

# AN XLISP-STAT PACKAGE FOR TIME SERIES ANALYSIS

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### 1. `prototype.lsp`

This file defines the basic prototype for the object

`univariate-time-series-proto`.

The object has a slot for the values of the variable at the time points, while the time-points are described in terms of `origin` and `interval`. Finally, there is a slot for the `title` of the time series.

It seems we assume equally spaced time-points, but it is possible to fill `interval` with a sequence of intervals, instead of a single one. Of course many of the computational procedures in the other files do not make sense for unequally spaced series. If possible, it is better for our purposes to think of unequal spacing as an example of having missing data.

The prototype `univariate-time-series-proto` merely inherits from `*object*`, which is at the top of the XLISP-STAT hierarchy.

The `:isnew` method for our basic prototype, which constructs a new instance, is very simple. It initializes the slots. The `:isnew` method has one optional argument for the `values` slot, and three keyword arguments for the three other slots. The optional `values` argument has no default value (i.e. it defaults to `nil`), the keyword arguments for `origin` has default 0, for `interval` the default is 1, and for `title` it is “The Title”.

If the optional parameter `values` is missing, the program puts up a file selection dialogue and the value put into the `values` slot is read from a file. This file is supposed to have numbers in it, separated by spaces or linefeeds. In general, the `values` slot should be set to a list or vector of numbers. Almost all methods assume numerical values. Non-numerical

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values, for instance to code categorical time series or to code missing data, will be added at a later stage. Lists of lists, or lists of vectors, or vectors of lists, or vectors of vectors, or matrices are not allowed.

Observe that `values` in the file `prototype.lsp` can mean different things. The prototype has a slot called `values` and a message called `:values`. And the `:isnew` method has an optional argument `values`.

The file `prototype.lsp` also defines accessor methods for the various slots, which can be used either to retrieve the content of the slot or to set (modify) the content. They have the familiar structure. If the method is called without an argument, it returns the value of the slot. If it is called with an argument, it puts the argument in the slot (and also returns the value of the slot).

Thus, for a small demo,

```
> (def my-series (send univariate-time-series-proto :new
  (normal-rand 100) :title "Standard Gaussian White Noise"))
MY-SERIES
> my-series
#<Object: 48305e8, prototype = UNIVARIATE-TIME-SERIES-PROTO>
```

## 2. `compmethods.lsp`

This file defines a number of fairly basic and simple messages that can be sent to a `univariate-time-series-proto` object.

## 3. `plotmethods.lsp`

This file has methods for the following plots.

**time-plot:** The time-plot plots the series against time. It has keyword arguments for the width and height of the plot, and for the colors of the points and the lines. It also has a parameter `pause`, which sets the pause (in 1/60 of a second units) between the plotting of successive points. Thus if `pause` is 10, for instance, the plot grows visibly in time. Finally, another keyword argument `type` can be used to make a line-plot (the default) or a spike-plot (vertical lines from the horizontal mean-line to the time-points) or a point-plot (no lines). For these options `type` should have the string values `"line"` or `"spike"` or whatever else for a point-plot.

**correlogram-plot:**

**lag-plot:**

**periodogram-plot:**

#### 4. `interface.lsp`

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