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PYTHON FOR COMPUTATIONAL PROBLEM SOLVING

Exception handling in Python

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Exception Handling

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Introduction:

- Programming error is an error which may occur because of various reasons.

Program can produce some errors even if the program is perfect.

- This may be because of

1. Exceptional situations that may occur during the execution of a program.
2. The data coming from outside the program which is malformed .

Exception Handling

Based on when the error occurs, errors are classified into two types:

1. Syntax errors

This occurs when there a deviation from the rules of the language.

A component of python's interpreter called parser discover these errors. If hybrid interpreter, compiler finds this error.

Ex: print("good morning)
    print("good morning“

2. Runtime Errors (Exceptions)

These are the errors which are detected during execution. This disrupts the normal flow of execution of instructions.

Ex: Print("Good Morning")
    #NameError: No name 'Print' found

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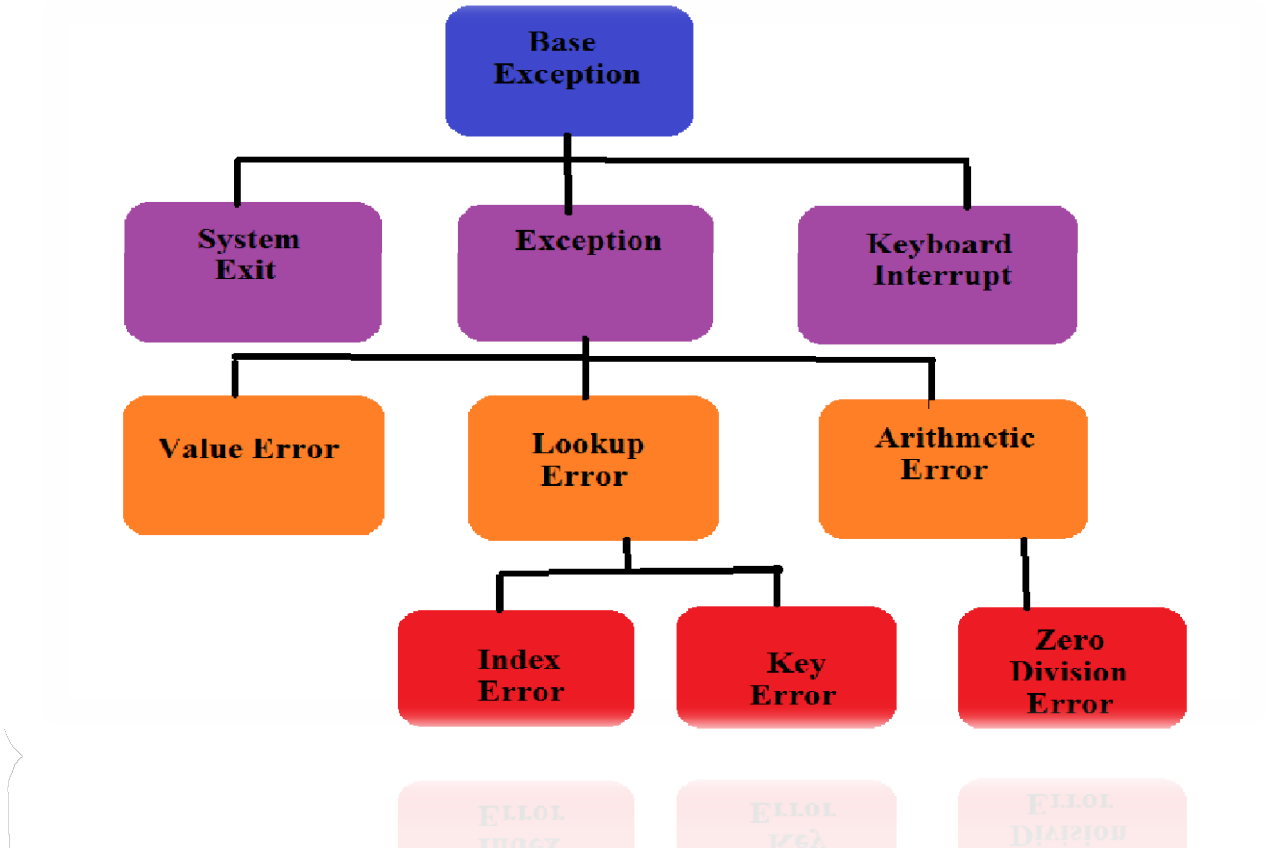
Exception Tree-Partial View



Exception Handling

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Two categories of Exceptions:

1. Built-In exception (System defined exceptions)
   Those exceptions which Python knows by default.

2. User defined exceptions
   User-defined type/class written for handling the exceptions

Exception Handling

Exceptions	Explanation
Keyboard Interrupt	Raised when users hit Ctrl-C,the interrupt key
Overflow Error	Raised when a floating-point expression evaluates to a value that is too large
ZeroDivision Error	Raised when attempting to divide by 0
IO Error	Raised when a sequence index is outside the range of valid indexes
Name Error	Raised when attempting to evaluate an unassigned identifier
Type Error	Raised when an operation or function is applied to an object wrong type

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Exception Handling(How to deal with errors?)

- Exception handling is a way to deal with errors or exceptional situations that may occur during the execution of a program.
- It allows you to gracefully manage these situations instead of letting the program crash.
- Python provides try, except, else, and finally blocks for handling exceptions.

