIONS FOLLOWED BY AN ACTIVATION FUNCTION TO PRODUCE CELL VALUES FOR NEXT ITERATION.

A NEURAL CELLULAR AUTOMATA

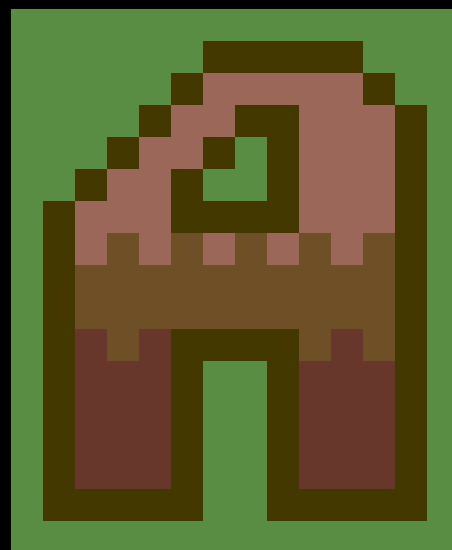
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A NEURAL CELLULAR AUTOMATA

- AND THEN WE MAKE IT DO LIKE THEY DO ON THE DISCOVERY CHANNEL:
 1. INIT GROW VAT WITH A GLYPH MASK
 2. RUN THE AUTOMATA N ITERATIONS
 3. CALCULATE LOSS: HOW MUCH THE RESULT DIFFERS FROM THE TARGET
 4. BACKPROPAGATE THE LOSS AND ADJUST PARAMETERS
 5. GOTO 10

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- NOW WE HAVE A DEVICE THAT CAN PRODUCE SOLID, TEXTURED DUKE FONT GLYPHS FROM A MASK.
- BUT HOW DOES THIS HELP US WITH OUR ORIGINAL PROBLEM?
 - ◆ DOESN'T THIS PRODUCE JUST THE SAME DUKE FONT?
 - ◆ NO! BECAUSE WE CAN JUST GIVE IT ANYTHING AS A MASK.
 - ◆ ..LIKE THE C=64 CHARGEN ROM!

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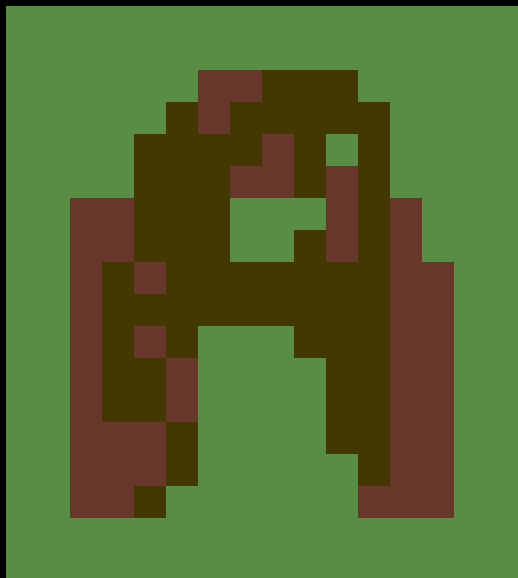


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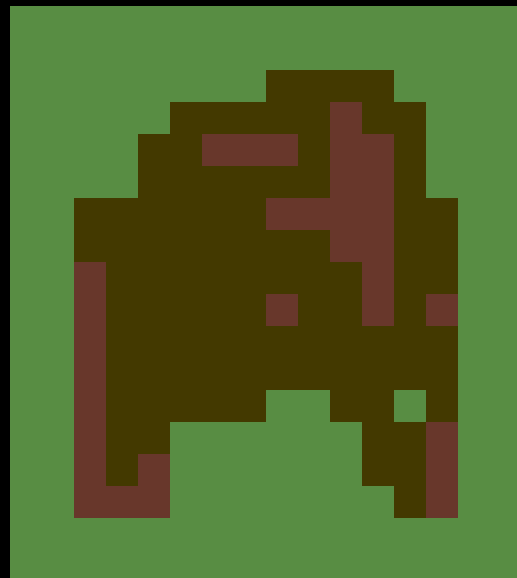


