Building cicero-tui

A Unicode tool for the terminal

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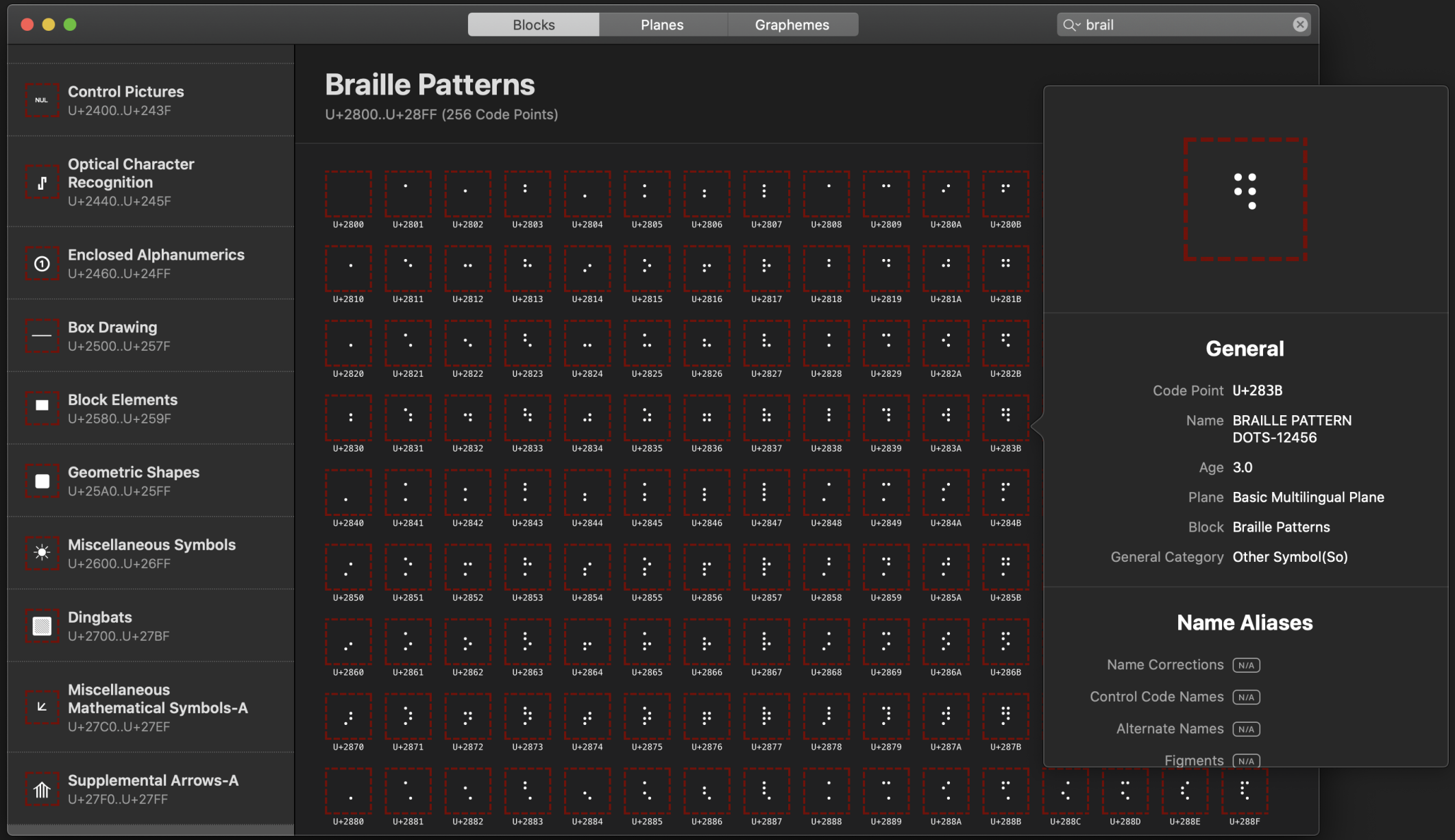
About Cicero

