RandomParadox Documentation

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1 Introduction

A tool to randomly generate scenarios for multiple games.
Currently implemented modules:

- Hearts of iron IV

To avoid error reports that are due to incorrect configuration, please read the documentation carefully.

1.1 How to read this document

Read section 2. Then read section 3 and follow its instructions.
Now, with a basic idea of the usage of this program, you can use its advanced features:

- Changing parameters of the RandomParadox generator config, explained in 4
- Changing parameters for the game modules you wish to generate for:
  - Changing parameters of the Hoi4Module, explained in 5
- Changing parameters of the FastWorldGenerator config, explained in 6. Note that without understanding the features explained in section 6.4, do NOT modify any of the layers (the part in between the brackets after "layers :" in FastWorldGenerator.json.
- Understanding interactive mode, mentioned in section 6.3
- Tuning advanced map generation parameters, explained in section 6.4

2 Modifying the config files

The generator works with config files in the json format, which is a file type with a very strict syntax.
In general, no changes to the fields on the left should be made. Such changes

will stop the program before generation.
In general, when working with the config files, a few rules should be obeyed:

- **Never add or remove quotes**
- **Never add or remove opening and closing brackets “{“ or “}“**
- **Never add or remove commas**
- **Never add or remove colons “:“**

There are multiple types of fields:

- **Boolean** fields: They can either be *“true“* or *“false“*, which can be understood as *yes* and *no* or *on* and *off*. Never type anything other than *true* or *false* there.
- **String** fields: *Strings* are surrounded by quotes. Never remove the quotes. Only change what is inside the quotes on the right.
  Example: **“heightmapPath“: “inputs/world_1024_paint.bmp“** can be changed to **“heightmapPath“: “inputs/middle_earth_1024_paint.bmp“**
- **Double** fields: These are numbers in the format e.g. *“2.5“*. More details to the sensible ranges can be found in the documentation for each config file.
- **Integer** fields: These are whole numbers in the format e.g. *“2“*. More details to the sensible ranges can be found in the documentation for each config file.

3 Getting started with a simple setup

After downloading and unpacking the generator, you have a folder containing the executable, config files and a resources folder.
Open the config file **Hoi4Module.json** and edit the fields hoi4Path (points to your installation of Hearts of iron IV), hoi4ModPath(points to the place you want the mod installed at) and hoi4ModsDirectory(points to the Hearts of Irov IV mod directory, usually under “*C://Users//**YourUsername**//Documents//Paradox Interactive//Hearts of Iron IV//mod*“).
Now you can run the executable. The generation will take a few minutes on default settings, so be patient. The generation is done when the window shows ”Done with the generation”.
Now start the game via launcher. In the launcher, create a new playset (see figure 1), add the mod to it (see figure 2), select this playset and launch the game. You should then be able to start a new game. Enjoy!

