Exceptions ................................................................. 2
Raising Exceptions .......................................................... 4
Inheritance and Exception .................................................. 7
Finding the Exception Handler ......................................... 8
Resumable Exceptions ....................................................... 12
Exception Messages that exit the Handler ......................... 13
ensure: ............................................................................ 19
Creating Your Own Exceptions ........................................ 20

References

Squeak Source Code & Image

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Exceptions
Basic Handling of Exceptions

Format

[ProtectedBlock]
on: ExceptionList
do: [:exception | HandlerBlock]

Example

[1/0]
on: ZeroDivide
do:
[:exception |
Transcript
show: exception description;
cr]

Unlike Java, in Smalltalk zero divide by both integer and floats cause a zero divide exception to be raised
Exceptions are Classes

Exception class is the parent of all exceptions

Subclasses define specialized exceptions

Important Subclasses

- **Error**
  A condition that prevents the normal continuation of processing

- **Notification**
  Something interesting has occurred
  If it is not handled, it will pass by without effect

- **Warning**
  An unusual event the user needs to know about
  Asks the user if the program should continue

- **MessageNotUnderstood**
  A method was sent to an object that does not implement it

Important exception methods

- **description**
  Returns a string describing the actual exception

- **defaultAction**
  Executed when an exception occurs
Raising Exceptions
Implicitly Raised Exceptions

Exceptions can be raised by VM

12 / 0

Explicitly Raised Exceptions

Send the message signal, signal: to an exception class

Warning signal: 'This string is the signal description'

Error signal
Exceptions & Return Values

on:do: is a message, so returns a value

If an exception is raised the return value is:
   The return value of the handler

If an exception is not raised the return value is:
   The return value of the protected block

Example - No Exception Raised

This code assigns 10 to result

| result |
result := [10/1]
   on: ZeroDivide
   do: [:exception | Float infinity ].
^result

Example - Exception Raised

This code assigns Infinity to result

| result |
result := [10/0]
   on: ZeroDivide
   do: [:exception | Float infinity ].
^result
Catching Multiple Exceptions

Use a comma or ExceptionSets

[1/0]
on: Warning, ZeroDivide
do: [:exception | code here]

| exceptions |
exceptions := ExceptionSet with: Warning with: ZeroDivide
[1/0]
on: exceptions
do: [:exception | code here]
Inheritance and Exception

All subexceptions are caught by an exception in on:do:

ZeroDivide is a subclass of Error

The ZeroDivide exception will be caught in the following

```smalltalk
[1/0]
on: Error
do:
    [:exception |
    Transcript
        show: exception description;
    cr]
```
Finding the Exception Handler

When an exception is raised

The enclosing handlers are searched

Start with the code that raised the exception

Search the "closest" enclosing handler first

Continue searching the enclosing handlers

The first handler that deals with the exception is used

If no handlers handle the exception the exception's default action is done

```
[[1/0]
  on: ZeroDivide
  do: [:exception | Transcript show: 'First']]
  on: ZeroDivide
  do: [:exception | Transcript show: 'Second']

Result in Transcript
```

First
Warning Default Action

Warning default action

   Show dialog asking user if program should continue

Example 1

The following code:
    Displays a dialog asking if user wishes to continue
    If user selects "continue" then 'End' is printed in Transcript

Warning signal: 'Hi Mom'.
Transcript show: 'End'

Example 2

The following code:
    Prints 'Handler' in the Transcript

[Warning signal: 'Hi Mom'.
Transcript show: 'End']
   on: Warning
   do: [:exception | Transcript show: 'Handler']
Notification Default Action

Notification default action

Do nothing & continue as normal

Example 1

The following code:

Prints 'End' in the Transcript

Notification signal: 'Hi Mom'.
Transcript show: 'End'

Example 2

The following code:

Prints 'Handler' in the Transcript

[Notification signal: 'Hi Mom'.
Transcript show: 'End']
  on: Exception
    do: [:exception | Transcript show: 'Handler']

This example shows why you may not want to wrap your code in a general catch all handler
What is the Default Action for Exception X?

Look at the defaultAction method in the exception's class
Resumable Exceptions

Some exceptions are resumable

| result |
[result := 10/0.
Transcript show: result.]  
on: ZeroDivide  
do:  
[:exception |
  exception resume: Float infinity ]

Output in Transcript

infinity
Exception Messages that exit the Handler

resume or resume:
  Continue processing the protected block, immediately following the message that triggered the exception.

return or return:
  Ends processing the protected block that triggered the exception.

retry
  Reevaluates the protected block

retryUsing:
  Evaluates a new block in place of the protected block

resignalAs:
  Resignal the exception as another exception

pass
  Exit the current handler and pass to the next outer handler, control does not return to the passer

outer
  as with pass, except will regain control if the outer handler resumes

resume: and return: return their argument as the return value, instead of the value of the final statement of the handler block
Example - resume:

10/0 raises an exception
The handler requests resumption with value 1
The expression 10/0 returns 1
The sum becomes 1 + 5

| result |
[result := 10/0 + 5.
Transcript show: result.]
   on: ZeroDivide
do:
     [:exception |
       exception resume: 1 ]

Output in Transcript

6
Example - resume

10/0 raises an exception
The handler requests resumption, no value
The expression 10/0 returns nil

| result |
[result := 10/0.

Transcript show: result.] on: ZeroDivide do: [:exception |
exception resume ]

Output in Transcript

nil
Example - retry

\(x/y\) raises an exception
The handler sets \(y := 1\).
The block is reexecuted

\[
\begin{array}{c|c|c}
x & y & result \\
\hline
10 & 0 & \text{ZeroDivide} \\
\end{array}
\]

Output in Transcript

10
Example - return

The following are equivalent

| result |
[result := 10/0.
Transcript show: result.]
  on: ZeroDivide
  do: [:exception | exception return]

| result |
[result := 10/0.
Transcript show: result.]
  on: ZeroDivide
  do: [:exception | nil]

Example - return:

The following are equivalent

| result |
result := [10/0]
  on: Error
  do: [:exception | Float infinity ].
^result

| result |
result := [10/0]
  on: Error
  do: [:exception | exception return: Float infinity ].
^result
Some Error Handling Messages in Object

self assert: [block]
  Raises AssertionFailure exception if block evaluates to false

self error: 'Error message'
  Raises Error exception with given message

self halt
self halt: 'Message'
  Raises Halt exception.
  Allows user to invoke debugger or resume

self notify: 'Notify message'
  Like halt except user does not see stack history

self shouldNotImplement
  Used in subclasses in inherited methods that do not belong in the subclass

self subclassResponsibility
  Used in methods to declare them abstract
  Indicated subclasses must implement this method
ensure:

Format
[block] ensure: [clean up block]

Ensure that the clean up block will be done

If block ends due to an exception

Execute handler for exception

Execute clean up block

You code should not depend on the order of execution of the handler and clean up block

Example

[[10/0] ensure: [Transcript show: 'In ensure'; cr]]
  on: ZeroDivide
  do: [:exception | Transcript show: 'In handler'; cr ]

Output in Transcript

In handler
In ensure
Creating Your Own Exceptions

Subclass the correct existing Exception
    Usually Error or Notification

If you want the exception to be resumable
    Insure isResumable returns true

If you want non-standard default behavior
    Override the method defaultAction