Constructs used in Exception handling -

try, except, else, finally, raise

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try:

- Contains the code which might cause an exception
- It may have more than one except clause to specify handlers for different exceptions.
- At most one handler(except) will be executed.
- Handlers only handle exceptions that occur in the corresponding try-block, not in the other handlers of the same try block.

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except :

- The exception thrown in try block, is caught in except block and the statements in this block are executed.
- Can have multiple exceptions as a parameterized tuple.
- If many except clauses are there, then the **specific classes are specified first** and **then the parent classes are specified.**
- Last except clause provide a common and default way of handling all exceptions.

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else :

- This block will be executed if no errors were raised.
- That is , this block gets executed when try is successful

Finally:

- The statements in this clause will executed regardless of whether an exception occurred or not in the try block.

- Its primary purpose is to perform **clean up actions or tasks and close the resources** used in the program.

raise

- Is used to forcefully throw an exception

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Basic Structure

```
try:
        # This is a block of code where an exception might occur

except   SomeException:
        # This is the except block  to handle the exception

else:
        # This is executed  if no exceptions were raised in the "try" block

finally:
        #This  is executed whether an exception  occurs or not
```

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Example 1: (with try and except only)

```
try:
        print(x)

except:    #default block

        print("An exception occurred as x is not defined ")
```

Output

An exception occurred as x is not defined

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Example 2: (with try and except only-ZeroDivision Error)

```
try:
        y = 10 / 0

except ZeroDivisionError:

        print("Python exception raised")
```

Output

Python exception raised

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Example 3: (with try,except ,else and finally)

```
try:
    result = 10 / 0              # This will raise a ZeroDivisionError

except   ZeroDivisionError as e:
    print("Error:", e)           # Handling the ZeroDivisionError

else:
    print("No exceptions occurred.")

finally:
    print("This will always execute, regardless of exceptions.")
```

Output:

Error: division by zero
This will always execute, regardless of exceptions.

Exception Handling

Example 4 (with try except else and finally)

```
try:
   file = open("example.txt", "r")

except FileNotFoundError:
   print("File not found.")

else:
   print("File operations completed successfully.")

finally:
      print("File closure commands can be given here")
```

Output:

```
File not found.
File closure commands can be given here
```

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Raising Exceptions:

Exceptions can be raised manually using the raise statement, which raises the custom exceptions. Ca also be used to raise builtin exceptions.

Example 5

```
try:
    age = int(input("Enter your age: "))

    if age < 0:
        raise ValueError("Age cannot be negative.")

except ValueError as e:   #as keyword is used to create an object
    print("Error:", e)
```

Output:

```
Enter your age: -7
Error: Age cannot be negative.
```

Exception Handling

Accessing Exception Information:

When an exception occurs, you can access information about the exception using "as" to assign it to a variable.

```
try:

    res= 20 / 0

except Exception as e:

   print("Exception type:", type(e).__name__)
   print("Exception details:", e)
```

Output:

```
Exception type: ZeroDivisionError
Exception details: division by zero
```

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Matching of except blocks:

- The raised or thrown exception object is matched with the except blocks in the order in which they occur in the try-except statement.

- The code following **the first match is executed.**

- It is **always the first match and not the best match**.

- If no match occurs and if there is a default except block, this will be executed.

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Handling Multiple Exceptions:
Example 6

```
try:
    num1 = int(input("Enter first number: "))
    num2 = int(input("Enter second number: "))

    result = num1 / num2      # This might raise a ZeroDivisionError

    my_list = [1, 2, 3]

    index = int(input("Enter an index for the list: "))
    value = my_list[index]      # This might raise an IndexError
```

Exception Handling

```
except ValueError:
    print("ValueError: Please enter a valid number.")

except ZeroDivisionError:
    print("ZeroDivisionError: Cannot divide by zero.")

except IndexError:
    print("IndexError: Index is out of range.")

else:
    print("No exceptions occurred.")

finally:
    print("This will always execute, regardless of exceptions.")
```

Output:

```
Enter first number: 4
Enter second number: 2
Enter an index for the list: 6
IndexError: Index is out of range.
This will always execute, regardless of exceptions.
```

Exception Handling

2.User defined exceptions

•Users can define custom exceptions by creating a new class.

•This **exception class has to be derived, either directly or indirectly, from the built-in Exception class**.

•Most of the built-in exceptions are also derived from this class.

•The new exception, like other exceptions, can be raised using the raise statement with an optional error message.

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Example 7

```
class MyException(Exception):    #inherits from the Exception class

        def __init__(self, str):
                self.str = str

        def __str__(self):
                return self.str

# check whether n is between 1 and 100
n = int(input("Enter a number:"))
```

Exception Handling

```
try:
        n = int(input("Enter the number"))
        if not 1 <= n <= 100 :
                raise MyException("Number not in range")
except MyException as e:
        print(e)
else:
        print("Number well within the range")

print("Program Terminated")
```

Output:

```
Enter the number200
Number not in range
Program Terminated
```

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Example 8

```
class FiveDivisionError(Exception):
        pass
try:
        n1=int(input("Enter the first number"))
        n2=int(input("Enter the second number"))
        if n2==5:
                raise FiveDivisionError("Dividing by 5 not possible")
        d=n1/n2
        print("The answer is",d)
except (FiveDivisionError,ZeroDivisionError) as e:
        print(e)
print("Program ends")
```

Output:

```
Enter the first number 7
Enter the second number 5
Dividing by 5 not possible
Program ends
```

THANK YOU

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