A proposal to add sincos to the standard library

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Paul Dreik <paul dot dreik at dreik dot se>
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Introduction
Sometimes one needs to calculate sine and cosine for the same argument x. This is made with one call to std::sin(x) and one to std::cos(x). This paper proposes adding a new function std::sincos(x), calculating both at the same time.

Problem
In case the argument x is a complicated expression, it is easy to introduce errors at the time of writing or during maintenance, erroneously calculating sine and cosine for different input.

Using a sincos function naturally expresses the intent of the programmer ("sin and cos should be calculated for the same argument").

Discussion
Gnu libc provides the following c sincos functions [gnu]:

void sincos(double x, double* sin, double* cos);
void sincosf(float x, float* sin, float* cos);
void sincosl(long double x, long double* sin, long double* cos);

Using pointer arguments for the results is c style and requires deciding if the pointers should be allowed to alias and/or be null. It is proposed that return by value is used instead.

Newer x86 cpus seem to have support for calculating sin and cos simultaneously [wikipedia] which can be more efficient[intel]. Having a sincos function may simplify exploiting hardware support without having to rely on compiler optimization.

Solution
It is proposed that a std::sincos function is added to the standard library, with overloads on all builtin floating point types.

Demonstration of intended usage:

#include <sincos>
#include <tuple>

double s, c;
void doit() {
    std::tie(s, c) = std::sincos(1.047);
}
Proposed wording

26.X sincos

26.X.1 Header sincos synopsis

```cpp
#include <utility>
namespace std {
    pair<double, double> sincos(double x) noexcept;
    // overloads on other floating point types, see below
}
```

In addition to the double version, there should be overloads on all other builtin floating point types.

26.X.2 sincos functions

*Preconditions:* none

*Returns:* the sine and cosine of the input

*Remark:* The sincos function shall behave as if it had the following definition:

```cpp
std::pair<double, double> std::sincos(double x) {
    return std::pair<double, double>(std::sin(x), std::cos(x));
}
```

// similarly for the overloaded versions

References


[wikipedia] X86 instruction listings
https://en.wikipedia.org/wiki/X86_instruction_listings#Added_with_80387