

# Appendix C

## TouchDevelop Datatypes

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This appendix reproduces material found on the TouchDevelop website at <https://www.touchdevelop.com/docs/api>. This appendix provides descriptions of the datatypes implemented in TouchDevelop. Appendix B covers *services* (also called *resources*).

### C.1 Appointment

A value of this type describes one calendar appointment.

attendees : Contact Collection	Gets the list of attendees. Each contact contains a name and email address.
details : String	Gets the details
end time : DateTime	Gets the end time
is all day event : Boolean	Indicates if this is an all day event
is invalid : Boolean	Returns true if the current instance is useless
is private : Boolean	Indicates if this appointment is private
location : String	Gets the location
organizer : Contact	Gets the organizer
post to wall	Posts the appointment to the wall
source : String	Gets the source of this appointment (Facebook, etc...)
start time : DateTime	Gets the location
status : String	Gets your status (free, tentative, busy, outofoffice)
subject : String	Gets the subject

### C.2 Appointment Collection

A value of this type represents a collection of appointments.

at(index : Number) : Appointment	Gets the appointment at index
count : Number	Gets the number of appointments
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Posts the appointments on the wall

## C.3 Board

An instance of the Board is a 2D image containing sprites and other graphic objects displayed by a games program.

at(i : Number) : Sprite	Gets the sprite indexed by i
clear background camera	Clears the background camera
clear background picture	Clear the background picture
clear events	Clear all queued events related to this board
count : Number	Gets the sprite count
create anchor(width : Number, height : Number) : Sprite	Create an anchor sprite
create boundary(distance : Number)	Create walls around the board at the given distance
create ellipse(width : Number, height : Number) : Sprite	Create a new ellipse sprite
create obstacle(x : Number, y : Number, x segment : Number, y segment : Number, elasticity : Number)	Create a line obstacle with given start point, and given extent. Elasticity is 0 for sticky, 1 for complete bounce.
create picture(picture : Picture) : Sprite	Create a new picture sprite.
create rectangle(width : Number, height : Number) : Sprite	Create a new rectangle sprite
create spring(sprite1 : Sprite, sprite2 : Sprite, stiffness : Number)	Create a spring between the two sprites
create sprite set : Sprite Set	Create a new collection for sprites
create text(width : Number, height : Number, fontSize : Number, text : String) : Sprite	Create a new text sprite.
evolve	Update positions of sprites on board.
height : Number	Gets the height in pixels
is invalid : Boolean	Returns true if the current instance is useless
is landscape : Boolean	Gets a value indicating if the board is designed to be viewed in landscape mode
post to wall	Shows the board on the wall.
set background(color : Color)	Sets the background color
set background camera(camera : Camera)	Sets the background camera
set background picture(picture : Picture)	Sets the background picture
set debug mode(debug : Boolean)	In debug mode, board displays speed and other info of sprites

set friction(friction : Number)	Sets the default friction for sprites to a fraction of speed loss between 0 and 1
set gravity(x : Number, y : Number)	Sets the uniform acceleration vector for objects on the board to pixels/sec <sup>2</sup>
touch current : Vector3	Current touch point
touch end : Vector3	Last touch end point
touch start : Vector3	Last touch start point
touch velocity : Vector3	Final touch velocity after touch ended
touched : Boolean	True if board has been touched
update on wall	Make updates visible.
width : Number	Gets the width in pixels

## C.4 Boolean

The datatype which has true or false as its two values.

and(right : Boolean) : Boolean	Builds conjunction
equals(right : Boolean) : Boolean	Indicates that the two values are equal
is invalid : Boolean	Returns true if the current instance is useless
not : Boolean	Negates the Boolean expression
or(right : Boolean) : Boolean	Builds disjunction
post to wall	Displays the value on the wall
to json : Json Object	Converts the value into a json data structure
to number : Number	Converts true to 1 and false to 0
to string : String	Converts a Boolean to a string

## C.5 Camera

The front or back camera.

height : Number	Gets the height of the camera image in pixels
is front : Boolean	Returns false if this is the primary camera, and true otherwise
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Displays the camera video stream in full screen
preview : Picture	Takes a low quality picture from the camera
width : Number	Gets the width of the camera image in pixels

## C.6 Color

An argb color (alpha, red, green, blue)

A : Number	Gets the alpha value (0.0-1.0)
B : Number	Gets the blue value (0.0-1.0)
blend(other : Color) : Color	Composes a new color using alpha blending
brightness : Number	Gets the brightness component of the color
darken(delta : Number) : Color	Makes a darker color by a delta between 0 and 1
equals(other : Color) : Boolean	Checks if the color is equal to the other
G : Number	Gets the green value (0.0-1.0)
hue : Number	Gets the hue component of the color
is invalid : Boolean	Returns true if the current instance is useless
lighten(delta : Number) : Color	Makes a lighter color by a delta between 0 and 1
make transparent(alpha : Number) : Color	Creates a new color by changing the alpha channel from 0 (transparent) to 1 (opaque)
post to wall	Prints the value to the wall
R : Number	Gets the red value (0.0-1.0)
saturation : Number	Gets the saturation component of the color

## C.7 Contact

An instance of this type represents a personal contact. The list of methods has been divided into three sections: *get methods* (which retrieve a single attribute of a contact), *set methods* (which set or update a single attribute), and *other methods*.

