“Hey Guys, What Map Program Should I Use?”

A Flowchart (of sorts)

Note: This document used to be open for comments and suggestions, but I got a large volume of basically nonsense edits that seem to have been misclicks, and had to reject so many of them that it seems google interpreted all the rejection emails as spam and locked my drive account for a couple days. As such, the document is locked, but if you have suggestions, even small ones, feel free to email them to worldbuildingpasta@gmail.com . Don’t need to be polite or have context or anything, just send me a list of bullet points to add or change or whatever and I’ll know what you mean.

While you’re here, check out Worldbuilding Pasta for more in-depth tutorials.

$$: paid version only
$: free and premium versions
A: free program that needs to be downloaded
B: free and can be used in a browser with no download
C: free but more complicated to install than downloading an app (some of them only work on Linux)

Start: I want it to…

- Generate maps for me, of...
  - The whole world
    - Songs of the Eons (A)
      - Produces a world map with terrain, geology, vegetation, and climate.
      - +Only generator I know of with reasonably accurate plate tectonics
      - +Many options for setup (size and the number of continents, etc)
      - +Map displayed on a globe, and exported in a format easy to use elsewhere

        - -Map editor still WIP
        - -Terrain constrained by hexagonal grid (no fold-and-thrust belts, sadly)
        - -Climate model still WIP, limited presets
- Just part of the world
    - Azgaar's (B)
        - Produces a map of a large region with terrain, climate, nations, culture.
        - +Many good templates to work from
        - +Reasonable terrain accuracy
        - +Can edit terrain after generating
        - +Can import heightmap images, though they're sometimes interpreted oddly
        - -No plate tectonics or geology
        - -Don't use for global maps, has projection issues at the poles and fairly poor climate generation
        - -Not excellent performance, trying to do a lot for a browser program
    - Mewo2 Fantasy map generator (A/B)
        - Original website went down from some reason, above is a fan copy, here's an archived version that explains the process more and here's the source code
- Star systems
    - Space Engine ($)
        - Includes an entire procedurally generated universe of star systems, planets, moons, and asteroids.
        - +High focus on realism in orbital mechanics and planet chemistry, and includes many real stars and exoplanets
        - +Gorgeous visually
        - +Version 0.980 is free
        - -Later versions $30 on steam
        - -Planet terrain has no plate tectonics or anything and isn't easy to export; use other generators for this
        - -Can be a bit hard to find a system with the features you want
- Cities
    - Medieval Fantasy City Generator (B)
        - Straightforward, simple medieval city map generator.

            - +There's a link to a nifty 3d viewer
            - -Not much depth to the procedural generation logic
            - -Actual cities would need way more farmland
- Give me premade brushes or tiles to quickly draw...
    - A map of a region in a medieval-ish style
        - Inkarnate ($)
            - -"Freemium"; Many features locked behind paywall
            - +/- Most maps you see of it don't look that good, but that may just be that people don't learn to blend biomes properly.
        - Wonderdraft ($$)
            - More powerful but costs $30
        - Campaign Cartographer 3+ ($$)
            - Somewhat older but looks like it still holds up, and has a broader variety of styles available.
            - More of a CAD program with swappable styles
            - Has a steep learning curve, but quite powerful.
        - Mapgen4 (A/B)
            - Very simple and straightforward, use if you're in a hurry or don't need much detail
            - +Procedurally adjusts topography and rivers as you draw terrain
            - +Various options to subtly adjust appearance
            - +A fairly basic rainshadowing system that adjusts terrain appearance and river generation
            - -Only 4 terrain brushes; this is not an advanced map editor
    - A grid of map tiles
        - HexTML (B)
            - In-browser editor for a hexagonal map grid
            - +Pretty easy to use, and a broad range of tools
            - -Not the prettiest thing in the world, but eh it's fine for what it is
            - -Some of the tools like editing notes are a tad tricky to figure out, but there are tutorials
    - A TTRPG map
        - MapTool (A)

