CHAPTER

TWENTYFOUR

INTERNATIONALIZATION

The modules described in this chapter help you write software that is independent of language and locale by providing mechanisms for selecting a language to be used in program messages or by tailoring output to match local conventions.

The list of modules described in this chapter is:

24.1 gettext — Multilingual internationalization services

Source code: Lib/gettext.py

The *gettext* module provides internationalization (I18N) and localization (L10N) services for your Python modules and applications. It supports both the GNU `gettext` message catalog API and a higher level, class-based API that may be more appropriate for Python files. The interface described below allows you to write your module and application messages in one natural language, and provide a catalog of translated messages for running under different natural languages.

Some hints on localizing your Python modules and applications are also given.

24.1.1 GNU gettext API

The *gettext* module defines the following API, which is very similar to the GNU **gettext** API. If you use this API you will affect the translation of your entire application globally. Often this is what you want if your application is monolingual, with the choice of language dependent on the locale of your user. If you are localizing a Python module, or if your application needs to switch languages on the fly, you probably want to use the class-based API instead.

`gettext.bindtextdomain`(*domain*, *localedir=None*)

Bind the *domain* to the locale directory *localedir*. More concretely, *gettext* will look for binary `.mo` files for the given domain using the path (on Unix): `localedir/language/LC_MESSAGES/domain.mo`, where *languages* is searched for in the environment variables `LANGUAGE`, `LC_ALL`, `LC_MESSAGES`, and `LANG` respectively.

If *localedir* is omitted or `None`, then the current binding for *domain* is returned.[1]

`gettext.bind_textdomain_codeset`(*domain*, *codeset=None*)

Bind the *domain* to *codeset*, changing the encoding of byte strings returned by the *lgettext()*, *ldgettext()*, *lngettext()* and *ldngettext()* functions. If *codeset* is omitted, then the current binding is returned.

[1] The default locale directory is system dependent; for example, on RedHat Linux it is `/usr/share/locale`, but on Solaris it is `/usr/lib/locale`. The *gettext* module does not try to support these system dependent defaults; instead its default is `sys.prefix/share/locale`. For this reason, it is always best to call *bindtextdomain()* with an explicit absolute path at the start of your application.

gettext.**textdomain**(*domain=None*)
Change or query the current global domain. If *domain* is `None`, then the current global domain is returned, otherwise the global domain is set to *domain*, which is returned.

gettext.**gettext**(*message*)
Return the localized translation of *message*, based on the current global domain, language, and locale directory. This function is usually aliased as `_()` in the local namespace (see examples below).

gettext.**dgettext**(*domain*, *message*)
Like *gettext()*, but look the message up in the specified *domain*.

gettext.**ngettext**(*singular*, *plural*, *n*)
Like *gettext()*, but consider plural forms. If a translation is found, apply the plural formula to *n*, and return the resulting message (some languages have more than two plural forms). If no translation is found, return *singular* if *n* is 1; return *plural* otherwise.

The Plural formula is taken from the catalog header. It is a C or Python expression that has a free variable *n*; the expression evaluates to the index of the plural in the catalog. See the GNU gettext documentation for the precise syntax to be used in `.po` files and the formulas for a variety of languages.

gettext.**dngettext**(*domain*, *singular*, *plural*, *n*)
Like *ngettext()*, but look the message up in the specified *domain*.

gettext.**lgettext**(*message*)

gettext.**ldgettext**(*domain*, *message*)

gettext.**lngettext**(*singular*, *plural*, *n*)

gettext.**ldngettext**(*domain*, *singular*, *plural*, *n*)
Equivalent to the corresponding functions without the `l` prefix (*gettext()*, *dgettext()*, *ngettext()* and *dngettext()*), but the translation is returned as a byte string encoded in the preferred system encoding if no other encoding was explicitly set with *bind_textdomain_codeset()*.

> **Warning:** These functions should be avoided in Python 3, because they return encoded bytes. It's much better to use alternatives which return Unicode strings instead, since most Python applications will want to manipulate human readable text as strings instead of bytes. Further, it's possible that you may get unexpected Unicode-related exceptions if there are encoding problems with the translated strings. It is possible that the `l*()` functions will be deprecated in future Python versions due to their inherent problems and limitations.

Note that GNU **gettext** also defines a `dcgettext()` method, but this was deemed not useful and so it is currently unimplemented.