Get Methods of Contact Type	
birthday : DateTime	Gets the birth date if any.
company : String	Gets the company name if any.
email : Link	Gets the work or personal email if any
first name : String	Gets the first name if any.
home address : String	Gets the work address if any
home phone : Link	Gets the home phone number if any
job title : String	Gets the job title at the company if any.
last name : String	Gets the last name if any
middle name : String	Gets the middle name if any
mobile phone : Link	Gets the cell phone number if any
name : String	Gets the display name (not used when saving contact)
nick name : String	Gets the nickname if any
office : String	Gets the office location at the company if any
personal email : Link	Gets the personal email if any
phone number : Link	Gets the cell or work or home phone number if any

picture : Picture	Gets the picture of the contact if any
source : String	Gets the source of this contact (phone, etc...)
suffix : String	Gets the name suffix if any
title : String	Gets the name title if any
web site : Link	Gets the web site if any
work address : String	Gets the home address if any
work email : Link	Gets the work email if any
work phone : Link	Gets the work phone number if any

<b>Set Methods of Contact Type</b>	
set company(value : String)	Sets the company
set first name(value : String)	Sets the first name
set home phone(home phone : String)	Sets the home phone
set job title(value : String)	Sets the job title
set last name(value : String)	Sets the last name
set middle name(middle name : String)	Sets the middle name
set mobile phone(value : String)	Sets the mobile phone
set personal email(value : String)	Sets the personal email
set source(value : String)	Sets the source
set suffix(value : String)	Sets the suffix
set title(value : String)	Sets the title
set web site(value : String)	Sets the web site
set work email(value : String)	Sets the work email
set work phone(work phone : String)	Sets the work phone

<b>Other Methods of Contact Type</b>	
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Posts the contact to the wall

## C.8 Contact Collection

A collection of contacts

at(index : Number) : Contact	Gets the contact at index
count : Number	Gets the number of contacts
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Posts the contacts on the wall

## C.9 DateTime

A DateTime value is a combination of date and time. The list of methods has been separated into a table of *get methods* (which return a single attribute) and *other methods*.

Get Methods of DateTime Type	
date : DateTime	Gets the date
day : Number	Gets the day of the month
hour : Number	Gets the hour
millisecond : Number	Gets the millisecond
minute : Number	Gets the minute
month : Number	Gets the month
second : Number	Gets the second
week day : Number	Gets the day of the week (sunday = 0, monday = 1, ... saturday = 6)
year : Number	Gets the year
year day : Number	Gets the day of the year between 1 and 366

Other Methods of DateTime Type	
add days(days : Number) : DateTime	Returns a date that adds the specified number of days to the value of this instance
add hours(hours : Number) : DateTime	Returns a date that adds the specified number of hours to the value of this instance
add milliseconds(milliseconds : Number) : DateTime	Returns a date that adds the specified number of milliseconds to the value of this instance
add minutes(minutes : Number) : DateTime	Returns a date that adds the specified number of minutes to the value of this instance
add months(months : Number) : DateTime	Returns a date that adds the specified number of months to the value of this instance
add seconds(seconds : Number) : DateTime	Returns a date that adds the specified number of seconds to the value of this instance
add years(years : Number) : DateTime	Returns a date that adds the specified number of years to the value of this instance
equals(other: DateTime): Boolean	Compares dates for equality
greater(other: DateTime): Boolean	Compares dates for greater
greater or equal(other : DateTime) : Boolean	Compares dates for greater or equal
is invalid : Boolean	Returns true if the current instance is useless
less(other : DateTime) : Boolean	Compares dates for less

less or equals(other : DateTime) : Boolean	Compares dates for less or equal
not equals(other : DateTime) : Boolean	Compares dates for inequality
post to wall	Prints the date to the wall
subtract(value: DateTime): Number	Computes difference between date-times in seconds
to local time : DateTime	Converts to the local time
to json : Json Object	Converts the value into a json data structure
to local time : DateTime	Converts to the local time
to string : String	Converts a dates to a string
to universal time : DateTime	Converts coordinated universal time

## C.10 Form Builder

A builder to create HTML Form data.

add boolean(name : String, value : Boolean)	Adds a boolean value
add number(name : String, value : Number)	Adds a number value
add picture(name : String, value : Picture, picture Name : String)	Adds a picture
add string(name : String, value : String)	Adds a string value
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Posts the form to the wall

## C.11 Json Builder

A json data structure builder.

add(value : Json Object)	Adds a value to the array
add null	Adds a null value to the array
is invalid : Boolean	Returns true if the current instance is useless
set boolean(name : String, value : Boolean)	Sets the boolean value
set field(name : String, value : Json Object)	Sets the field value
set field null(name : String)	Sets the field value as null
set number(name : String, value : Number)	Sets the number value

set string(name : String, value : String)	Sets the string value
to json : Json Object	Converts the builder into a json data structure and clears the builder

## C.12 Json Object

A JSON data structure

at(index : Number) : Json Object	Gets the i-th json value
boolean(key : String) : Boolean	Gets a field value as a Boolean
contains key(key: String) : Boolean	Indicates if the key exists
count : Number	Gets the number of values
field(key : String) : Json Object	Gets a value by name
is invalid : Boolean	Returns true if the current instance is useless
keys : String Collection	Gets the list of keys
kind : String	Gets json kind (string, number, object, array, boolean)
number(key : String) : Number	Gets a field value as a number
post to wall	Prints the value to the wall
string(key : String) : String	Gets a field value as a string
time(key : String) : DateTime	Gets the field value as a time
to boolean : Boolean	Converts to a Boolean (type must be boolean)
to number : Number	Converts to a number (type must be number)
to string : String	Converts to a string (type must be string)
to time : DateTime	Converts and parses to a date time (type must be string)

## C.13 Link

A link to a video, image, email, or a phone number.

address : String	Gets the url
is invalid : Boolean	Returns true if the current instance is useless
kind : String	Gets the kind of asset - media, image, email, phone number, hyperlink, deep zoom link, radio
location : Location	Gets the location if any
name : String	Gets the name if any
post to wall	Displays the link on the wall
set location(location : Location)	Sets the location
set name(name : String)	Sets the name



share(network : String)	Shares the link (email, sms, Facebook, social or " to pick from a list)
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## C.14 Link Collection

A list of links.