        - RPG Map Editor 2 (A/B)
            - More simplistic, can run in browser
        - MapForge ($)
            - Can create battlemaps, hex-tile maps, and isometric maps appropriate for various genres
            - + Free version with a decent bit of starting content
            - - $38 for licenses, but that mostly only seems to matter if you want higher resolution.
            - +/- Lot of additional asset packs, some of which are free, others are real pricey. Not sure what the quality/quantity breakdown is for free and paid stuff.
        - Dungeon Fog ($?)
            - Free but needs an account, and there are paid asset packs
        - Dungeon Scrawl (B)
            - Very straightforward browser program for square grid maps
        - Hobbyte ($)
            - Isometric map maker with a pleasant style
        - Canvas of Kings ($)
            - Top-down mapmaker, looks like it has a lot of nice features but ~$20. Has a demo you can try
    - A star system
        - Star System Creator (B)
            - Minimalist 2D star system map editor, take a star and add planets, moons, rings, and asteroid belts
            - +Pretty easy to use and highly configurable
            - +Much easier than other methods I've seen for the same result
            - +/- Can't add much detail but pretty easy to just export it and then use any of the drawing programs below
            - -Map size seems to be locked
        - Stellar System Creator (A)
            - A more advanced tool for calculating star, planet, and moon properties and rendering charts of those systems
        - Astrosynthesis ($$)
        - Celestia (A)
            - Similar to space engine, but advertises solar system construction as an option. I've been meaning to try it out for a while.

            - Okay I tried it out and making new objects is a real complicated process, you basically gotta construct it as an addon. But I'll still leave it here as an option.
    - A metro map
        - NetworX (A)
            - Someone apparently got an antivirus warning about it but it looks like it came from some sort of machine learning algorithm from a service known to be prone to false positives
        - Tennessine Metro Designer (B)
    - Minecraft maps
        - WorldPainter (A)
    - Historical/Alt Hist Maps of Earth
        - Mapchart ($)
            - +Subscription for US 43 dollars yearly which adds nothing (no annoying features stuck behind paywall)
            - +Simple yet detailed tools
            - +Good Customisation of Map
            - +Useful sister historical website if you are into that sorta thing
            - +Multiple map projections
            - +Good for political maps and stuff like that
            - -No ability to create your own subdivisions
            - -Constrained to real world geography (Good for Alt hist and stuff like that)
            - -While there is options for older maps on mapchart historical they lack anything past 1815
- Let me draw my own maps, by...
    - Filling in areas with brushes (use a raster program)
        - Paint.net (A)
            - Fairly straightforward program, similar to old MS paint but with many more features
            - +Pretty intuitive UI, with the core tools front-and-center
            - +Easy to alter UI layout
            - +Can be extended with user-made plugins
            - -Advanced tools are a bit thin
            - -Hitches a bit on large files
        - Gimp (A)
            - More advanced program with a diverse toolset, sorta an attempt to make a free version of photoshop

        - +Many advanced tools, like dodging and custom brushes
        - +Control over color mode (useful for stuff like heightmaps)
        - -UI is less intuitive
    - Affinity Photo ($$)
        - +Non-destructive workflow using layer groups and effects
        - +Extensive filter functionality and brush tools
        - +Windows, Mac and iPad versions
        - -Lacks some functionality compared to Photoshop
    - Krita (A)
        - +Diverse brush tools, good for detailed textures
        - +Vector and raster toolset.
        - +Very similar base feature set to Adobe Photoshop, so familiarity with one will allow you to use the other without much problem.
        - +If you wanna draw other stuff as well, Krita is a good tool to learn
        - -Weird branding but don't let it scare you off
        - -This may just be me not understanding the tools well enough but it seems to want to blend and antialias everything in a way that's not always convenient for mapping
        - +/-Some settings buried in weird places, but you can customize the UI a lot so it should be easier to work with once you get used to it.
    - Photopea (B)
        - Looks like basically an attempt to implement Gimp/Photoshop in a browser.
        - +No download or install required
        - -I gotta imagine the performance won't be as good as a for a desktop program
    - Leonardo ($$)
        - Drawing app for Windows tablets
        - +15-day free trial
        - +infinite canvas could be nice for some people
        - +performs well
        - -still in beta; apparently lacks a text tool?
- Tracing out features with lines (use a vector program)
    - Inkscape (A)

