

Modul:Set

Vorlage:Lua

This module includes a number of set operations for Lua tables. It currently has **union**, **intersection** and **complement** functions for both key/value pairs and for values only. It is a meta-module, meant to be called from other Lua modules, and should not be called directly from `#invoke`.

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Loading the module

To use any of the functions, first you must load the module.

```
local set = require('Module:Set')
```

union

```
set.union(t1, t2, ...)
```

Returns the union of the key/value pairs of *n* tables. If any of the tables contain different values for the same table key, the table value is converted to an array holding all of the different values. For example, for the tables `{foo = "foo", bar = "bar"}` and `{foo = "foo", bar = "baz", qux = "qux"}`, `union` will return `{foo = "foo", bar = {"bar", "baz"}, qux = "qux"}`. An error is raised if the function receives less than two tables as arguments.

valueUnion

```
set.valueUnion(t1, t2, ...)
```

Returns the union of the values of *n* tables, as an array. For example, for the tables `{1, 3, 4, 5}`, and `{2, bar = 3, 5, 6}`, `valueUnion` will return `{1, 2, 3, 4, 5, 6, 7}`. An error is raised if the function receives less than two tables as arguments.

intersection

```
set.intersection(t1, t2, ...)
```

Returns the intersection of the key/value pairs of n tables. Both the key and the value must match to be included in the resulting table. For example, for the tables `{foo = "foo", bar = "bar"}` and `{foo = "foo", bar = "baz", qux = "qux"}`, intersection will return `{foo = "foo"}`. An error is raised if the function receives less than two tables as arguments.

valueIntersection

```
set.valueIntersection(t1, t2, ...)
```

Returns the intersection of the values of n tables, as an array. For example, for the tables `{1, 3}` and `{2, bar = 3, 5, 6}`, valueIntersection will return `{3, 5}`. An error is raised if the function receives less than two tables as arguments.

complement

```
set.complement(t1, t2, ..., tn)
```

Returns the **relative complement** of $t1, t2, \dots$, in tn . The complement is of key/value pairs. This is equivalent to all the key/value pairs that are in tn but are not in any of $t1, t2, \dots, tn-1$. For example, for the tables `{foo = "foo", bar = "bar", baz = "baz"}` and `{foo = "foo", bar = "bar", qux = "qux"}`, complement would return `{bar = "baz", qux = "qux"}`. An error is raised if the function receives less than two tables as arguments.