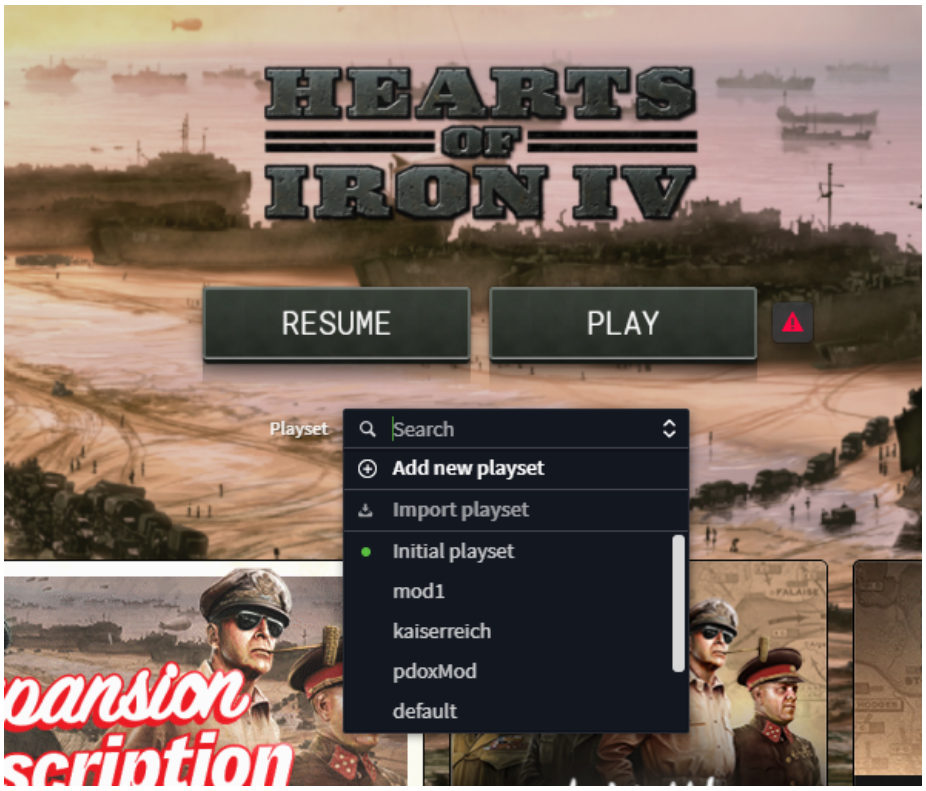

Figure 1: Add a playset to the launcher.

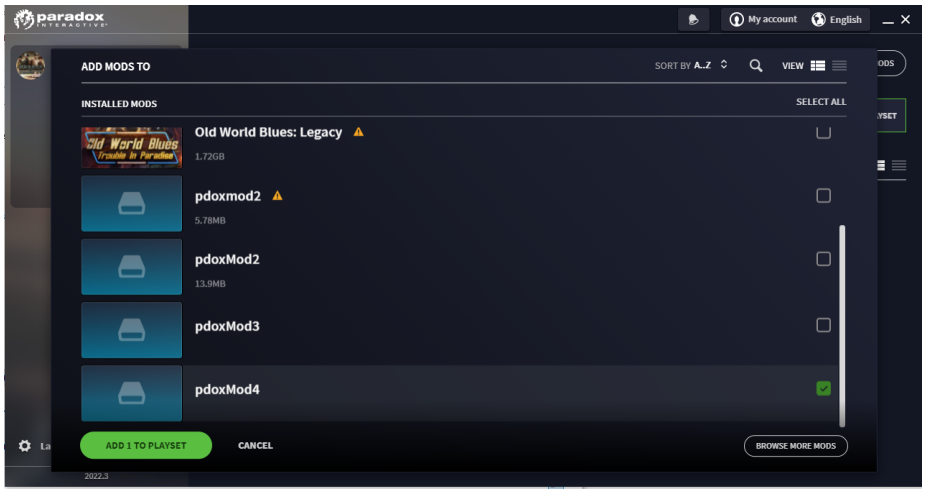

Figure 2: Add mod to the newly created playset.

4 Documentation for RandomParadox Generator

Generic settings are set in the file *RandomParadox.json*.
The list of options:

- **"writeMaps": true**, set to true, if you want the FastWorldGenerator maps created in the "Maps" folder. These maps are not used by the games, but show a lot of info about the world
- **"genhoi4": true,** set to true if you want to generate a scenario for Hearts of Iron IV
- **"inputheightmap": false,** set to true if you want to read in an existing heightmap. See next option for the path. See section 6.4.2
- **"heightmapPath": "inputs/world_1024_paint.bmp",**. This option points to a file relative to the executable. Therefore, if you have a map at hand, create a directory inputs and place it there and point this option here to it.
- **latitudeLow**: what the lower range of the latitude for the generated world should be. Influences climate of the generated world. Lowest value is 0.0, which is equal to 90 south. This is an **overwrite** of the FastWorldGenerator settings.
- **latitudeHigh**: what the lower range of the latitude for the generated world should be. Influences climate of the generated world. Highest value

is 2.0, which is equal to 90 north. This is an **overwrite** of the FastWorldGenerator settings.

5 Documentation for the Hearts of Iron IV Module

Specific settings for the Hearts of Iron IV Scenario can be found in *Hoi4Module.json*. The rules for handling json files apply, see chapter 2.
Module settings:

- **modName** : "pdoxMod2". Any name you want. Will create a new folder for every mod name, in case you don't want to overwrite. If the name stays the same, files will get overwritten.
- **hoi4Path** : the path to you Hearts of Iron IV game directory. The program searches under normal paths, but might not find the game. Please configure this correctly
- **hoi4ModPath** : the path you want the mod installed at. Doesn't have to be the standard Hearts of Iron IV mod directory. Can be anywhere on your computer.
- **hoi4ModsDirectory** : MUST point to the standard Hearts of Iron IV mod directory. If configured incorrectly, the launcher will not show this mod as available. Usually under **Documents//Paradox Interactive//Hearts of Iron IV//mod//**

Hoi4 Settings:

- **strategicRegionSize**: modifier for the size of strategic regions.
- **resourceFactor**: double field. Sensible values between 0.0 and 1000.0. Modifies the total amount of resources available in the game. The higher, the more resources.
- **aluminiumFactor, chromiumFactor, oilFactor, rubberFactor, steelFactor, tungstenFactor**: like resourceFactor, but only for the specific resources. These modifiers work **on top** of resourceFactor. So resourceFactor: 2.0 and oilFactor 2.0 would give 4.0 times the amount of oil. Sensible values between 0.0 and 1000.0.