add(value : Link)	Adds a link
add many(value : Link Collection)	Adds many links at once
at(index : Number) : Link	Gets the i-th link
clear	Clears the collection
count : Number	Gets the number of elements
index of(item : Link, start : Number) : Number	Gets the index of the first occurrence of item. Returns -1 if not found or start is out of range.
insert at(index : Number, item : Link)	Inserts a link at position index. Does nothing if index is out of range.
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Displays the links on the wall
random : Link	Gets a random element from the collection. Returns invalid if the collection is empty.
remove(item : Link) : Boolean	Removes the first occurrence of the link. Returns true if removed.
remove at(index : Number)	Removes the link at position index.
reverse	Reverses the order of the elements.
set at(index : Number, value : Link)	Sets the i-th link

## C.15 Location

A geo coordinate (latitude, longitude, ...)

altitude : Number	Gets the altitude of the coordinate
course : Number	Gets the course of the coordinate
distance(other : Location) : Number	Calculates the distance in meters
equals(other : Location) : Boolean	Indicates if this instance is equal to the other
hor accuracy : Number	Gets the horizontal accuracy of the coordinate
is invalid : Boolean	Returns true if the current instance is useless
latitude : Number	Gets the latitude of the coordinate
longitude : Number	Gets the longitude of the coordinate
post to wall	Displays the location in a map using Bing
share(network : String, message : String)	Shares the location (email, sms, Facebook, social or " to pick from a list)
speed : Number	Gets the speed of the coordinate
to string : String	Converts to a string lat,long

vert accuracy : Number	Gets the vertical accuracy of the coordinate
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## C.16 Location Collection

add(value : Location)	Adds a location
add many(value : Location Collection)	Adds many locations at once
at(index : Number) : Location	Gets the i-th geo coordinate
clear	Clears the collection
count : Number	Gets the number of elements
index of(item : Location, start : Number) : Number	Gets the index of the first occurrence of item. Returns -1 if not found or start is out of range.
insert at(index : Number, item : Location) : Nothing	Inserts a location at position index. Does nothing if index is out of range.
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Displays the locations in a map using Bing
random : Location	Gets a random element from the collection. Returns invalid if the collection is empty.
remove(item : Location) : Boolean	Removes the first occurrence of the location. Returns true if removed.
remove at(index: Number)	Removes the location at position index
reverse	Reverses the order of the elements
set at(index : Number, value : Location)	Sets the i-th geo coordinate
sort by distance(loc : Location)	Sorts by distance to the location

## C.17 Map

A Bing map.

add line(locations : Location Collection, color : Color, thickness : Number)	Adds a polyline that passes through various geo coordinates
add link(link : Link, background : Color, foreground : Color)	Adds a link pushpin on the map (ignored if the location is not set)
add message(msg : Message, background : Color, foreground : Color)	Adds a message pushpin on the map (ignored if the location is not set)
add picture(location : Location, picture : Picture, background : Color)	Adds a picture pushpin on the map
add place(place : Place, background : Color, foreground : Color)	Adds a place pushpin on the map (ignored if the location is not set)

add text(location : Location, text : String, background : Color, foreground : Color)	Adds a text pushpin on the map
center : Location	Gets the map center location
clear	Clears the lines, regions and pushpins
fill region(locations : Location Collection, fill : Color, stroke : Color, thickness : Number)	Fills a region with a color
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Displays the map in the wall using Bing
set center(center : Location)	Sets the map center location
set zoom(level : Number)	Sets the zoom level from 1 (earth) to 21 (street)
view pushpins	Changes the current zoom and center so that all the pushpins are visible. This method has no effect if the map is not posted on the wall yet.
zoom : Number	Gets the zoom level

## C.18 Matrix

A two-dimensional matrix of numbers.

add(b : Matrix) : Matrix	Returns a matrix resulting from adding this matrix to b. The sizes of both matrices must match.
at(index : Number) : Number	Gets the value at a given index. Elements are ordered line by line starting top left.
clear(value : Number)	Sets all the element of the matrix to the value.
clone : Matrix	Creates a deep copy of the matrix.
column count : Number	Gets the number of columns
count : Number	Gets the total number of elements
is invalid : Boolean	Returns true if the current instance is useless
item(row : Number, column : Number) : Number	Gets the value at a given location. Returns invalid if outside the array dimensions.
max : Number	Computes the maximum of the values
min : Number	Computes the minimum of the values
multiply(b : Matrix) : Matrix	Returns a matrix resulting from multiplying each element in the matrices. The sizes of both matrices must match.
negate : Matrix	Returns the matrix negated.
post to wall	Displays the map in the wall using Bing

random : Number	Gets a random element. Returns invalid if the matrix is empty.
row count : Number	Gets the number of rows
scale(factor : Number) : Matrix	Returns a copy of the matrix scaled by factor
set at(index : Number, value : Number)	Sets the value at a given index. Elements are ordered line by line starting top left.
set item(row : Number, column : Number, value : Number)	Sets the value at a particular position. The matrix will be expanded with zero values if the position falls outside the boundaries.
subtract(b : Matrix) : Matrix	Returns a matrix resulting from subtracting b from this matrix. The sizes of both matrices must match.
to string : String	Gets the string representation of the matrix
transpose : Matrix	Returns the transposed matrix

## C.19 Message

A Message value contains the details of a posting on a message board. The list of methods is separated into *get methods* (which retrieve a single attribute of a message), *set methods* (which assign or update an attribute value), and *other methods*.

