Help & Documentation*

Codes of this library is written by of Hydro Group members.

1 Dynamic Model

The Dynamic Model excel file is provided here and its use is explained here.

1. `Fahrenheit_to_Celsius(temp_cel)` converts Fahrenheit temp. to Celsius. Celsius is the proper form of temp. used in the model.

   `Input`:

   - `temp_cel` A real valued temp. or a column of a data frame containing the temp in the Celsius format.

   `output`

   - A real valued temp. in Fahrenheit or a column of data frame.

2. `initiate_data_frame(col_names, init_temp_c, const)` Creates a new data frame of size 2×13 and fills in the cells which are to be used by dynamic model. It corresponds to rows 11 and 12 of the model given in the excel file.

   `Input`:

   - `col_names` The names of columns of the data frame to be used in the model.

     `col_names` $=$ [date, time, temp__c, temp__k, ftmprt, sr, xi, xs, ak1, Inter-S, Inter-E, delt, Portions]
   - `init_temp_c`. Initial temps. corresponding to cells C11 and C12 of the excel file. `init_temp_c` $= (15, 12)$.
   - `const` An object of the class `constants` containing constants of the model. They are given below and in the D1 through D8 cells of the excel file.

[*] Name of the programmer of functions is written in the code for debugging purposes. If you see any flaw, please contact the programmer.

Table 1: `const` object

e0	e1	a0	a1	slp	tetmlt	aa	ee
4.15E+03	1.29E+04	1.40E+05	2.57E+18	1.6	277	a0 / a1	e1 - e0

output: A data frame of the following form.

Table 2: initial data frame to construct the model with.

date	time	temp_c	temp_k	ftmprt	sr	xi	xs	ak1	Inter-S	Inter-E	delt	Portions
None	None	15	288	16.93	22471935.51	1	v.81	.09	0.00	.07	0.00	0
None	None	12	285	12.44	252887.94	1	1.11	.06	.07	.13	0.00	0

3. `fill_in_the_table(given_table, const)` This function takes the `const` object and `given_table` as input and runs the model to fill in the proper information that we need to compute the Chill Portions which is the ultimate goal of the model.

   input:

   - `given_table` Is the data frame that contains the first two rows, like the one given by Table 2 and the first three columns, from row 3 to the end, are provided by datalogger and are read off the disk. Anything from the column **temp_k** onward is computed and filled by this function.
   - `const`: The object containing constants of the model mentioned before.

   output: A complete table that has the Chill Portions for the data of out orchard.

4. `dynamic_model(path_to_data, col_names, init_temp_c, const)`

   This function takes the path of the file we wish to compute the Chilling portions for, along with other inputs that we have already mentioned before, and produces the Chilling Portions.

   input:

   - `path_to_data`: the path to the data location on the disk.

- `col_names`: Name of the columns of the data frame, like mentioned before. These names has to be exact, because they are used for computations in the model.

  NOTE: These data should have temp. in Celsius. And it is assumed the first three columns are `date`, `time` and `temp` respectively.

- `init_temp_c` Initial temp. as mentioned before.
- `const`: An object containing the constants of the model.

`output:` A data frame containing all information we need. (Shall I change this so that it just gives the `Portions`?)

2 Codling Moth Generations

All these functions are written by Giridhar.

1. `readbinarydata_addmdy(filename, Nrecords, Nofvariables, ymd, ind)`
   This function reads the binary data off the disk, generates a matrix containing [**`precip, Max temp., Min temp., Wind speed`**] adds the **`ymd`** to it and returns it.

   `input:`

   - `filename` This is the full path to the file which includes the file name.
   - `Nrecords`
   - `Nofvariables`
   - `ymd` Year, Month, Day values
   - `ind`

   `output:` [**`precip, Max temp., Min temp., Wind speed, ymd`**]

   Why not **`readRDF`**? why connection thing?

   I do not know what the rest are yet. and I do not know why **`Nrecords`** and **`Nofvariables`** are not found inside the function by looking at dimension of the file read off the disk! Are not they related?

2. `create_ymdvalues(nYears, Years, leap.year)`

   `input:`

   - `nYears`: Number of years. (Is not this just `length(Years)`?)
   - `Years`
   - `leap.year`: A binary vector indicating whether a year is a leap year or not.

   `output:` `ymd`, i.e. `Year, Month, Day`.

3. `add_dd_cumudd(metdata_data.table, lower, upper)`

   Computes the degree days (`dd`), cumulative degree days (`Cum_dd`) and concatenates it to the `metdata_data.table`

   `input:`

   - `metdata_data.table`: the data
   - `lower`: lower threshold
   - `upper`: upper threshold

   `output:` `[metdata_data.table, dd, Cum_dd]`

4. `CodlingMothRelPopulation(CodMothParams, metdata_data.table)`

   `input:`

   - `CodMothParams`
   - `metdata_data.table`

   `output:` It takes a data table, and parameters of the model such as cumulative degree days, and then based on them produces some random numbers from Weibull distribution and then generates (predicts/models) number of eggs, larva, pupa and adults, concatenates the new data to the loaded data and spits it out.

5. `CodlingMothPercentPopulation( CodMothParams, metdata_data.table )`

   `input:`

   - `CodMothParams` The parameters of the model.
   - `metdata_data.table` The collected data

`output:` This reads the data off the disk, and adds some new columns to it, containing percentages of stuff, it seems. (I have to find the source that this code is based on. Where did he learn the model from?)

2.1 Script

This goes from line 210 to 1400 (in the clean version).

3 Hossein Codes and notes

When ASCII files are read off the disk, they are read and imported with the right format. When I read an ASCII file and it was a table, I got a data frame in R. Hence, I do not know whether we have a reason to convert them to .rds.

4 Questions

1. What is the difference between `gen_CM_POP_data.R` and `CodlingMothGenerations.R`
2. What is the difference between `prepareData` and `prepareData1` in `core.R`
3. What is the difference between `data` and `data_processed` in

   `/data/hydro/users/giridhar/giridhar/codmoth_pop/alldata_us_locations`

4. It seems the files data_lat_long in the following paths are THE SAME!!!! The ones in the first directory are green. (are they links to the original dara?)

   `/data/hydro/users/giridhar/giridhar/codmoth_pop/historical`/

   `/data/hydro/users/giridhar/giridhar/codmoth_pop/alldata_us_locations/data/historical/`

5 Appendix

The list below corresponds to folder names for historical data and six future climate projections. Each of the“future” folders will have two folders rcp45 and rcp85.

```
categories = c("historical", "BNU-ESM", "CanESM2", "GFDL-ESM2G", "bcc-csm1-1-m", "CNRM-CM5", "GFDL-ESM2M")
```

The raw data (file name: `data_lat_long`) for the 295 locations that are currently part of the web app are in the first path below (folder names in list above). These are the input data folders you will need to reproduce rds files and plots. The second path below contains historical input data for a larger set of locations which we processed to find historical analogs. You will need it later, but not now to reproduce results in web app.

```
/data/hydro/users/giridhar/giridhar/codmoth_pop
```

```
/data/hydro/users/giridhar/giridhar/codmoth_pop/alldata_us_locations/historical
```