Scenario settings:

- **numCountries**: how many countries will be placed. An exact result is not guaranteed. Some countries will be generated but not be placed
- **worldPopulationFactor**: multiplier for the world population. Note that this modifies total available manpower. Too high numbers will crash the game, too low numbers will not allow units to be trained. Sensible values probably between 0.1 and 10.0.

- **industryFactor**: multiplier for available industry at game start. Note that this is limited by build slots in the states. From a certain point on, increasing the factor will not have an effect.

6 Documentation for FastWorldGenerator

Specific settings for the World Generation can be found in *FastWorldGenerator.json*. The rules for handling json files apply, see chapter 2.
Many settings also apply for input heightmaps.

6.1 Module Settings

- **debugLevel**: between 0 and 9. 0 means almost no output, 9 means a lot of debug output
- **genHeight**: if false, a map is loaded from *Maps//input.bmp*.
- **interactiveMode**: if true, interactive mode is turned on, which lets you edit and reload certain maps during generation. Can be used to for example change climate maps so following province generation is different. See chapter 6.3
- **writeMaps**: When generating for Paradox Games, leave as true
- **seed**: can be any number from 0 to 2147483647. This determines how the map is generated. If 0, a random seed is chosen. For any other number, the result of the generation will always be the same. Meaning the result of seed 1 will always be the same, but different from the seed 2.

6.2 Map Settings

The map generation has generic settings, and then settings for every layer. The generation works with merging multiple layers of fractal noise and creating a heightmap from it. There can be as many layers as you have resources. Only generic settings will be presented in this chapter, advanced use can be found in subsection 6.4.

- **height**: the height in pixels of the generated maps. Note that large maps require a lot of memory.
- **width**: the width in pixels of the generated maps. Note that large maps require a lot of memory.
- **landMassPercentage**: Set how much land you desire in percent of the world. Range between 0 and 100
- **seaLevel**: Set at which grayscale value the sealevel is. Range between 0 and 255. Note that Paradox Games have a fixed sealevel, so best leave as is.

- **accuracy**: The lower, the faster the program, but the less accurate the results. Range 1 to 100. If you have time, just leave at 100.
- **rivers** :
  - **numRivers**: The amount of desired rivers. Must be greater than or equal to 0

6.2.1 Heightmap settings

- "complexHeight" : true, if you set this to *false*, only the first layer will be used. Recommended to leave at true.
- layerAmount: 4, only change this if you've read and understood section 6.4
- "overallFrequencyModifier" : 1.0, the higher this value, the smaller the continents and islands will be. Sensible range from 0.1 to 10.0. Anything smaller or larger will significantly reduce stability and success of the generation.
- detailed explanation of layer settings can be found in subsection 6.4

6.2.2 Provinces Settings

- **auto**: true, if this is true, the values of landProvinceFactor and seaProvinceFactor are ignored
- **landProvinceFactor**: Must be greater than 0. Sensible range from 0.1 to 10.0: The higher, the more land provinces. Too high values will be ignored, as the maximum amount of land provinces is 65535 provinces.
- **seaProvinceFactor**: Must be greater than 0. Sensible range from 0.1 to 10.0: The higher, the more land provinces. Too high values will be ignored, as the maximum amount of sea provinces is 65535 provinces.
- **minProvPerRegion**: 3, sets the minimum amount of provinces to be in a region.
- **minProvSize**: 10, the minimum amount of pixels that a province has to consist of.
- **provinceDensityByHabitability** : 100. How much you want province size to be influenced by habitability. 100 means maximum influence of habitability, 0 means none, which means province size is roughly the same in every region of the world.

6.2.3 Humidity settings

- **latitudeLow**: what the lower range of the latitude for the generated world should be. Influences climate of the generated world. Lowest value is 0.0, which is equal to 90 degrees south
- **latitudeHigh**: what the upper range of the latitude for the generated world should be. Influences climate of the generated world. Highest value is 2.0, which is equal to 90 degrees north

6.2.4 Weather settings

- **baseTemperature**: what the lowest temperature in the generated world will be
- **deviationFactor**: how much temperature deviates depending on continentality. The more continental a province is, the higher the daily deviation. This means that temperatures between night and day differ a lot.
- **temperatureRange**: How warm provinces can be. Added to baseTemperature, depending on location. Meaning max temperature on the generated map is baseTemperature + temperatureRange.

