

An Object Oriented Extension to the Matlab Middle Layer

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Using objects for accelerator control is presently an experiment. Basically, the middle layer already has a data structure for machine data and response matrices. It can be a little cumbersome to manipulate the structures so I'm turning them into objects and seeing if it's any easier. If it doesn't make coding much easier than the project will be scraped.

Here are the basic properties of data objects.

Accelerator Data Objects (AccObj)

1. Creating an accelerator data object (AccObj)

- a. The fundamental way is to send a data structure to AccObj
`X = getam('BPMx', 'Struct');`
`Xobject = AccObj(x);`
- b. The `getpv` function can create a data object with a keyword
`OrbitA = getam('BPMx', [1 2;1 3;2 4;3 4;6 2], 'Object');`
`OrbitB = getam('BPMx', [1 3;5 4;5 5], 'Object');`

`CM = getsp('HCM', [1 2;2 3;5 2], 'Object');`

2. Function Overloading

- a. Get and Set
% To fill an object with new data use the `get` function
`OrbitA = get(OrbitA)`

% To set the object data to the accelerator use the `set` function
`set(CMobject)`
- b. Plus and Minus
% Add two objects
`Orbit = OrbitA + OrbitB`

% Subtract a vector
`Orbit = OrbitA - [1; 2; 3; 4; 5]'`
`Orbit = [1; 2; 3; 4; 5]' - OrbitA`

% Add a new device
`OrbitA = OrbitA + getam('BPMx',[3 2])`

% Subtraction can also be used to remove a family
`Orbit = OrbitA - 'BPMx' % Same as OrbitA.BPMx = []`
- c. Convert an object to a structure
`OrbitAstruct = struct(OrbitA);`

- d. Subreferencing
 - % Get the data field
OrbitVector = OrbitA(:)
 - % Get the second & third element
OrbitVector = OrbitA(2:3)
 - % A device list can be used for an index by passing it in {}
% Get all the [1 4] device lists
OrbitVector = OrbitA({[1 4]})
 - % Get the data for the 'BPMx' family
OrbitVector = OrbitA.BPMx
 - % Get the device list and time stamp for the 'BPMx' family
DeviceList = OrbitA.BPMx.DeviceList
TimeStamp = OrbitA.BPMx.TimeStamp
- e. Assignments
 - % Change the data in elements 3 & 5
Xobject([3 5]) = [3.33; 5.55]
 - % A device list can be used for an index by passing it in {}
% Set all the [1 4] device lists to zero
OrbitA({[1 4]}) = 0
 - % Remove a family
Orbit.BPMx = []

3. Programming examples

- a. Response matrix and corrector correction
 - M = getrespmat(OrbitA, CM)
 - CM(:) = M \ OrbitA
 - set(CM)

Response Matrix Objects (AccRespObj)

(future work)

1. Creating a response matrix accelerator data object (AccRespObj)

- a. Create a response matrix data structure AccRespObj
 - Mobject = getbpmresp(OrbitA, CM);
- b. Orbit correction
 - CMdelta = Mobject \ OrbitA
 - set(CMdelta)