Command Design Pattern

Actions as objects

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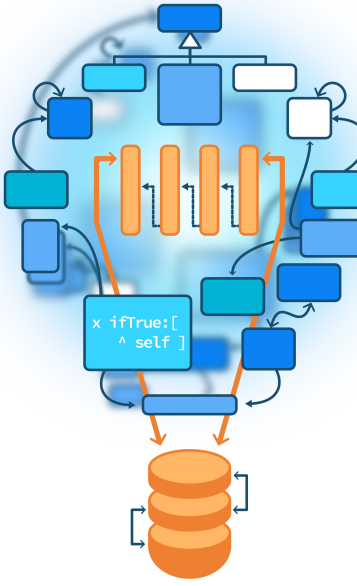


Goals

- Little motivation
- Power of reification of actions
- Command Design Pattern

Imagine a scriptable robot

```
testExecute
  | rb b |
  rb := RbsRobot new.
  rb startLocation: 4@1.
  rb execute:
'dir #east
mov 2
mov 3
dir #north
mov 3'.
  self assert: rb position equals: 9@4
```

Execute (first version)

```
RbsRobot >> execute: aString

  orders := aString splitOn: Character cr.
  orders := orders collect: [ :each | each splitOn: Character space ].
  orders do: [ :each |
    each first = 'mov'
      ifTrue: [ self move: (Object readFrom: each second) ]
      ifFalse: [ each first = 'dir'
              ifTrue: [ self direction: (Object readFrom: each second) ] ] ]
```

Execute (more actions)

```
RbsRobot >> execute: aString

  orders := aString splitOn: Character cr.
  orders := orders collect: [ :each | each splitOn: Character space ].
  orders do: [ :each |
    each first = 'mov'
      ifTrue: [ self move: (Object readFrom: each second) ]
      ifFalse: [ each first = 'dir'
              ifTrue: [ self direction: (Object readFrom: each second) ]
              ifFalse: [ each first = 'drop' ]]
              ...
              each first = 'pick'
              ...
              each first = 'return' ]
```

Analysis

- Each time we add a new order we **have to modify** execute:
- Imagine if a mov order cost a lot
  - Better to have one over many ones
  - mov 10 mov 10 mov 10 -> mov 30
  - Not simple to perform a simple path optimization
- How to replay the exact low-level executions

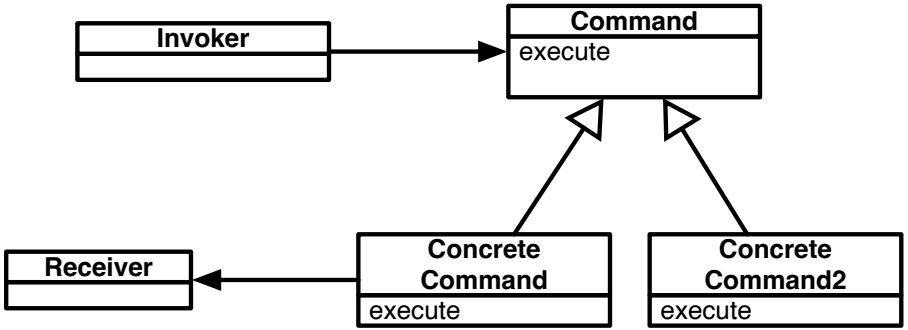
Command Design Pattern

Intent from the book: Encapsulate a request or operation as an object, thereby letting you parametrize clients with different operations, queue or log request, and support undoable operations

A command

- A command is a reification of an order/action
- A command encapsulates an action and optionally its context
  - menu item
  - log action
- Commands are often the basis for Undo

Command core



Robot direction command

```
RbsCommand << #RbsDirectionCommand
  slots: { #direction };
  tag: 'Commands';
  package: 'Robots'
```

```
RbsDirectionCommand << handleArguments: aCollection
  direction := aCollection first asSymbol

RbsDirectionCommand << executeOn: aRobot
  aRobot direction: direction
```

Robot move command

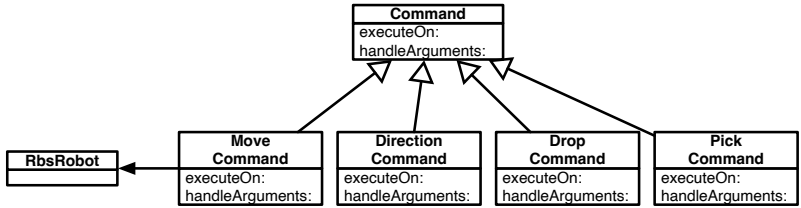
```
RbsCommand << #RbsMoveCommand
  slots: { #distance };
  tag: 'Commands';
  package: 'Robots'
```

```
RbsMoveCommand << handleArguments: aCollection
  direction := Object readFrom: aCollection first

RbsMoveCommand << executeOn: aRobot
  aRobot move: distance
```

Modular execution logic

```
RbsRobot >> executeCommandBased: aString

  orders := aString splitOn: Character cr.
  orders := orders collect: [ :each | each splitOn: Character space ].
  orders do: [ :each |
      (self commandClassFor: each first) new
        handleArguments: each allButFirst;
        executeOn: self ]
```

Analysis of extensibility in place



- Each command is **responsible** for handling its **own data**
- Each command encapsulates its state, applicability and action
- Can now manipulate actions (log, sort, undo....)

Command cons

- Not all operations should be turned into Command objects
- Produce large hierarchies of simple classes
- Pay attention not to externalize key object behavior
  - a class should still be complete
  - better if a command represents an existing behavior

Conclusion

- Commands are first class actions
- Adapted for manipulation of actions (undo, replay)

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Advanced Object-Oriented Design and Development with Pharo

A course by
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