Here's an example of typical usage for this API:

```
import gettext
gettext.bindtextdomain('myapplication', '/path/to/my/language/directory')
gettext.textdomain('myapplication')
_ = gettext.gettext
# ...
print(_('This is a translatable string.'))
```

24.1.2 Class-based API

The class-based API of the *gettext* module gives you more flexibility and greater convenience than the GNU **gettext** API. It is the recommended way of localizing your Python applications and modules. `gettext` defines a "translations" class which implements the parsing of GNU `.mo` format files, and has methods for

returning strings. Instances of this "translations" class can also install themselves in the built-in namespace as the function `_()`.

`gettext.find`(*domain*, *localedir=None*, *languages=None*, *all=False*)

This function implements the standard `.mo` file search algorithm. It takes a *domain*, identical to what *textdomain()* takes. Optional *localedir* is as in *bindtextdomain()* Optional *languages* is a list of strings, where each string is a language code.

If *localedir* is not given, then the default system locale directory is used.[2] If *languages* is not given, then the following environment variables are searched: `LANGUAGE`, `LC_ALL`, `LC_MESSAGES`, and `LANG`. The first one returning a non-empty value is used for the *languages* variable. The environment variables should contain a colon separated list of languages, which will be split on the colon to produce the expected list of language code strings.

find() then expands and normalizes the languages, and then iterates through them, searching for an existing file built of these components:

localedir/*language*/LC_MESSAGES/*domain*.mo

The first such file name that exists is returned by *find()*. If no such file is found, then `None` is returned. If *all* is given, it returns a list of all file names, in the order in which they appear in the languages list or the environment variables.

`gettext.translation`(*domain*, *localedir=None*, *languages=None*, *class_=None*, *fallback=False*, *codeset=None*)

Return a `Translations` instance based on the *domain*, *localedir*, and *languages*, which are first passed to *find()* to get a list of the associated `.mo` file paths. Instances with identical `.mo` file names are cached. The actual class instantiated is either *class_* if provided, otherwise *GNUTranslations*. The class's constructor must take a single *file object* argument. If provided, *codeset* will change the charset used to encode translated strings in the *lgettext()* and *lngettext()* methods.

If multiple files are found, later files are used as fallbacks for earlier ones. To allow setting the fallback, *copy.copy()* is used to clone each translation object from the cache; the actual instance data is still shared with the cache.

If no `.mo` file is found, this function raises *OSError* if *fallback* is false (which is the default), and returns a *NullTranslations* instance if *fallback* is true.

Changed in version 3.3: *IOError* used to be raised instead of *OSError*.

`gettext.install`(*domain*, *localedir=None*, *codeset=None*, *names=None*)

This installs the function `_()` in Python's builtins namespace, based on *domain*, *localedir*, and *codeset* which are passed to the function *translation()*.

For the *names* parameter, please see the description of the translation object's *install()* method.

As seen below, you usually mark the strings in your application that are candidates for translation, by wrapping them in a call to the `_()` function, like this:

```
print(_('This string will be translated.'))
```

For convenience, you want the `_()` function to be installed in Python's builtins namespace, so it is easily accessible in all modules of your application.

The `NullTranslations` class

Translation classes are what actually implement the translation of original source file message strings to translated message strings. The base class used by all translation classes is *NullTranslations*; this provides the basic interface you can use to write your own specialized translation classes. Here are the methods of `NullTranslations`:

[2] See the footnote for *bindtextdomain()* above.

class gettext.NullTranslations(*fp=None*)

Takes an optional *file object* *fp*, which is ignored by the base class. Initializes "protected" instance variables *_info* and *_charset* which are set by derived classes, as well as *_fallback*, which is set through *add_fallback()*. It then calls `self._parse(fp)` if *fp* is not `None`.

_parse(*fp*)

No-op'd in the base class, this method takes file object *fp*, and reads the data from the file, initializing its message catalog. If you have an unsupported message catalog file format, you should override this method to parse your format.

add_fallback(*fallback*)

Add *fallback* as the fallback object for the current translation object. A translation object should consult the fallback if it cannot provide a translation for a given message.

gettext(*message*)

If a fallback has been set, forward `gettext()` to the fallback. Otherwise, return *message*. Overridden in derived classes.

ngettext(*singular*, *plural*, *n*)

If a fallback has been set, forward `ngettext()` to the fallback. Otherwise, return *singular* if *n* is 1; return *plural* otherwise. Overridden in derived classes.

lgettext(*message*)

lngettext(*singular*, *plural*, *n*)

Equivalent to *gettext()* and *ngettext()*, but the translation is returned as a byte string encoded in the preferred system encoding if no encoding was explicitly set with *set_output_charset()*. Overridden in derived classes.