valueComplement

```
set.valueComplement(t1, t2, ..., tn)
```

This returns an array containing the **relative complement** of $t1, t2, \dots$, in tn . The complement is of values only. This is equivalent to all the values that are in tn but are not in $t1, t2, \dots, tn-1$. For example, for the tables `{1, 2}`, `{1, 2, 3}` and `{1, 2, 3, 4, 5}`, valueComplement would return `{4, 5}`. An error is raised if the function receives less than two tables as arguments.

```
--[[
----- Set
--
-- This module includes a number of set operations for dealing with Lua tables.
-- It currently has union, intersection and complement functions for both
-- key/value pairs and for values only.
-----
--]]
```



```
-- Get necessary libraries and functions
local libraryUtil = require('libraryUtil')
local checkType = libraryUtil.checkType
local tableTools = require('Module:TableTools')

local p = {}

--[[
-----
-- Helper functions
-----
--]]

-- Makes a set from a table's values. Returns an array of all values with
-- duplicates removed.
local function makeValueSet(t)
    local isNan = tableTools.isNan
    local ret, exists = {}, {}
    for k, v in pairs(t) do
        if isNan(v) then
            -- NaNs are always unique, and they can't be table keys,
            -- check for existence.
            ret[#ret + 1] = v
        elseif not exists[v] then
            exists[v] = true
            ret[#ret + 1] = v
        end
    end
    return ret
end

end

--[[
-----
-- union
-----
-- This returns the union of the key/value pairs of n tables. If any of the table
-- contain different values for the same table key, the table value is converted
-- to an array holding all of the different values.
-----
--]]
function p.union(...)
    local lim = select('#', ...)
    if lim < 2 then
        error("too few arguments to 'union' (minimum is 2, received " ..
            lim .. ")")
    end
    local ret, trackArrays = {}, {}
    for i = 1, lim do
        local t = select(i, ...)
        checkType('union', i, t, 'table')
        for k, v in pairs(t) do
            local retKey = ret[k]
            if retKey == nil then
                ret[k] = v
            elseif retKey ~= v then
                if trackArrays[k] then
                    local array = ret[k]
                    local valExists
                    for _, arrayVal in ipairs(array) do
                        if arrayVal == v then
                            valExists = true
                            break
                        end
                    end
                end
            end
        end
    end
end
```



```
                if not valExists then
                    array[#array + 1] = v
                    ret[k] = array
                end
            else
                ret[k] = {ret[k], v}
                trackArrays[k] = true
            end
        end
    end
end
return ret
end

--[[
-----
-- valueUnion
--
-- This returns the union of the values of n tables, as an array. For example, for
-- the tables {1, 3, 4, 5, foo = 7} and {2, bar = 3, 5, 6}, union will return
-- {1, 2, 3, 4, 5, 6, 7}.
-----
--]]
function p.valueUnion(...)
    local lim = select('#', ...)
    if lim < 2 then
        error("too few arguments to 'valueUnion' (minimum is 2, received " .. lim .. ")")
    end
    local isNaN = tableTools.isNaN
    local ret, exists = {}, {}
    for i = 1, lim do
        local t = select(i, ...)
        checkType('valueUnion', i, t, 'table')
        for k, v in pairs(t) do
            if isNaN(v) then
                ret[#ret + 1] = v
            elseif not exists[v] then
                ret[#ret + 1] = v
                exists[v] = true
            end
        end
    end
    return ret
end

--[[
-----
-- intersection
--
-- This returns the intersection of the key/value pairs of n tables. Both the key
-- and the value must match to be included in the resulting table.
-----
--]]
function p.intersection(...)
    local lim = select('#', ...)
    if lim < 2 then
        error("too few arguments to 'intersection' (minimum is 2, received " .. lim .. ")")
    end
    local ret, track, pairCounts = {}, {}, {}
    for i = 1, lim do
        local t = select(i, ...)
        checkType('intersection', i, t, 'table')
        for k, v in pairs(t) do
            local trackVal = track[k]
```

```
        if trackVal == nil then
            track[k] = v
            pairCounts[k] = 1
        elseif trackVal == v then
            pairCounts[k] = pairCounts[k] + 1
        end
    end
end
for k, v in pairs(track) do
    if pairCounts[k] == lim then
        ret[k] = v
    end
end
return ret
end

--[[
-----
-- valueIntersection
--
-- This returns the intersection of the values of n tables, as an array. For
-- example, for the tables {1, 3, 4, 5, foo = 7} and {2, bar = 3, 5, 6},
-- intersection will return {3, 5}.
-----
--]]

function p.valueIntersection(...)
    local lim = select('#', ...)
    if lim < 2 then
        error("too few arguments to 'valueIntersection' (minimum is 2, re
    end