            - +Free and can do many of the things other vector programs can do…
            - -...but it's harder to do those things and can be annoying about them
            - -UI takes some getting used to
        - Affinity Designer ($$)
            - +Provides a lot of tools
            - +Offers a 90 day trial (as of 24/05/2021)
            - +Windows, Mac and iPad versions
            - -UI is complicated for a beginner
        - QGIS (A)
            - I hear cool things (some very powerful tools) but I've never used it and it looks a bit daunting to get into. Someone made a detailed tutorial here: Making your Fantasy Map in QGIS
    - Drawing directly on a globe
        - Planet Painter (A)
            - A tad basic, slightly buggy, and perhaps overstylized, but about the best implementation of the concept I've seen so far
        - I think you can do this with Blender but it seems to require a bit of setup
- Help me get really detailed about…
    - Plate tectonics
        - Gplates (A)
            - Allows you to draw features and move them around over time to simulate tectonic movement. Tutorial here.
            - +Used by actual geologists
            - +About the most realistic way to get plate tectonics
            - +Also one of the most convenient ways to draw straight onto a globe even if you aren't doing tectonics
            - +Nifty in-program display and exports in multiple formats
            - -Pretty awkward UI and tools
            - -Simulating plate tectonics with this will take you a long time
            - -Installation process is not very user friendly
            - -Weird decentralized file management makes it hard to move or share gplates maps
            - -Exporting maps takes some figuring out too

- -Don’t use non-Latin characters for file names, I’ve heard it causes issues

- Erosion
  - (Daemoria wrote most of these, big thanks to them)
  - Wilbur (A)
    - Takes an existing heightmap and simulates erosion and river formation
    - +Fairly easy to make and import heightmaps
    - +Lots of options for minor adjustments and preparation
    - +Results look very realistic
    - +Numerous options for exporting terrain and relief shading
    - +Many tutorials available
    - +Couple extra tools like projection to icosahedral map
    - -Microsoft Windows only
    - -Takes some getting used to
    - -Awkward drawing tools
    - -Heavily scale dependent; same map in different resolutions will get different results
    - -Built-in terrain generation has obvious artifacting
    - -Only simulates water erosion; no wind or glacial (you can kinda cheat glacial by applying high blur to “incise flow” at a good resolution)
  - genbrush(A)
    - Takes some getting used to, but once you’ve learned it probably one of the best options if you’re in a hurry and want something passable for a world map
    - + Lots of nifty little brushes and tools
    - + GPU-accelerated flow erosion works pretty quick
    - + Good system for handling global projection, if a little unintuitive before you’re used to it.
    - + Biome painting system is a good option for doing photorealistic globes
    - Wind erosion is neat but not necessarily useful for global scales
    - - Somewhat unintuitive file and layering system that doesn’t always explain itself well (check the tutorials on the youtube channel)