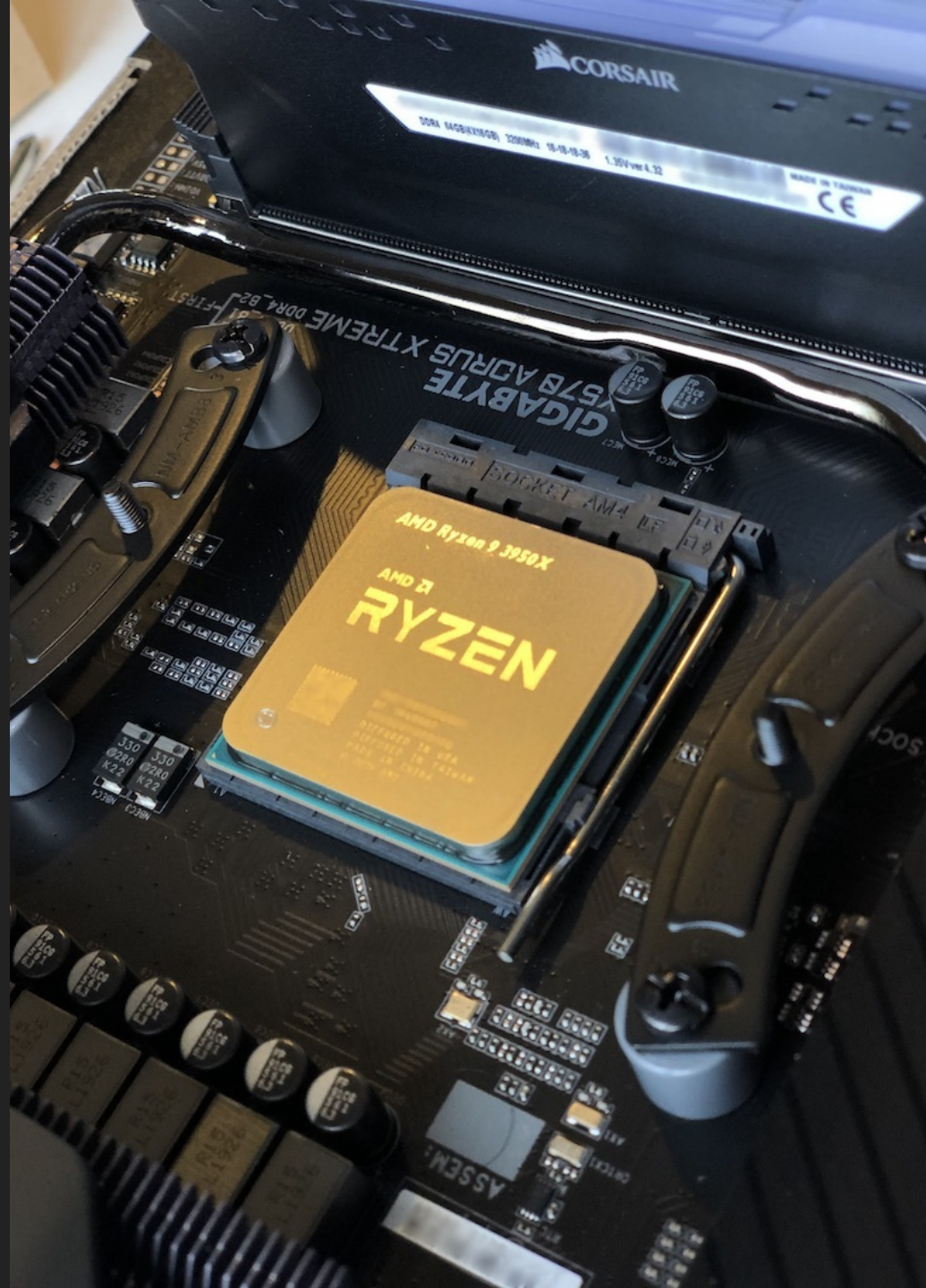
- My side project for fun
- Named after *Marcus Tullius Cicero (Rome, 106 BC - 43 BC)*
- A Unicode tool
  - Split a Unicode string into Grapheme Clusters
  - Browse through all Unicode blocks and plans
  - Search character by Unicode Name
- Available for free on:
  - macOS and iOS (GUI)


Blocks
Planes
Graphemes
brail
Control Pictures
U+2400..U+243F
Optical Character Recognition
U+2440..U+245F
Enclosed Alphanumerics
U+2460..U+24FF
Box Drawing
U+2500..U+257F
Block Elements
U+2580..U+259F
Geometric Shapes
U+25A0..U+25FF
Miscellaneous Symbols
U+2600..U+26FF
Dingbats
U+2700..U+27BF
Miscellaneous Mathematical Symbols-A
U+27C0..U+27EF
Supplemental Arrows-A
U+27F0..U+27FF
Braille Patterns
U+2800..U+28FF (256 Code Points)
General
Code Point U+283B
Name BRAILLE PATTERN DOTS-12456
Age 3.0
Plane Basic Multilingual Plane
Block Braille Patterns
General Category Other Symbol(So)
Name Aliases
Name Corrections N/A
Control Code Names N/A
Alternate Names N/A
Figments N/A

But I use Linux now :(

AMD YES!