> **Warning:** These methods should be avoided in Python 3. See the warning for the *lgettext()* function.

info()

Return the "protected" `_info` variable.

charset()

Return the encoding of the message catalog file.

output_charset()

Return the encoding used to return translated messages in *lgettext()* and *lngettext()*.

set_output_charset(*charset*)

Change the encoding used to return translated messages.

install(*names=None*)

This method installs *gettext()* into the built-in namespace, binding it to `_`.

If the *names* parameter is given, it must be a sequence containing the names of functions you want to install in the builtins namespace in addition to `_()`. Supported names are `'gettext'`, `'ngettext'`, `'lgettext'` and `'lngettext'`.

Note that this is only one way, albeit the most convenient way, to make the `_()` function available to your application. Because it affects the entire application globally, and specifically the built-in namespace, localized modules should never install `_()`. Instead, they should use this code to make `_()` available to their module:

```
import gettext
t = gettext.translation('mymodule', ...)
_ = t.gettext
```

This puts `_()` only in the module's global namespace and so only affects calls within this module.

The `GNUTranslations` class

The *gettext* module provides one additional class derived from *NullTranslations*: *GNUTranslations*. This class overrides `_parse()` to enable reading GNU **gettext** format `.mo` files in both big-endian and little-endian format.

GNUTranslations parses optional meta-data out of the translation catalog. It is convention with GNU **gettext** to include meta-data as the translation for the empty string. This meta-data is in **RFC 822**-style `key: value` pairs, and should contain the `Project-Id-Version` key. If the key `Content-Type` is found, then the `charset` property is used to initialize the "protected" `_charset` instance variable, defaulting to `None` if not found. If the charset encoding is specified, then all message ids and message strings read from the catalog are converted to Unicode using this encoding, else ASCII encoding is assumed.

Since message ids are read as Unicode strings too, all `*gettext()` methods will assume message ids as Unicode strings, not byte strings.

The entire set of key/value pairs are placed into a dictionary and set as the "protected" `_info` instance variable.

If the `.mo` file's magic number is invalid, the major version number is unexpected, or if other problems occur while reading the file, instantiating a *GNUTranslations* class can raise *OSError*.

class gettext.**GNUTranslations**

The following methods are overridden from the base class implementation:

gettext(*message*)

Look up the *message* id in the catalog and return the corresponding message string, as a Unicode string. If there is no entry in the catalog for the *message* id, and a fallback has been set, the look up is forwarded to the fallback's *gettext()* method. Otherwise, the *message* id is returned.

ngettext(*singular*, *plural*, *n*)

Do a plural-forms lookup of a message id. *singular* is used as the message id for purposes of lookup in the catalog, while *n* is used to determine which plural form to use. The returned message string is a Unicode string.

If the message id is not found in the catalog, and a fallback is specified, the request is forwarded to the fallback's *ngettext()* method. Otherwise, when *n* is 1 *singular* is returned, and *plural* is returned in all other cases.

Here is an example:

```
n = len(os.listdir('.'))
cat = GNUTranslations(somefile)
message = cat.ngettext(
    'There is %(num)d file in this directory',
    'There are %(num)d files in this directory',
    n) % {'num': n}
```

lgettext(*message*)

lngettext(*singular*, *plural*, *n*)

Equivalent to *gettext()* and *ngettext()*, but the translation is returned as a byte string encoded in the preferred system encoding if no encoding was explicitly set with *set_output_charset()*.

> **Warning:** These methods should be avoided in Python 3. See the warning for the *lgettext()* function.

Solaris message catalog support

The Solaris operating system defines its own binary `.mo` file format, but since no documentation can be found on this format, it is not supported at this time.

The Catalog constructor

GNOME uses a version of the *gettext* module by James Henstridge, but this version has a slightly different API. Its documented usage was:

```
import gettext
cat = gettext.Catalog(domain, localedir)
_ = cat.gettext
print(_('hello world'))
```

For compatibility with this older module, the function `Catalog()` is an alias for the *translation()* function described above.