        - - Takes some babysitting to get the erosion system to work well, don't expect the most realistic results in detail
- Terresculptor (A)
    - +Several types of erosion (fluvial, rain, thermal) with subtly different impacts.
    - -Erosion is fairly slow to execute--better as a finisher than for the whole process
- Gaea ($)
    - Node based heightmap and texture generation
    - Emphasis on artistic tweaking of heightmaps, allowing specific types of distortion to modify erosion and base noise layers.
    - Still in development, and missing some features of WorldMachine, such as tiled generation, erosion across tiles will need to be processed in a separate pass.
    - GPU accelerated. Requires a decent dedicated GPU in order to function. Very fast, provided you have a graphics card from this decade.
- WorldMachine ($)
    - Node based heightmap and texture generation
    - Legacy of being vfx/gamedev industry standard heightmap generation; stable, robust feature set, feels like it was built in 1995.
    - CPU bound. Doesn't require a GPU to calculate heightmaps, but can be slow if you lack the power there.
- Vue($$)
- Terragen($)
    - Heightmap generation, with possible voxel export for overhang-style detailing
    - Native support of planet scale generation/rendering.
- Houdini($$ for anything beyond Houdini Apprentice)
    - Node-based heightmap & texture generation, combined with the raw power of Houdini toolset. Extremely detailed scattering system, simulation, and asset generation possible.
    - More so than other suggestions here, this might be entirely overkill. VFX and gaming industry mainstay.
- gospl (C)
    - Global erosion simulator; tutorial here

- +designed by geologists to work on a global scale with a spherical mesh
- +options to account for precipitation, tectonic uplift/subsidence, and sea level change
- +can handle endorheic basins (though tends to fill them in)
- -package of code rather than a program; the tutorial includes some scripts to work with it but it can be a bit opaque and inflexible
- -only very basic seafloor deposition and no dedicated glacial erosion simulation
- -Strongly RAM-limited; with 16gb I can manage about 5-6 km max resolution if working on one continent at a time. Attempting finer resolution can sometimes totally lock up my computer

○ Climate

■ Clima-sim ($)

- Simulates global temperature based off topography and orbital elements
- +Basically the only tool of its kind available
- +Pretty straightforward UI
- +Can draw your own terrain, and even import a map for reference
- -Pretty unstable, everyone who's used it has seen at least a couple crashes (when drawing topography, try to avoid dragging the mouse from inside the map window to outside)
- -Doesn't account for ocean currents
- -Doesn't handle exotic orbital scenarios well (tidal-locking, high tilt)
- -Very coarse resolution; can miss mountain features
- -Many tools (fine control of atmosphere, saving session) locked out of free version; standard is $49

■ ExoPlaSim (C)

- Intermediate circulation model that can simulate the climate of essentially any habitable planet (tutorial here https://worldbuildingpasta.blogspot.com/2021/11/an-apple-pie-from-scratch-part-vi.html)
- +Actual, research-grade climate model
- -Hoo boy is it not straightforward to get installed

        - -Runtimes of hours to days
    - Orbital Stability
        - Universe Sandbox ($$)
            - A game that allows you to place stars, planets, and other objects and simulate their interactions
            - + Has a lot of other features, like collisions and basic climate modeling
            - - Limited simulation speed and may introduce artificial instability at high speed. Not appropriate for simulating long-term orbital stability
        - Orbe (A)
            - Fairly simple orbital simulation program, takes in data from a text file and outputs results to another text file. See here for a somewhat more detailed description of its use.
            - + A proper orbital integrator, can simulate systems for millions or billions of years.
            - +/- No GUI, just the text files, but that's a lot more straightforward than most software of its type
            - - Only simulates point masses, doesn't support fancy stuff like binary systems.
        - REBOUND (C)
            - A more advanced integrator with a Python API. Used by proper researchers, but designed to be scalable so it doesn't have to be run on a supercomputer.
            - + As I hear it, it's literally impossible to simulate orbits more accurately without using quantum computers.
            - - Have to use it through python and work through the fairly technical documentation
        - SPOCK (C)
            - Some kind of machine learning trickery to estimate the stability of systems without actually simulating them. Have to use it through python again, but may be quicker than REBOUND.
- Take my map that I already made and show it as…
    - A new map in a different projection
        - G.Projector (A)