(It builds LLVM with `-j32`*, and completes within 10 mins)*



Let's build a Cicero for Linux

Building blocks of a Unicode tool (macOS/iOS)

- Unicode data and algorithms (Bring your own)
- Character preview
  - Find fonts on a system (e.g. `CTFont`)
  - Convert fonts to bitmaps (e.g. `CTLine`)
- Search
  - Full text search for Unicode name (Bring your own)
- Views (AppKit/UIKit)
  - Label and text input with Unicode support (e.g. `NSTextField`, `UILabel`)
  - List or Table (e.g. `NSTableView`, `UICollectionView`)
  - Windowing and user event handling (Cocoa)
  - A canvas to draw pixels on (`CALayer`)

Building blocks of a Unicode tool (Linux)

- Same as the previous slide (Bring your own)

Building blocks of a Unicode tool (Linux)

- Unicode data and algorithms (rust-unic, libicu)
- Character preview
  - Find fonts on a system (fontconfig)
  - Convert fonts to bitmaps (freetype, harfbuzz)
- Search
  - Full text search for Unicode name (SQLite)
- Views (GTK, Qt, ...Electron) `<=== Hmmm...`
  - Label and text input with Unicode support
  - List or Table
  - Windowing and user event handling
  - A canvas to draw pixels on

Why TUI

- I don't want to rewrite the GUI for Cicero for the 3rd time
- Inspied by 7sDream/fontfor
- I prefer to use terminal in most of my daily workflows
- It's usable everywhere
  - Linux and macOS have great terminals
  - It's 2020, even Windows now has a good terminal, and it has a subsystem for Linux

Let me show you cicero-tui

Building blocks of cicero-tui

- ~~Unicode data and algorithms~~ (rust-unic)
- Character preview
  - Find fonts on a system (fontconfig)
  - Convert fonts to bitmaps (freetype)
- ~~Search~~ *Not planned*
- Views (tui-rs and crossterm)
  - Label and text input with Unicode support (`tui::widgets::Text`)
  - List or Table (`tui::widgets::List`)
  - Windowing and user event handling (`crossterm::event`)
  - A canvas to draw pixels on (`tui::widgets::canvas`)

So where do we start?

What's a UI's responsibility?

What's a UI's responsibilty?

Accepting user inputs

- Change application state in response to events

Producing human understandable outputs

- Draw stuff according to application state

An oversimplified view of a macOS app's GUI

If you set a break point in:

- `[YourNSViewSubclass drawRect:]`
- Or `[YourNSViewSubclass mouseDown:]`

Then you will observe:

- `main()`
  - `[NSApplication run]`
    - `CFRunLoopRun`
      - `[NSView drawRect:]`
    - `[NSApplication sendEvent:]`
      - `[NSView mouseDown:]`

There is even a song about this. And here are the lyrics.

An oversimplified view of a GUI application

- `main()` entered
  - Initialize app state
  - Prepare root view
  - Start a loop that ticks *n* times per second
    - Draw views according to static code and dynamic app state
    - Change app state according to events
      - User input or other pre-defined flow
    - Should keep running?
  - Loop exited
  - Release all resources
- `main()` exited

An overview of cicero-tui

- `main()` entered
  - Parse arguments
    - `cli`
      - Generate and print output; `main()` exited
    - `tui`
      - Initialize app state
      - Prepare root view
      - Start a loop that ticks per user input
        - Draw views according to static code and dynamic app state
        - Change app state according to user input events
        - Should keep running?
      - `main()` exited

Let me show you the code

(Sorry about the Rust)

Building blocks of cicero-tui

- ~~Unicode data and algorithms~~ (rust-unic)
- Character preview
  - Find fonts on a system (fontconfig)
  - Convert fonts to bitmaps (freetype)
- ~~Search~~ *Not planned*
- ~~Views~~ (tui-rs and crossterm)

fontconfig, freetype, and HarfBuzz

(Oversimplified, pseudo code)

- What's a font?
  - `Map<UInt32, Shape> where Shape is BezierPath or Bitmap`
- What's a Glyph?
  - `struct { bitmap: [[UInt8]], /* metrics */ }`
- What do I use fontconfig for?
  - `fn (code_point: UInt32) -> (font_files: [String])`
- What do I use freetype for?
  - `fn (code_point: UInt32, font_file: String) -> Optional<Glyph>`
- HarfBuzz (not used in cicero-tui, but very cool)
  - `struct GlyphRun { glyphs: [Glyph], /* metrics for the run */ }`
  - `fn (string: [UInt32], font_file: String) -> GlyphRun`

Drawing the "pixels"

Blocks | Planes | Graphemes

brail

- Control Pictures
  U+2400..U+243F
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- Supplemental Arrows-A
  U+27F0..U+27FF

Braille Patterns

U+2800..U+28FF (256 Code Points)

Ideas for the future

- Complex character shaping with HarfBuzz
- GPU text rendering
  - Vulkan
  - Signed distance fields
  - Vector based GPU text rendering

Thank you

github.com/eyeplum/cicero-tui