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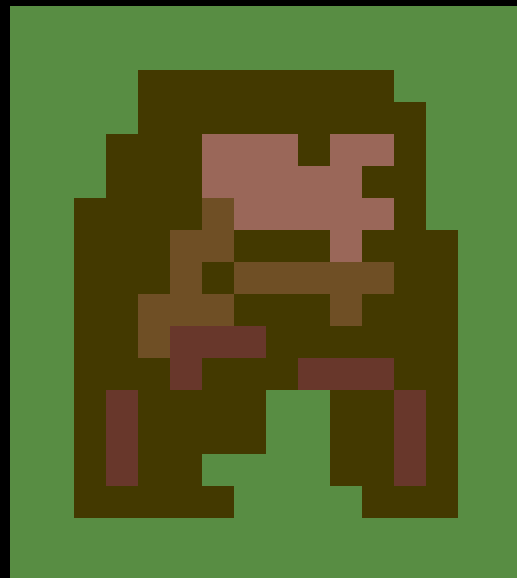


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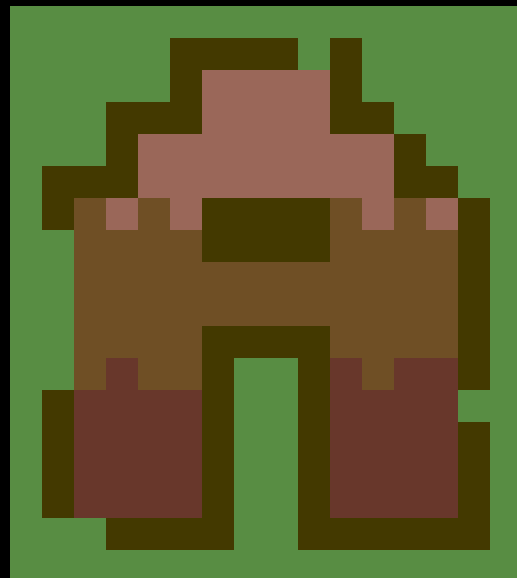


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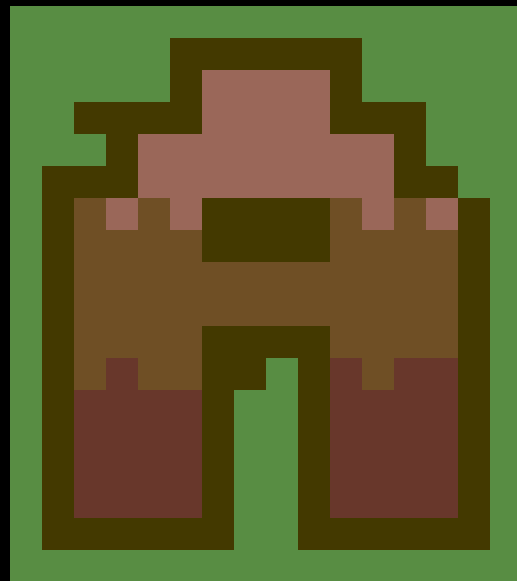


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DONE



DONE



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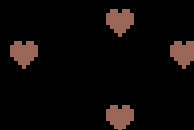
SOME PROBLEMS STILL REMAIN:

- THE TRAINING DATA DOESN'T INCLUDE ALL POSSIBLE SHAPES, AND SOME ERRORS REMAIN IN THE GROWN GLYPHS
- HARD TO KNOW HOW MANY ITERATIONS PRODUCE THE BEST RESULTS, THE NETWORK IS NOT INTRINSICALLY STABLE.
 - ◆ MAY BE MITIGATED BY MORE ITERS WHILE TRAINING, BUT DUE TO THE RNN NATURE OF THE AUTOMATA, VANISHING GRADIENTS MAY BE A PROBLEM.



CONCLUSION

- A CLASSIC CHARSET THAT PERFECTLY CAPTURES THE ESSENCE OF THE DUKE FONT
- NO ARTISTS WERE NEEDED!
- ORIGINAL WORK, AS COPYRIGHTS DON'T APPLY TO "TRAINING DATA"



MORE EXCITING CONCLUSION

**STAY TUNED FOR THE EXCITING
RELEASE OF OUR GAME**

"THE SKILANDER"

AT THE REVISION 2024

WE ARE HIRING!

QUESTIONS?

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THANK YOU

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