    local isNan = tableTools.isNan
    local vals, ret = {}, {}
    local isSameTable = true -- Tracks table equality.
    local tableTemp -- Used to store the table from the previous loop so that
    for i = 1, lim do
        local t = select(i, ...)
        checkType('valueIntersection', i, t, 'table')
        if tableTemp and t ~= tableTemp then
            isSameTable = false
        end
        tableTemp = t
        t = makeValueSet(t) -- Remove duplicates
        for k, v in pairs(t) do
            -- NaNs are never equal to any other value, so they can't
            -- Which is lucky, as they also can't be table keys.
            if not isNan(v) then
                local valCount = vals[v] or 0
                vals[v] = valCount + 1
            end
        end
    end
    if isSameTable then
        -- If all the tables are equal, then the intersection is that table.
        -- All we need to do is convert it to an array and remove duplicates.
        return makeValueSet(tableTemp)
    end
    for val, count in pairs(vals) do
        if count == lim then
            ret[#ret + 1] = val
        end
    end
    return ret
end
```



```
--[[
-----
-- complement
--
-- This returns the relative complement of t1, t2, ..., in tn. The complement
-- is of key/value pairs. This is equivalent to all the key/value pairs that are
-- in tn but are not in t1, t2, ... tn-1.
-----
--]]
function p.complement(...)
    local lim = select('#', ...)
    if lim < 2 then
        error("too few arguments to 'complement' (minimum is 2, received
    end
    --[[
    -- Now we know that we have at least two sets.
    -- First, get all the key/value pairs in tn. We can't simply make ret equal
    -- as that will affect the value of tn for the whole module.
    --]]
    local tn = select(lim, ...)
    checkType('complement', lim, tn, 'table')
    local ret = tableTools.shallowClone(tn)
    -- Remove all the key/value pairs in t1, t2, ..., tn-1.
    for i = 1, lim - 1 do
        local t = select(i, ...)
        checkType('complement', i, t, 'table')
        for k, v in pairs(t) do
            if ret[k] == v then
                ret[k] = nil
            end
        end
    end
    return ret
end

--[[
-----
-- valueComplement
--
-- This returns an array containing the relative complement of t1, t2, ..., in tn.
-- The complement is of values only. This is equivalent to all the values that are
-- in tn but are not in t1, t2, ... tn-1.
-----
--]]
function p.valueComplement(...)
    local lim = select('#', ...)
    if lim < 2 then
        error("too few arguments to 'valueComplement' (minimum is 2, received
    end
    local isNaN = tableTools.isNaN
    local ret, exists = {}, {}
    for i = 1, lim - 1 do
        local t = select(i, ...)
        checkType('valueComplement', i, t, 'table')
        t = makeValueSet(t) -- Remove duplicates
        for k, v in pairs(t) do
            if not isNaN(v) then
                -- NaNs cannot be table keys, and they are also not values
                exists[v] = true
            end
        end
    end
    local tn = select(lim, ...)
```

```
    checkType('valueComplement', lim, tn, 'table')
    tn = makeValueSet(tn) -- Remove duplicates
    for k, v in pairs(tn) do
        if isNaN(v) or exists[v] == nil then
            ret[#ret + 1] = v
        end
    end
end
return ret
end

--[[
-----
-- symmDiff
--
-- This returns the symmetric difference of key/value pairs of t1, t2, ..., tn.
-- The symmetric difference of two tables consists of the key/value pairs
-- that appear in set 1 but not set 2, together with the key/value pairs that
-- appear in set 2 but not in set 1. This is the same as the union of the two
-- minus the intersection. If either of the tables contain different values for t
-- same table key, the table value is converted to an array holding all of the
-- different values. For more than two tables, this can get confusing - see the
-- "Symmetric difference" article for details.
-----
--]]

--[[ -- This is a rough work in progress.
function p.symmDiff(...)
    local lim = select('#', ...)
    if lim < 2 then
        error("too few arguments to 'symmDiff' (minimum is 2, received ")
    end

    local tremove = table.remove
    local trackArrays = {}

    local function symmDiffTwo(t1, t2)
        local ret = {}
        for k, v in pairs(t1) do
            local t2val = t2[k]
            if t2val == nil then
                ret[k] = v
            elseif trackArrays[k] then
                local array = ret[k]
                local valExists
                for i, arrayVal in ipairs(array) do
                    if arrayVal == v then
                        valExists = true
                        break
                    end
                end
                if not valExists then
                    array[#array + 1] = v
                end
            elseif v ~= t2val then
                ret[k] = {t2val, v}
                trackArrays[k] = true
            end
        end
    end

--]]
return p
```