Get Methods of Message Type	
from : String	Gets the author
id : String	Gets the message identifier
link : String	Gets the link associated with the message
location : Location	Gets the geo coordinates
media link : String	Gets a url to the media
message : String	Gets the message text
picture link : String	Gets a url for the picture
source : String	Gets the source of this message (Facebook, Twitter, etc...)
time : DateTime	Gets the time
title : String	Gets the title text
to : String	Gets the recipient
values : String Map	Gets additional values stored in the message

Set Methods of Message Type	
set from(author : String)	Sets the author
set id(value : String)	Sets the message identifier
set link(url : String)	Sets the link associated to the message
set location(location : Location)	Sets the geo coordinates

set media link(url : String)	Sets the url to the media
set message(message : String)	Sets the message text
set picture link(url : String)	Sets the url to the picture
set source(source : String)	Sets the source of this message
set time(time : DateTime)	Sets the time
set title(title : String)	Sets the title text
set to(author : String) : Nothing	Sets the recipient

Other Methods of Message Type	
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Posts the message to the wall
share(where : String) : Nothing	Shares this message (email, sms, Facebook, social or " to pick from a list)

## C.20 Message Collection

A list of messages.

add(value : Message)	Adds a Message
add many(value : Message Collection)	Adds a collection of Message items
at(index : Number) : Message	Gets the i-th Message
clear	Clears the collection
continuation : String	Gets the identifier of the next set of messages
count : Number	Gets the number of elements
index of(item : Message, start : Number) : Number	Gets the index of the first occurrence of item. Returns -1 if not found or start is out of range.
insert at(index : Number, item : Message)	Inserts a link at position index. Does nothing if index is out of range.
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Displays the Messages in the wall
random : Message	Gets a random element from the collection. Returns invalid if the collection is empty.
remove(item : Message) : Boolean	Removes the first occurrence of the message. Returns true if removed.
remove at(index : Number)	Removes the message at position index
reverse	Reverses the order of the elements
set at(index : Number, value : Message)	Sets the i-th Message
set continuation(value : String)	Sets the identifier of the next set of message
sort by date	Sorts from the newest to oldest

## C.21 Motion

Describes the motion of the device.

acceleration : Vector3	Gets the linear acceleration of the device, in gravitational units
gravity : Vector3	Gets the gravity vector associated with this reading
is invalid : Boolean	Returns true if the current instance is useless
pitch : Number	Gets the pitch of the attitude in degrees
post to wall	Displays the motion reading to the wall
roll : Number	Gets the roll of the attitude in degrees
rotation speed : Vector3	Gets the device rotation speed in degrees per second
time : DateTime	Gets a timestamp indicating the time at which the reading was calculated
yaw : Number	Gets the yaw of the attitude in degrees

## C.22 Number

A number (possibly negative and/or fractional)

-(right : Number) : Number	Subtracts numbers
*(right : Number) : Number	Multiplies numbers
/(right : Number) : Number	Divides numbers
+(right : Number) : Number	Adds numbers
<(right : Number) : Boolean	Compares numbers for less
=(right : Number) : Boolean	Compares numbers for equality
≠(right : Number) : Boolean	Compares numbers for inequality
>(right : Number) : Boolean	Compares numbers for more
≤(right : Number) : Boolean	Compares numbers for less or equal
≥(right : Number) : Boolean	Compares numbers for more or equal
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Prints the number to the wall
to character : String	Interprets a number as a unicode value and converts it to a single character string
to color : Color	Interprets the number as a ARGB (alpha, red, green, blue) color
to json : Json Object	Converts the value into a json data structure
to string : String	Converts a number to a string

## C.23 Number Collection

A collection of numbers

add(item : Number)	Adds a number at the end of the collection
add many(items : Number Collection)	Adds many numbers at once
at(index : Number) : Number	Gets the number at position index. Returns invalid if index is out of range
avg : Number	Computes the average of the values
clear	Clears the numbers
contains(item : Number) : Boolean	Indicates if the collection contains the item
count : Number	Gets the number of items
index of(item : Number, start : Number) : Number	Gets the index of the first occurrence of a number. Returns -1 if not found or start is out of range.
insert at(index : Number, item : Number)	Inserts a double at position index. Does nothing if index is out of range.
is invalid : Boolean	Returns true if the current instance is useless
max : Number	Computes the maximum of the values
min : Number	Computes the minimum of the values
post to wall	Displays the numbers on the wall
random : Number	Gets a random element from the collection. Returns invalid if the collection is empty.
remove(item : Number) : Boolean	Removes the first occurrence of a number. Returns true if removed.
remove at(index : Number)	Removes the number at position index
reverse	Reverses the items
set at(index : Number, item : Number)	Sets the number at position index. Does nothing if the index is out of range.
sort	Sorts the numbers in this collection
sum : Number	Computes the sum of the values

## C.24 Number Map

A map of numbers to numbers

at(index : Number) : Number	Gets the element at index. Index may be any floating-point value
avg : Number	Computes the average of the values
clear	Clears the number map
count : Number	Gets the number of elements
is invalid : Boolean	Returns true if the current instance is useless

max : Number	Computes the maximum of the values
min : Number	Computes the minimum of the values
post to wall	Displays the map in a line chart; you need to call 'update on wall' later if you want changes to be reflected
remove(index : Number)	Removes the value at a given index
set at(index : Number, value : Number)	Sets the element at index. Index may be any floating-point value
set many(numbers : Number Map)	Sets many elements at once
slice(start : Number, end : Number) : Number Map	Extracts the elements at indices between start (inclusive) and end (non-inclusive)
sum : Number	Computes the sum of the values
update on wall	Updates any display of this map

## C.25 OAuth Response

OAuth 2.0 Access Token or Error.

access token : String	The access token issued by the authorization server
error : String	A single ASCII [USASCII] error code
error description : String	(Optional) A human readable error code
error uri : String	(Optional) A URI identifying a human-readable web page with information about the error, used to provide the client developer with additional information about the error.
expires in : Number	(Optional) The lifetime in seconds of the access token
is error : Boolean	Indicates if this response is an error
is expiring(lookup : Number) : Boolean	(Optional) Indicates if the token might expire within the next seconds
is invalid : Boolean	Returns true if the current instance is useless
others : String Map	(Optional) Additional key-value pairs not covered by the OAuth 2.0 specification
post to wall	Displays the response
set at(index : Number, item : Number)	Sets the number at position index. Does nothing if the index is out of range.
sort	Sorts the numbers in this collection
scope : String	(Optional) Optional if identical to the scope requested by the client; otherwise, the scope of the access token as described by Section 3.3



## C.26 Page

A page on a wall

equals(other : Page) : Boolean	Gets a value indicating if the page is equal to the other
is invalid : Boolean	Returns true if the current instance is useless

## C.27 Page Button

A page button on the wall

equals(page button : Page) : Boolean	Gets a value indicating if both instances are equal
icon : String	Gets the icon name
is invalid : Boolean	Returns true if the current instance is useless
page : Page	Gets the page hosting this button
post to wall	Pushes this button on the wall
text : String	Gets the text

## C.28 Page Collection

A collection of pages

at(index : Number) : Page	Gets the pages at index
count : Number	Gets the number of pages
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Posts the pages on the wall

## C.29 Picture

A Picture value is an image which can be displayed. The list of methods has been separated into *get methods* (which return a single property of a picture) and *other methods*.