One difference between this module and Henstridge's: his catalog objects supported access through a mapping API, but this appears to be unused and so is not currently supported.

24.1.3 Internationalizing your programs and modules

Internationalization (I18N) refers to the operation by which a program is made aware of multiple languages. Localization (L10N) refers to the adaptation of your program, once internationalized, to the local language and cultural habits. In order to provide multilingual messages for your Python programs, you need to take the following steps:

1. prepare your program or module by specially marking translatable strings
2. run a suite of tools over your marked files to generate raw messages catalogs
3. create language specific translations of the message catalogs
4. use the *gettext* module so that message strings are properly translated

In order to prepare your code for I18N, you need to look at all the strings in your files. Any string that needs to be translated should be marked by wrapping it in `_('...')` — that is, a call to the function `_()`. For example:

```
filename = 'mylog.txt'
message = _('writing a log message')
fp = open(filename, 'w')
fp.write(message)
fp.close()
```

In this example, the string `'writing a log message'` is marked as a candidate for translation, while the strings `'mylog.txt'` and `'w'` are not.

There are a few tools to extract the strings meant for translation. The original GNU **gettext** only supported C or C++ source code but its extended version **xgettext** scans code written in a number of languages, including Python, to find strings marked as translatable. Babel is a Python internationalization library that includes a **pybabel** script to extract and compile message catalogs. François Pinard's program called **xpot** does a similar job and is available as part of his po-utils package.

(Python also includes pure-Python versions of these programs, called **pygettext.py** and **msgfmt.py**; some Python distributions will install them for you. **pygettext.py** is similar to **xgettext**, but only understands Python source code and cannot handle other programming languages such as C or C++. **pygettext.py**

supports a command-line interface similar to **xgettext**; for details on its use, run `pygettext.py --help`. **msgfmt.py** is binary compatible with GNU **msgfmt**. With these two programs, you may not need the GNU **gettext** package to internationalize your Python applications.)

xgettext, **pygettext**, and similar tools generate `.po` files that are message catalogs. They are structured human-readable files that contain every marked string in the source code, along with a placeholder for the translated versions of these strings.

Copies of these `.po` files are then handed over to the individual human translators who write translations for every supported natural language. They send back the completed language-specific versions as a `<language-name>.po` file that's compiled into a machine-readable `.mo` binary catalog file using the **msgfmt** program. The `.mo` files are used by the *gettext* module for the actual translation processing at run-time.

How you use the *gettext* module in your code depends on whether you are internationalizing a single module or your entire application. The next two sections will discuss each case.

Localizing your module

If you are localizing your module, you must take care not to make global changes, e.g. to the built-in namespace. You should not use the GNU `gettext` API but instead the class-based API.

Let's say your module is called "spam" and the module's various natural language translation `.mo` files reside in `/usr/share/locale` in GNU **gettext** format. Here's what you would put at the top of your module:

```
import gettext
t = gettext.translation('spam', '/usr/share/locale')
_ = t.gettext
```

Localizing your application

If you are localizing your application, you can install the `_()` function globally into the built-in namespace, usually in the main driver file of your application. This will let all your application-specific files just use `_('...')` without having to explicitly install it in each file.

In the simple case then, you need only add the following bit of code to the main driver file of your application:

```
import gettext
gettext.install('myapplication')
```

If you need to set the locale directory, you can pass it into the *install()* function:

```
import gettext
gettext.install('myapplication', '/usr/share/locale')
```

Changing languages on the fly

If your program needs to support many languages at the same time, you may want to create multiple translation instances and then switch between them explicitly, like so:

```
import gettext

lang1 = gettext.translation('myapplication', languages=['en'])
lang2 = gettext.translation('myapplication', languages=['fr'])
lang3 = gettext.translation('myapplication', languages=['de'])
```

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```
# start by using language1
lang1.install()

# ... time goes by, user selects language 2
lang2.install()

# ... more time goes by, user selects language 3
lang3.install()
```

Deferred translations

In most coding situations, strings are translated where they are coded. Occasionally however, you need to mark strings for translation, but defer actual translation until later. A classic example is:

```
animals = ['mollusk',
           'albatross',
           'rat',
           'penguin',
           'python', ]
# ...
for a in animals:
    print(a)
```

Here, you want to mark the strings in the `animals` list as being translatable, but you don't actually want to translate them until they are printed.

Here is one way you can handle this situation:

```
def _(message): return message

animals = [_('mollusk'),
           _('albatross'),
           _('rat'),
           _('penguin'),
           _('python'), ]

del _

# ...
for a in animals:
    print(_(a))
```

This works because the dummy definition of `_()` simply returns the string unchanged. And this dummy definition will temporarily override any definition of `_()` in the built-in namespace (until the `del` command). Take care, though if you have a previous definition of `_()` in the local namespace.

Note that the second use of `_()` will not identify "a" as being translatable to the **gettext** program, because the parameter is not a string literal.

Another way to handle this is with the following example:

```
def N_(message): return message

animals = [N_('mollusk'),
           N_('albatross'),
           N_('rat'),
           N_('penguin'),
           N_('python'), ]

# ...
for a in animals:
    print(_(a))
```

In this case, you are marking translatable strings with the function `N_()`, which won't conflict with any definition of `_()`. However, you will need to teach your message extraction program to look for translatable strings marked with `N_()`. **xgettext**, **pygettext**, `pybabel extract`, and **xpot** all support this through the use of the `-k` command-line switch. The choice of `N_()` here is totally arbitrary; it could have just as easily been `MarkThisStringForTranslation()`.

24.1.4 Acknowledgements

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- François Pinard
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24.2 `locale` — Internationalization services

Source code: Lib/locale.py

The *locale* module opens access to the POSIX locale database and functionality. The POSIX locale mechanism allows programmers to deal with certain cultural issues in an application, without requiring the programmer to know all the specifics of each country where the software is executed.

The *locale* module is implemented on top of the `_locale` module, which in turn uses an ANSI C locale implementation if available.

The *locale* module defines the following exception and functions:

exception locale.**Error**
: Exception raised when the locale passed to *setlocale()* is not recognized.

locale.**setlocale**(*category*, *locale=None*)

If *locale* is given and not `None`, *setlocale()* modifies the locale setting for the *category*. The available categories are listed in the data description below. *locale* may be a string, or an iterable of two strings (language code and encoding). If it's an iterable, it's converted to a locale name using the locale aliasing engine. An empty string specifies the user's default settings. If the modification of the locale fails, the exception *Error* is raised. If successful, the new locale setting is returned.

If *locale* is omitted or `None`, the current setting for *category* is returned.

setlocale() is not thread-safe on most systems. Applications typically start with a call of