6.3 Interactive Mode

Interactive mode allows to overwrite certain maps during generation. This works by pausing generation at certain steps, and prompting the user to change a file. When the user is done changing the file, it is reloaded and used for further generation. **Important: Do not use paint to modify the files, instead use other tools.**
Quoting `https://hoi4.paradoxwikis.com/Map_modding#Notes`: "Due to not preserving the order of colours in the palette, Paint.net or Microsoft Paint will not work for terrain.bmp or any .bmp files other than provinces.bmp or world_normal.bmp. GIMP or Photoshop is recommended. In case GIMP is used, in the export settings while exporting to BMP on each map, you need to check the 'Disable writing colorspace information' box."

6.3.1 Example

Currently supported maps for interactiveMode:

- habitabilityMap

By setting **interactiveMode** to true and **habitabilityMap** to true, the program stops during generation and shows a message, see figure 3.

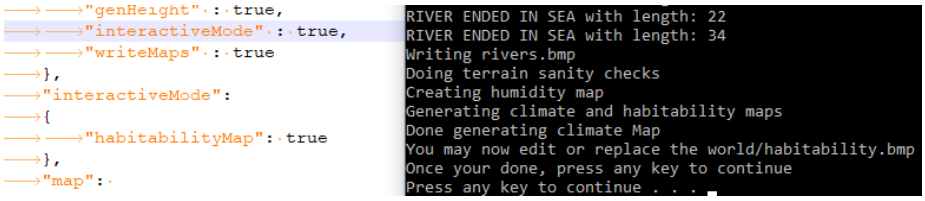

Figure 3: Prompt asking for user input in interactive mode

Now the habitability map can be edited, see figure 4 and 5.

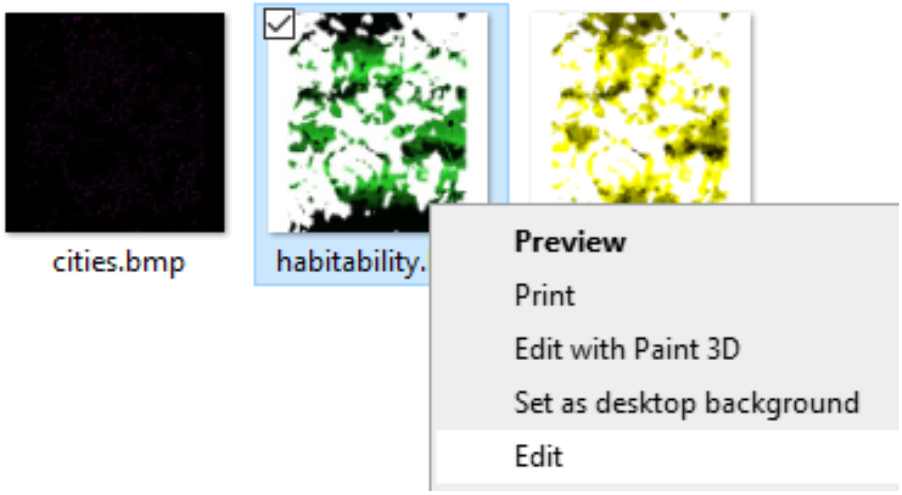

Figure 4: Edit the map with your favourite tools.

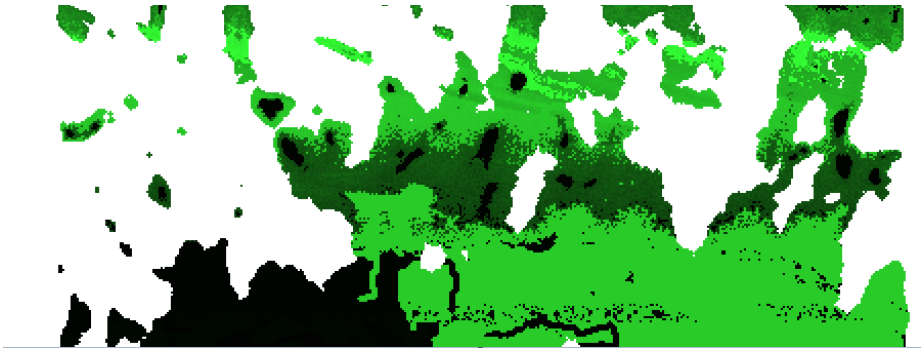

Figure 5: Here we paint over the uninhabitable land with a strong green colour, which sets this land to be very inhabitable. Note that you MUST use the colour picker, so it is the same type of green.

The result of this generation can be seen in 6. Here, the provinces in the lower right are smaller, due to increased habitability in this area.