Get Methods of Picture Type	
at(index : Number) : Color	Gets the pixel color at the given linear index
count : Number	Gets the number of pixels
date : DateTime	Gets the date and time where the picture was taken; if any

height : Number	Gets the height in pixels
location : Location	Gets the location where the picture was taken; if any.
pixel(left : Number, top : Number) : Color	Gets the color of a pixel
width : Number	Gets the width in pixels

<b>Other Methods of Picture Type</b>	
blend(other : Picture, left : Number, top : Number, angle : Number, opacity : Number)	Writes another picture at a given location. The opacity ranges from 0 (transparent) to 1 (opaque).
blend svg(markup : String, left : Number, top : Number, width : Number, height : Number, angle : Number)	Writes a Scalable Vector Graphics (SVG) document at a given location. By default, this action uses the viewport size provided in the SVG document when width or height are negative.
brightness(factor : Number)	Changes the brightness of the picture. Factor in [-1, 1].
clear(color : Color)	Clears the picture to a given color
clone : Picture	Returns a copy of the image
colorize(background : Color, foreground : Color, threshold : Number)	Recolors the picture with the background and foreground color, based on a color threshold between 0.0 and 1.0
contrast(factor : Number)	Changes the contrast of the picture. Factor in [-1, 1].
crop(left : Number, top : Number, width : Number, height : Number)	Crops a sub-image
desaturate	Makes the picture gray
draw ellipse(left : Number, top : Number, width : Number, height : Number, angle : Number, c : Color, thickness : Number)	Draws an elliptic border with a given color
draw line(x1 : Number, y1 : Number, x2 : Number, y2 : Number, color : Color, thickness : Number)	Draws a line between two points
draw rect(left : Number, top : Number, width : Number, height : Number, angle : Number, c : Color, thickness : Number)	Draws a rectangle border with a given color
draw text(left : Number, top : Number, text : String, font size : Number, angle : Number, color : Color)	Draws some text border with a given color and font size

fill ellipse(left : Number, top : Number, width : Number, height : Number, angle : Number, color : Color)	Fills a ellipse with a given color
fill rect(left : Number, top : Number, width : Number, height : Number, angle : Number, color : Color)	Fills a rectangle with a given color
flip horizontal	Flips the picture horizontally
flip vertical	Flips the picture vertically
invert	Inverts the red, blue and green channels
is invalid : Boolean	Returns true if the current instance is useless
is panorama : Boolean	Indicates if the picture width is greater than its height
post to wall	Displays the image to the wall; you need to call 'update on wall' later if you want changes to be reflected
resize(width : Number, height : Number)	Resizes the picture to the given size in pixels
save to library : String	Saves the picture to the 'saved pictures' album. Returns the file name.
set pixel(left : Number, top : Number, color : Color)	Sets the pixel color at a given pixel
share(where : String, message : String)	Shares this message (" to pick from a list)
tint(color : Color)	Converts every pixel to gray and tints it with the given color.
update on wall	Refreshes the picture on the wall

## C.30 Picture Album

A picture album

albums : Picture Albums	Gets the children albums
is invalid : Boolean	Returns true if the current instance is useless
name : String	Gets the name of the album
pictures : Pictures	Gets the pictures
post to wall	Displays the album to the wall

## C.31 Picture Albums

A collection of picture albums

at(index : Number) : Picture Album	Gets the item at position 'index'; invalid if index is out of bounds
count : Number	Gets the number of elements in the collection
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Displays the value to the wall
random : Picture Album	Gets random item; invalid if collection is empty

## C.32 Pictures

A collection of pictures

at(index : Number) : Picture	Gets the item at position 'index'; invalid if index is out of bounds
count : Number	Gets the number of elements in the collection
find(name : String) : Number	Finds a picture by name and returns the index. Returns -1 if not found.
full(index : Number) : Picture	Gets the full resolution version of i-th picture
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Displays the picture thumbnails to the wall
random : Picture	Gets a random item; invalid if collection is empty
thumbnail(index : Number) : Picture	Gets the thumbnail of i-th picture

## C.33 Place

Attaches or uses information for a named location. The list of methods has been separate into three tables: *get methods* which access attributes of a Place, *set methods* which update or replace attributes, and *other methods*.

Get Methods of Place Type	
category : String	Gets the category of the place
id : String	Gets the identifier of this place
link : String	Gets the link associated to the message
location : Location	Gets the location of the place
name : String	Gets the name of the place
picture link : String	Gets a url to the picture
source : String	Gets the source of this place (Facebook, TouchDevelop)

<b>Set Methods of Place Type</b>	
set category(category : String)	Sets the category of the place
set id(id : String)	Sets the identifier of this place
set link(url : String)	Sets the link associated with the message
set location(location : Location)	Sets the location of the place
set name(name : String)	Sets the name of the place
set picture link(url : String)	Sets the url for the picture
set source(source : String)	Sets the source of this place

<b>Other Methods of Place Type</b>	
is invalid : Boolean	Returns true if the current instance is useless
post to wall : Nothing	Posts the place to the wall
to string : String	Converts to a string name, plus latitude and longitude