```
import locale
locale.setlocale(locale.LC_ALL, '')
```

This sets the locale for all categories to the user's default setting (typically specified in the `LANG` environment variable). If the locale is not changed thereafter, using multithreading should not cause problems.

locale.**localeconv**()

Returns the database of the local conventions as a dictionary. This dictionary has the following strings as keys:

Category	Key	Meaning
LC_NUMERIC	'decimal_point'	Decimal point character.
	'grouping'	Sequence of numbers specifying which relative positions the 'thousands_sep' is expected. If the sequence is terminated with *CHAR_MAX*, no further grouping is performed. If the sequence terminates with a 0, the last group size is repeatedly used.
	'thousands_sep'	Character used between groups.
LC_MONETARY	'int_curr_symbol'	International currency symbol.
	'currency_symbol'	Local currency symbol.
	'p_cs_precedes/n_cs_precedes'	Whether the currency symbol precedes the value (for positive resp. negative values).
	'p_sep_by_space/n_sep_by_space'	Whether the currency symbol is separated from the value by a space (for positive resp. negative values).
	'mon_decimal_point'	Decimal point used for monetary values.
	'frac_digits'	Number of fractional digits used in local formatting of monetary values.
	'int_frac_digits'	Number of fractional digits used in international formatting of monetary values.
	'mon_thousands_sep'	Group separator used for monetary values.
	'mon_grouping'	Equivalent to 'grouping', used for monetary values.
	'positive_sign'	Symbol used to annotate a positive monetary value.
	'negative_sign'	Symbol used to annotate a negative monetary value.
	'p_sign_posn/n_sign_posn'	The position of the sign (for positive resp. negative values), see below.

All numeric values can be set to *CHAR_MAX* to indicate that there is no value specified in this locale.

The possible values for 'p_sign_posn' and 'n_sign_posn' are given below.

Value	Explanation
0	Currency and value are surrounded by parentheses.
1	The sign should precede the value and currency symbol.
2	The sign should follow the value and currency symbol.
3	The sign should immediately precede the value.
4	The sign should immediately follow the value.
CHAR_MAX	Nothing is specified in this locale.

The function sets temporarily the LC_CTYPE locale to the LC_NUMERIC locale or the LC_MONETARY locale if locales are different and numeric or monetary strings are non-ASCII. This temporary change affects other threads.

Changed in version 3.7: The function now sets temporarily the LC_CTYPE locale to the LC_NUMERIC locale in some cases.

locale.**nl_langinfo**(*option*)

Return some locale-specific information as a string. This function is not available on all systems, and the set of possible options might also vary across platforms. The possible argument values are numbers, for which symbolic constants are available in the locale module.

The *nl_langinfo()* function accepts one of the following keys. Most descriptions are taken from the corresponding description in the GNU C library.

locale.CODESET
Get a string with the name of the character encoding used in the selected locale.

locale.D_T_FMT
Get a string that can be used as a format string for *time.strftime()* to represent date and time in a locale-specific way.

locale.D_FMT
Get a string that can be used as a format string for *time.strftime()* to represent a date in a locale-specific way.

locale.T_FMT
Get a string that can be used as a format string for *time.strftime()* to represent a time in a locale-specific way.

locale.T_FMT_AMPM
Get a format string for *time.strftime()* to represent time in the am/pm format.

DAY_1 ... DAY_7
Get the name of the n-th day of the week.

Note: This follows the US convention of `DAY_1` being Sunday, not the international convention (ISO 8601) that Monday is the first day of the week.

ABDAY_1 ... ABDAY_7
Get the abbreviated name of the n-th day of the week.

MON_1 ... MON_12
Get the name of the n-th month.

ABMON_1 ... ABMON_12
Get the abbreviated name of the n-th month.

locale.RADIXCHAR
Get the radix character (decimal dot, decimal comma, etc.).

locale.THOUSEP
Get the separator character for thousands (groups of three digits).

locale.YESEXPR
Get a regular expression that can be used with the regex function to recognize a positive response to a yes/no question.

Note: The expression is in the syntax suitable for the `regex()` function from the C library, which might differ from the syntax used in *re*.

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locale.NOEXPR
Get a regular expression that can be used with the regex(3) function to recognize a negative response to a yes/no question.

locale.CRNCYSTR
Get the currency symbol, preceded by "-" if the symbol should appear before the value, "+" if the symbol should appear after the value, or "." if the symbol should replace the radix character.

locale.ERA
Get a string that represents the era used in the current locale.

Most locales do not define this value. An example of a locale which does define this value is the Japanese one. In Japan, the traditional representation of dates includes the name of the era corresponding to the then-emperor's reign.

Normally it should not be necessary to use this value directly. Specifying the `E` modifier in their format strings causes the *time.strftime()* function to use this information. The format of the returned string is not specified, and therefore you should not assume knowledge of it on different systems.

locale.ERA_D_T_FMT
Get a format string for *time.strftime()* to represent date and time in a locale-specific era-based way.

locale.ERA_D_FMT
Get a format string for *time.strftime()* to represent a date in a locale-specific era-based way.

locale.ERA_T_FMT
Get a format string for *time.strftime()* to represent a time in a locale-specific era-based way.

locale.ALT_DIGITS
Get a representation of up to 100 values used to represent the values 0 to 99.

locale.getdefaultlocale([*envvars*])
Tries to determine the default locale settings and returns them as a tuple of the form `(language code, encoding)`.

According to POSIX, a program which has not called `setlocale(LC_ALL, '')` runs using the portable `'C'` locale. Calling `setlocale(LC_ALL, '')` lets it use the default locale as defined by the `LANG` variable. Since we do not want to interfere with the current locale setting we thus emulate the behavior in the way described above.