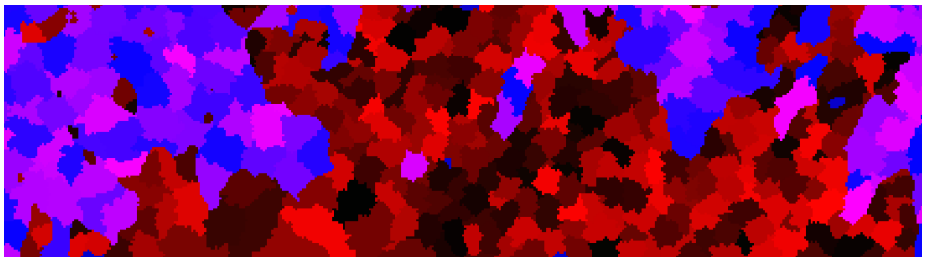

Figure 6: The result of the province generation. See the difference between province size on the left and right

6.4 FastWorldGenerator Advanced Use

This subsection explains more details of heightmap, terrain and climate generation.
To be done.

6.4.1 Editing image files

Quoting `https://hoi4.paradoxwikis.com/Map_modding#Notes`: "Due to not preserving the order of colours in the palette, Paint.net or Microsoft Paint will not work for terrain.bmp or any .bmp files other than provinces.bmp or world_normal.bmp. GIMP or Photoshop is recommended. In case GIMP is

used, in the export settings while exporting to BMP on each map, you need to check the 'Disable writing colorspace information' box.“

6.4.2 Supplying a heightmap

You can supply a heightmap. It must be a grayscale bitmap image, either in 8 bit or 24 bit format. An example 8 bit file is distributed with the generator files, in "inputs". You can modify this with Gimp or Photoshop. See 6.4.1 for details.

7 Modifying Resource Files

7.1 Flag Generation

7.2 Name Generation

When modifying name generation, you have different options:

7.2.1 Add new state names in state_types.txt

It is important to format them correctly. Separate them via ; and also ALWAYS contain template where the country name is supposed to be. Example: Revolutionary template; However, you cannot add new ideologies/lines like democratic or monarchy. So no new lines.

7.2.2 Editing token groups in token_groups.txt

You can add token groups by adding a new line, e.g. :
mytokenGroup;n;tt;r;s;reallyLongEntry;
First, the name of the group. All entries afterwards are characters that appear randomly if you use this group in name_rules.txt. Each entry can be as long as you want.
You can of course also edit all other token groups, remove and add characters, or remove a group altogether. However, if you remove a group, you need to remove it from name_rules.txt
If you ever see an error mentioning a missing namegroup or token group, make sure to check for errors in the text files. There is no need to for capitalization of letters.

7.2.3 Editing name rules

You can modify or add name rules. Name rules are randomly chosen for countries/regions etc. You can add as many name rules as you wish. Name rules work like this: For every entry separated by ; in the name rule, a random entry from a token group is selected. E.g.: E.g., the name rule: vowels;groupMiddle;vowels;groupEnd; gives:

- a random element from vowels, e.g. o.
- a random element from groupMiddle, e.g. lt.
- a random element from vowels again, e.g. e.
- a random element from groupEnd, e.g. stan.

The full name now is Altestan.

7.3 Hoi4 Unit Generation

7.4 Hoi4 Focus Tree Generation

8 Common Issues

8.1 Common errors

- "Configured paths seem to be messed up, check Hoi4Module.json": You have misconfigured paths. Make sure they are in a format like "D://Steam//steamapps//common//Hearts
of Iron IV". The double forward slashes "//" are **important**
- Incorrect config "*.json": The mentioned .json file has an error. The line the error is at should also be mentioned in the message your program shows. Make sure you follow the rules in section 2. If it doesn't work, search for "json validator" and copy the whole file content there.
- "No input map found under heightmapPath, please correct the path": Find and correct the field *heightmapPath* in RandomParadox.json.
- The game crashes on startup or while loading into the map: This can happen if there are too few provinces or states. This can't be fixed in the generator code, instead, just configure more provinces (with **auto: false** and higher **landProvinceFactor**.
- in case the generator can't load one of the maps you edited, make sure you edited them correctly, with the correct tools. See 6.4.1 for details.

9 Known Issues

9.1 Necessary Improvements for FastWorldGen

- river generation has yet to be finished. Weird looking rivers are to be expected

9.2 Necessary Improvements for Hoi4Module

- Focus Tree Generation is lacking features and proper focus trees
- Flag Generation needs more symbol templates, colour combinations and flag templates