## C.34 Place Collection

A collection of places

add(value : Place)	Adds a place
add many(value : Place Collection)	Adds many places at once
at(index : Number) : Place	Gets the i-th place
clear	Clears the collection
continuation : String	Gets the identifier of the next set of messages
count : Number	Gets the number of elements
index of(item : Place, start : Number) : Number	Gets the index of the first occurrence of item. Returns -1 if not found or start is out of range.
insert at(index : Number, item : Place)	Inserts a place at position index. Does nothing if index is out of range.
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Posts the places on the wall
random : Place	Gets a random element from the collection. Returns invalid if the collection is empty.
remove(item : Place) : Boolean	Removes the first occurrence of a place. Returns true if removed.
remove at(index : Number)	Removes the location at position index
reverse	Reverses the order of the elements
set at(index : Number, value : Place)	Sets the i-th place
set continuation(value : String)	Sets the identifier of the next set of messages
sort by distance(loc : Location)	Sorts the places by distance to the location

## C.35 Playlist

A song playlist

duration : Number	Gets the duration in seconds
is invalid : Boolean	Returns true if the current instance is useless
name : String	Gets the name of the song
play	Plays the songs in the playlist
post to wall	Displays the playlist to the wall
songs : Songs	Gets the songs

## C.36 Playlists

A collection of playlists

at(index : Number) : Playlist	Gets i-th playlist
count : Number	Gets the number of playlists
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Displays the value to the wall

## C.37 Song

A song

album : Song Album	Gets the song album containing the song
artist : String	Gets the name of the artist
duration : Number	Gets the duration in seconds
genre : String	Gets the genre of the song
is invalid : Boolean	Returns true if the current instance is useless
name : String	Gets the name of the song
play	Plays the song
play count : Number	Gets the play count
post to wall	Displays the song on the wall
protected : Boolean	Gets a value indicating whether the song is DRM protected
rating : Number	Gets the users rating; -1 if not rated
track : Number	Gets the track number in the album

## C.38 Songs

A collection of songs

at(index : Number) : Song	Gets the item at position 'index'; invalid if index is out of bounds
count : Number	Gets the number of elements in the collection
is invalid : Boolean	Returns true if the current instance is useless
play	Plays the song
post to wall	Displays the songs on the wall
random : Song	Gets random item; invalid if collection is empty

## C.39 Song Album

A song album

art : Picture	Gets album art picture
artist : String	Gets the name of the artist
duration : Number	Gets the duration in seconds
genre : String	Gets the genre of the song
has art : Boolean	Indicates if the album has art
is invalid : Boolean	Returns true if the current instance is useless
name : String	Gets the name of the album
play	Plays the songs of the album
post to wall	Displays the song album on the wall
songs : Songs	Gets the songs
thumbnail : Picture	Gets the thumbnail picture

## C.40 Song Albums

A collection of albums

at(index : Number) : Song Album	Gets the item at position 'index'; invalid if index is out of bounds
count : Number	Gets the number of elements in the collection
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Displays the value to the wall
random : Song Album	Gets random item; invalid if collection is empty

## C.41 Songs

A collection of songs.

at(index : Number) : Song	Gets the item at position 'index'; invalid if index is out of bounds
count : Number	Gets the number of elements in the collection
is invalid : Boolean	Returns true if the current instance is useless
play	Plays the song
post to wall	Displays the songs on the wall
random : Song	Gets random item; invalid if collection is empty

## C.42 Sound

A sound effect

duration : Number	Gets the duration in seconds
is invalid : Boolean	Returns true if the current instance is useless
pan : Number	Gets the panning, ranging from -1.0 (full left) to 1.0 (full right)
pitch : Number	Gets the pitch adjustment, ranging from -1 (down one octave) to 1 (up one octave)
play	Plays the sound effect
play special(volume : Number, pitch : Number, pan : Number)	Plays the song with different volume (0 to 1), pitch (-1 to 1) and pan (-1 to 1)
post to wall	Displays a player on the wall
set pan(pan : Number)	Sets the panning, ranging from -1.0 (full left) to 1.0 (full right)
set pitch(pitch : Number)	Sets the pitch adjustment, ranging from -1 (down one octave) to 1 (up one octave)
set volume(v : Number)	Sets the volume from 0 (silent) to 1 (full volume)
volume : Number	Gets the volume from 0 (silent) to 1 (full volume)

## C.43 Sprite

A sprite is a graphical object which can be displayed on a Board instance. The list of methods of the Sprite type has been separated into get methods (which return a single attribute), *set methods* (which assign or update an attribute), and *other methods*.



<b>Get Methods of Sprite Type</b>	
acceleration x : Number	Gets the acceleration along x in pixels/sec <sup>2</sup>
acceleration y : Number	Gets the acceleration along y in pixels/sec <sup>2</sup>
angle : Number	Gets the angle of the sprite in degrees
angular speed : Number	Gets the rotation speed in degrees/sec
color : Color	Gets the sprite color
elasticity : Number	Gets the sprite elasticity as a fraction of speed preservation per bounce (0-1)
friction : Number	Gets the fraction of speed loss between 0 and 1
height : Number	Gets the height in pixels
location : Location	Gets the geo location assigned to the sprite
mass : Number	Gets the mass
opacity : Number	Gets the opacity (between 0 transparent and 1 opaque)
picture : Picture	Gets the picture on a picture sprite (if it is a picture sprite)
speed x : Number	Gets the speed along x in pixels/sec
speed y : Number	Gets the speed along y in pixels/sec
text : String	The text on a text sprite (if it is a text sprite)
width : Number	Gets the width in pixels
x : Number	Gets the x position in pixels
y : Number	Gets the y position in pixels
z index : Number	Gets the z-index of the sprite

<b>Set Methods of Sprite Type</b>	
set acceleration(vx : Number, vy : Number)	Sets the acceleration in pixels/sec <sup>2</sup>
set acceleration x(vx : Number)	Sets the x acceleration in pixels/sec <sup>2</sup>
set acceleration y(vy : Number)	Sets the y acceleration in pixels/sec <sup>2</sup>
set angle(angle : Number)	Sets the angle of the sprite in degrees
set angular speed(speed : Number)	Sets the rotation speed in degrees/sec
set clip(left : Number, top : Number, width : Number, height : Number)	Sets the clipping area for an image sprite (if it is an image sprite)
set elasticity(elasticity : Number)	Sets the sprite elasticity as a fraction of speed preservation per bounce (0-1)
set friction(friction : Number)	Sets the friction to a fraction of speed loss between 0 and 1
set height(height : Number)	Sets the height in pixels
set location(location : Location)	Sets the geo location of the sprite
set mass(mass : Number)	Sets the sprite mass
set opacity(opacity : Number)	Sets the sprite opacity (between 0 transparent and 1 opaque)