To maintain compatibility with other platforms, not only the `LANG` variable is tested, but a list of variables given as envvars parameter. The first found to be defined will be used. *envvars* defaults to the search path used in GNU gettext; it must always contain the variable name `'LANG'`. The GNU gettext search path contains `'LC_ALL'`, `'LC_CTYPE'`, `'LANG'` and `'LANGUAGE'`, in that order.

Except for the code `'C'`, the language code corresponds to **RFC 1766**. *language code* and *encoding* may be `None` if their values cannot be determined.

locale.getlocale(*category=LC_CTYPE*)
Returns the current setting for the given locale category as sequence containing *language code*, *encoding*. *category* may be one of the `LC_*` values except *LC_ALL*. It defaults to *LC_CTYPE*.

Except for the code `'C'`, the language code corresponds to **RFC 1766**. *language code* and *encoding* may be `None` if their values cannot be determined.

locale.getpreferredencoding(*do_setlocale=True*)
Return the encoding used for text data, according to user preferences. User preferences are expressed differently on different systems, and might not be available programmatically on some systems, so this function only returns a guess.

On some systems, it is necessary to invoke *setlocale()* to obtain the user preferences, so this function is not thread-safe. If invoking setlocale is not necessary or desired, *do_setlocale* should be set to `False`.

On Android or in the UTF-8 mode (`-X utf8` option), always return `'UTF-8'`, the locale and the *do_setlocale* argument are ignored.

Changed in version 3.7: The function now always returns `UTF-8` on Android or if the UTF-8 mode is enabled.

`locale.normalize(`*localename*`)`
Returns a normalized locale code for the given locale name. The returned locale code is formatted for use with *setlocale()*. If normalization fails, the original name is returned unchanged.

If the given encoding is not known, the function defaults to the default encoding for the locale code just like *setlocale()*.

`locale.resetlocale(`*category=LC_ALL*`)`
Sets the locale for *category* to the default setting.

The default setting is determined by calling *getdefaultlocale()*. *category* defaults to *LC_ALL*.

`locale.strcoll(`*string1*, *string2*`)`
Compares two strings according to the current *LC_COLLATE* setting. As any other compare function, returns a negative, or a positive value, or `0`, depending on whether *string1* collates before or after *string2* or is equal to it.

`locale.strxfrm(`*string*`)`
Transforms a string to one that can be used in locale-aware comparisons. For example, `strxfrm(s1) < strxfrm(s2)` is equivalent to `strcoll(s1, s2) < 0`. This function can be used when the same string is compared repeatedly, e.g. when collating a sequence of strings.

`locale.format_string(`*format*, *val*, *grouping=False*, *monetary=False*`)`
Formats a number *val* according to the current *LC_NUMERIC* setting. The format follows the conventions of the `%` operator. For floating point values, the decimal point is modified if appropriate. If *grouping* is true, also takes the grouping into account.

If *monetary* is true, the conversion uses monetary thousands separator and grouping strings.

Processes formatting specifiers as in `format % val`, but takes the current locale settings into account.

Changed in version 3.7: The *monetary* keyword parameter was added.

`locale.format(`*format*, *val*, *grouping=False*, *monetary=False*`)`
Please note that this function works like *format_string()* but will only work for exactly one `%char` specifier. For example, `'%f'` and `'%.0f'` are both valid specifiers, but `'%f KiB'` is not.

For whole format strings, use *format_string()*.

Deprecated since version 3.7: Use *format_string()* instead.

`locale.currency(`*val*, *symbol=True*, *grouping=False*, *international=False*`)`
Formats a number *val* according to the current *LC_MONETARY* settings.

The returned string includes the currency symbol if *symbol* is true, which is the default. If *grouping* is true (which is not the default), grouping is done with the value. If *international* is true (which is not the default), the international currency symbol is used.

Note that this function will not work with the 'C' locale, so you have to set a locale via *setlocale()* first.

`locale.str(`*float*`)`
Formats a floating point number using the same format as the built-in function `str(float)`, but takes the decimal point into account.

`locale.delocalize(`*string*`)`
Converts a string into a normalized number string, following the *LC_NUMERIC* settings.

New in version 3.5.

`locale.atof(`*string*`)`
Converts a string to a floating point number, following the *LC_NUMERIC* settings.

locale.atoi(*string*)
Converts a string to an integer, following the *LC_NUMERIC* conventions.

locale.LC_CTYPE
Locale category for the character type functions. Depending on the settings of this category, the functions of module *string* dealing with case change their behaviour.

locale.LC_COLLATE
Locale category for sorting strings. The functions *strcoll()* and *strxfrm()* of the *locale* module are affected.

locale.LC_TIME
Locale category for the formatting of time. The function *time.strftime()* follows these conventions.

locale.LC_MONETARY
Locale category for formatting of monetary values. The available options are available from the *localeconv()* function.

locale.LC_MESSAGES
Locale category for message display. Python currently does not support application specific locale-aware messages. Messages displayed by the operating system, like those returned by *os.strerror()* might be affected by this category.

locale.LC_NUMERIC
Locale category for formatting numbers. The functions *format()*, *atoi()*, *atof()* and *str()* of the *locale* module are affected by that category. All other numeric formatting operations are not affected.

locale.LC_ALL
Combination of all locale settings. If this flag is used when the locale is changed, setting the locale for all categories is attempted. If that fails for any category, no category is changed at all. When the locale is retrieved using this flag, a string indicating the setting for all categories is returned. This string can be later used to restore the settings.

locale.CHAR_MAX
This is a symbolic constant used for different values returned by *localeconv()*.

Example:

```
>>> import locale
>>> loc = locale.getlocale()  # get current locale
# use German locale; name might vary with platform
>>> locale.setlocale(locale.LC_ALL, 'de_DE')
>>> locale.strcoll('f\xe4n', 'foo')  # compare a string containing an umlaut
>>> locale.setlocale(locale.LC_ALL, '')   # use user's preferred locale
>>> locale.setlocale(locale.LC_ALL, 'C')  # use default (C) locale
>>> locale.setlocale(locale.LC_ALL, loc)  # restore saved locale
```

24.2.1 Background, details, hints, tips and caveats

The C standard defines the locale as a program-wide property that may be relatively expensive to change. On top of that, some implementation are broken in such a way that frequent locale changes may cause core dumps. This makes the locale somewhat painful to use correctly.

Initially, when a program is started, the locale is the `C` locale, no matter what the user's preferred locale is. There is one exception: the *LC_CTYPE* category is changed at startup to set the current locale encoding to the user's preferred locale encoding. The program must explicitly say that it wants the user's preferred locale settings for other categories by calling `setlocale(LC_ALL, '')`.

It is generally a bad idea to call *setlocale()* in some library routine, since as a side effect it affects the entire program. Saving and restoring it is almost as bad: it is expensive and affects other threads that happen to run before the settings have been restored.

If, when coding a module for general use, you need a locale independent version of an operation that is affected by the locale (such as certain formats used with *time.strftime()*), you will have to find a way to do it without using the standard library routine. Even better is convincing yourself that using locale settings is okay. Only as a last resort should you document that your module is not compatible with non-`C` locale settings.

The only way to perform numeric operations according to the locale is to use the special functions defined by this module: *atof()*, *atoi()*, *format()*, *str()*.

There is no way to perform case conversions and character classifications according to the locale. For (Unicode) text strings these are done according to the character value only, while for byte strings, the conversions and classifications are done according to the ASCII value of the byte, and bytes whose high bit is set (i.e., non-ASCII bytes) are never converted or considered part of a character class such as letter or whitespace.

24.2.2 For extension writers and programs that embed Python

Extension modules should never call *setlocale()*, except to find out what the current locale is. But since the return value can only be used portably to restore it, that is not very useful (except perhaps to find out whether or not the locale is `C`).

When Python code uses the *locale* module to change the locale, this also affects the embedding application. If the embedding application doesn't want this to happen, it should remove the `_locale` extension module (which does all the work) from the table of built-in modules in the `config.c` file, and make sure that the `_locale` module is not accessible as a shared library.

24.2.3 Access to message catalogs

`locale.gettext`(*msg*)

`locale.dgettext`(*domain*, *msg*)

`locale.dcgettext`(*domain*, *msg*, *category*)

`locale.textdomain`(*domain*)

`locale.bindtextdomain`(*domain*, *dir*)

The locale module exposes the C library's gettext interface on systems that provide this interface. It consists of the functions `gettext()`, `dgettext()`, `dcgettext()`, `textdomain()`, `bindtextdomain()`, and `bind_textdomain_codeset()`. These are similar to the same functions in the *gettext* module, but use the C library's binary format for message catalogs, and the C library's search algorithms for locating message catalogs.

Python applications should normally find no need to invoke these functions, and should use *gettext* instead. A known exception to this rule are applications that link with additional C libraries which internally invoke `gettext()` or `dcgettext()`. For these applications, it may be necessary to bind the text domain, so that the libraries can properly locate their message catalogs.