        - Takes an existing map and reprojects it out to a different map projection
        - You may need a java update to get it working
        - +Huge number of output projections
        - +Easy to use, various customization options
        - +Does a good job of not “blurring” anything too much
        - -Accepts only a few projections as input
        - -Some popular projections (Waterman Butterfly) not available (still a large catalogue though).
        - -Limited to 20k by 10k resolution (some people have experienced issues loading large maps even below this limit, might help if you open the main window first and then load the map)
    - MapDesigner (A)
        - Similar to GProjector, reprojects maps to new projections.
        - +Includes many projections, including some Gprojector doesn’t have, such as an attempt to replicate Authagraph
        - +Programs for raster and vector maps
        - +Also includes a program for visualizing the distortion of some projections
        - -Not quite as many options as GProjector
        - -Your antivirus might not like it, but that’s a false positive
    - projectionpasta (A)
        - +Can take any of the listed projections as both input and output
        - +Can project to and from any aspect (orientation of the globe relative to the map
        - +Maintains image color type, good if you’re working with greyscale heightmaps
        - -Clunky command-line interface
        - -Interpolation is a bit slow and unreliable and available only in the script version (which requires a python install)
    - MMPS (C)
        - +Will easily reproject absurdly high resolution maps
        - +Can reproject from orthographic, which is rare
        - -Has to be compiled
        - -Has to be run from command line
        - -Pain to use on windows
    - ReprojectImage (A)

        - Lightweight tool that does the opposite of most of these; takes maps in various projections and reprojects them back to equirectangular
        - -Output resolution limited to 4096 x 2048
    - Flex Projector (A)
        - Generally less useful and more annoying to use than GProjector, *but* it does let you make your own projections if you really want to (just like typical compromise ones though, nothing fancy like dymaxion).
- It would appear on a globe
    - Maptoglobe (B)
        - Web tool that takes an equirectangular map and projects it on a globe
        - +Basic tools for editing the map with globe present
        - +Post-processing for realistic “planet in space” appearance
        - +Also can do a couple flat projections, including Waterman Butterfly
        - -Only takes equirectangular maps as input
        - -I can’t keep track of which links actually work at this point, you may have to search around
        - Original site has gone down, a slightly older and somewhat slow version is archived tho https://web.archive.org/web/20240718001859/https://www.maptoglobe.com/
    - Also Gplates again
    - Blender? (A)
        - Bit finicky but not that bad if you already know the software
        - Here’s a tutorial for using it to draw on a globe, pretty sure there are others around too.
    - Google earth pro (A)
        - You can add your own maps as extra layers, quick tutorial here
    - GIMP can kinda do this but not well
- An Interactive web page
    - Map Tailor (A)

- (Not recommended / Intentionally excluded)
  - Pen and paper
    - Yes you're very clever.
  - Photoshop
    - I'm tired of the AI bullshit and outrageous pricing schemes these companies keep trying to pull, I'm not recommending adobe products anymore, don't pay for photoshop, use Gimp or..do what you have to. Same applies to illustrator
  - Donjon
    - I won't comment on any of the text generators, they may be fine, but the world map generator is terrible. The terrain it produces is both geologically and hydrologically implausible and frankly just boring, and there's some pretty obvious artifacting making features line up along a grid. Even when people edit the output elsewhere, it's pretty easy to spot the underlying poor generation
  - Tectonics.js
    - For all the work put into this, the implementation of subduction just isn't sensible and no attempt is made to produce associated orogenies. Those are pretty core elements of how plate tectonics produces terrain; you might as well try to build a city generator that doesn't include roads.
  - Various TTRPG dungeon maps programs
    - There are tons of these floating around, and I don't really use them myself so I can't judge them too well; I've done my best to pick out the most popular or commonly recommended, but I'm not gonna include every single little web app unless someone can specifically recommend it.
  - Mobile-only apps
    - I'm generally assuming that's not what people are coming here for. But if you know a particularly good one, go ahead and recommend it.
  - Space Calc's Climate Simulator

- It’s a valiant attempt, and may be worth playing around with, but lack of seasons is a major downside, and ultimately I think you can probably get a more accurate result mapping climate by hand, let alone the other software available.