<b>Set Methods of Sprite Type</b>	
set picture(pic : Picture) : Nothing	Updates picture on a picture sprite (if it is a picture sprite)
set pos(x : Number, y : Number)	Sets the position in pixels
set speed(vx : Number, vy : Number)	Sets the speed in pixels/sec
set speed x(vx : Number)	Sets the x speed in pixels/sec
set speed y(vy : Number)	Sets the y speed in pixels/sec
set text(text : String)	Updates text on a text sprite (if it is a text sprite)
set width(width : Number)	Sets the width in pixels
set x(x : Number)	Sets the x position in pixels
set y(y : Number) : Nothing	Sets the y position in pixels
set z index(zindex : Number)	Sets the z-index of the sprite
speed towards(other : Sprite, magnitude : Number)	Sets sprite speed direction towards other sprite with given magnitude

<b>Other Methods of Sprite Type</b>	
delete	Delete sprite
equals(other : Sprite) : Boolean	Are these the same sprite?
hide	Hide the sprite
is invalid : Boolean	Returns true if the current instance is useless
is visible : Boolean	Returns true if sprite is not hidden
move(delta x : Number, delta y : Number)	Moves sprite
move clip(x : Number, y : Number)	Moves the clipping area and wraps around the image if needed (if it is an image sprite)
move towards(other : Sprite, fraction : Number)	Moves sprite towards other sprite
overlap with(sprites : Sprite Set) : Sprite Set	Returns the subset of sprites in the given set that overlap with sprite
overlaps with(other : Sprite) : Boolean	Do the sprites overlap?
show	Show the sprite

## C.44 Sprite Set

A collection of sprites. Unlike the other collection types, a Sprite Set does not allow duplicate items, and the items in the set are ordered.

add(sprite : Sprite) : Boolean	Add sprite to set. Returns true if sprite was not already in set.
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add from(old set : Sprite Set, sprite : Sprite) : Boolean	Add sprite to set and remove from old set. Returns true if sprite was in old set and not in new set.
at(index : Number) : Sprite	Return sprite at given index
clear	Removes all sprites from the set
contains(sprite : Sprite) : Boolean	Returns true if sprite is in set
count : Number	Returns the number of sprites in the set
index of(sprite : Sprite) : Number	Returns index of sprite in this set or -1 if not in set
is invalid : Boolean	Returns true if the current instance is useless
remove(sprite : Sprite) : Boolean	Remove sprite from set. Returns true if sprite was in set
remove first : Sprite	Remove sprite that was added to set first

## C.45 String

A piece of text.

ll(right : String) : String	Concatenates two pieces of text
at(index : Number) : String	Gets the character at a specified index
compare(other : String) : Number	Compares two pieces of text
concat(other : String) : String	Concatenates two pieces of text
contains(value : String) : Boolean	Returns a value indicating if the second string is contained
copy to clipboard	Stores text in the clipboard
count : Number	Returns the number of characters
ends with(value : String) : Boolean	Determines whether the ending matches the specified string
equals(other : String) : Boolean	Checks if two strings are the same
index of(value : String, start : Number) : Number	Returns the index of the first occurrence if found starting at a given position
insert(start : Number, value : String) : String	Inserts a string at a given position
is empty : Boolean	Indicates if the string is empty
is invalid : Boolean	Returns true if the current instance is useless
is match regex(pattern : String) : Boolean	Indicates if the string matches a regular expression
last index of(value : String, start : Number) : Number	Returns the index of the last occurrence if found starting at a given position
matches(pattern : String) : String Collection	Gets the strings matching the regex expression (pattern)
post to wall	Displays string on the wall
remove(start : Number) : String	Returns all character from a string starting at a given index

replace(old : String, new : String) : String	Returns a given string with a replacement
replace regex(pattern : String, replace : String) : String	Replace every match of the regex according to the replacement string
share(network : String)	Shares the string (email, sms, Facebook, social or " to pick from a list)
split(separator : String) : String Collection	Returns a string collection that contains the substrings in this string that are delimited by elements of a specified string
starts with(value : String) : Boolean	Determines whether the beginning matches the specified string
substring(start : Number, length : Number) : String	Returns a substring given a start index and a length
to boolean : Boolean	Parses the string as a boolean
to color : Color	Parses the string as a color
to datetime : DateTime	Parses the string as a date and time
to json : Json Object	Converts the value into a json data structure
to location : Location	Parses the string as a geo coordinate
to lower case : String	Returns a copy of this string converted to lowercase, using the casing rules of the current culture
to number : Number	Parses the string as a number
to time : Number	Parses the string as a time (12:30:12) and returns the number of seconds
to unicode : Number	Converts a single character string into its unicode number
to upper case : String	Returns a copy of this string converted to uppercase, using the casing rules of the current culture
trim(chars : String) : String	Removes all leading and trailing occurrences of a set of characters specified in a string from the current string
trim end(chars : String) : String	Removes all trailing occurrences of a set of characters specified in a string from the current string
trim start(chars : String) : String	Removes all leading occurrences of a set of characters specified in a string from the current string

## C.46 String Collection

A collection of strings

add(item : String)	Adds a string
add many(items : String Collection)	Adds many strings at once
at(index : Number) : String	Gets the string at position index. Returns invalid if index is out of range.
clear	Clears the strings
contains(item : String) : Boolean	Indicates if the collection contains the item
count : Number	Gets the number of strings
index of(item : String, start : Number) : Number	Gets index of the first occurrence of a string. Returns -1 if not found or start is out of range.
insert at(index : Number, item : String) : Nothing	Inserts a string at position index. Does nothing if index is out of range.
is invalid : Boolean	Returns true if the current instance is useless
join(separator : String) : String	Concatenates separator and items into a string
post to wall	Displays the string on the wall
random : String	Gets a random element from the collection. Returns invalid if the collection is empty.
remove(item : String) : Boolean	Removes the first occurrence of a string. Returns true if removed.
remove at(index : Number) : Nothing	Removes the string at position index
reverse	Reverses the items
set at(index : Number, item : String)	Sets the string at position index. Does nothing if the index is out of range.
sort	Sorts the strings in this collection

## C.47 String Map

A map from strings to strings

at(key : String) : String	Gets the value at a given key; invalid if not found
clear	Clears the values from the map
count : Number	Gets the number of elements in the map
is invalid : Boolean	Returns true if the current instance is useless
keys : String Collection	Gets the keys in the map
post to wall	Displays the list of key,value pairs in a table
remove(key : String)	Removes the value at a given key
set at(key : String, value : String) : Nothing	Sets the value at a given key; invalid if not found
set many(other : String Map) :	Sets many elements at once

Nothing	
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## C.48 TextBox

A text box

background : Color	Gets the background color
border : Color	Gets the border color
font size : Number	Gets the font size
foreground : Color	Gets the foreground color
icon : Picture	Gets the icon picture (max 173x173)
is invalid : Boolean	Returns true if current instance is useless
post to wall	Posts the textbox to the wall
set background(color : Color)	Sets the background color
set border(color : Color)	Sets the border color
set font size(size: Number)	Sets font size (small = 14, normal = 15, medium = 17, medium large = 19, large = 24, extra large = 32, extra extra large = 54, huge = 140)
set foreground(color : Color)	Sets the foreground color
set icon(pic : Picture)	Sets the icon picture (max 96 x 96)
set text(text : String)	Sets the text
text : String	Gets the text

## C.49 Vector3

A 3D vector

add(other : Vector3) : Vector3	Adds a vector
clamp(min : Vector3, max : Vector3) : Vector3	Restricts the vector in the specified range
cross(other : Vector3) : Vector3	Calculates the cross product with the other vector
distance(other : Vector3) : Number	Gets the distance between the two vectors
is invalid : Boolean	Returns true if the current instance is useless
length : Number	Gets the length of the vector
linear interpolation(other : Vector3, amount : Number) : Vector3	Linear interpolation between two vectors
multiply(other : Vector3) : Vector3	Multiplies component-wise with a vector

negate : Vector3	Returns a vector pointing in the opposite direction
normalize : Vector3	Returns a vector of one unit pointing in the same direction as the original vector
post to wall	Displays the vector on the wall
scale(scalar : Number) : Vector3	Multiplies with a scaling factor
subtract(other : Vector3) : Vector3	Subtracts another vector
to string : String	Turns the vector into a string
x : Number	Gets the x-component
y : Number	Gets the y-component
z : Number	Gets the z-component

## C.50 Web Request

An HTTP web request

equals(other : Web Request) : Boolean	Indicates if both requests are the same instance
header(name : String) : String	Gets the value of a given header
header names : String Collection	Gets the names of the headers
is invalid : Boolean	Returns true if the current instance is useless
method : String	Determines whether it was a 'get' or a 'post'
on response received(handler : Web Response Action)	Set what happens whenever the response comes back from 'send async'
post to wall	Displays the request on the wall
send : Web Response	Performs the request synchronously
set accept(type : String)	Sets the Accept header type ('text/xml' for XML, 'application/json' for JSON)
set compress(value : Boolean)	Compresses the request content with gzip and sets the Content-Encoding header
set content(content : String)	Sets the content of a 'post' request
set content as form(form : Form Builder)	Sets the content as multipart/form-data
set content as json(json : Json Object)	Sets the content of a 'post' request as the JSON tree
set content as picture(picture : Picture, quality : Number)	Sets the content of a 'post' request as a JPEG encoded image. Quality from 0 (worse) to 1 (best).
set content as xml(xml : Xml Object)	Sets the content of a 'post' request as the XML tree
set credentials(name : String, password : String)	Sets the name and password for basic authentication. Requires an HTTPS URL, empty string clears.
set header(name : String, value : String)	Sets an HTML header value. An empty string clears the value

set method(method : String)	Sets the method as 'get' or 'post'. Default value is 'get'
set url(url : String)	Sets the url of the request. Must be a valid internet address.
url : String	Gets the url of the request

## C.51 Web Response

An HTTP web response

content : String	Reads the response body as a string
content as json : Json Object	Reads the response body as a JSON tree
content as picture : Picture	Reads the response body as a picture
content as sound : Sound	Reads the response body as a wave sound
content as xml : Xml Object	Reads the response body as a XML tree
header(name : String) : String	Gets the value of a given header
header names : String Collection	Gets the names of the headers
is invalid : Boolean	Returns true if the current instance is useless
post to wall	Displays the response to the wall
request : Web Request	Gets the request associated to this response
status code : Number	Gets the HTTP Status code of the request if any

## C.52 Xml Object

An xml element or collection of elements.

at(index : Number) : Xml Object	Gets the i-th child element in the collection
attr(name : String) : String	Gets the value of the attribute
attr names : String Collection	Gets the list of attribute names
child(name : String) : Xml Object	Gets a first child element matching the fully qualified name
children(name : String) : Xml Object	Gets a collection of child element matching the fully qualified name
count : Number	Gets the number of child element
create name(local name : String, namespace uri : String) : String	Creates a qualified full name from the namespace and local name
is element : Boolean	Indicates if this instance is an element or a filtered collection
is invalid : Boolean	Returns true if the current instance is useless
local name : String	Gets the local name of this element
name : String	Gets the full name of this element



namespace : String	Gets the namespace of this element
post to wall	Display the xml content on the wall
to string : String	Gets an xml string
value : String	Gets the concatenated text contents of this element