

[Skip to main content](#)

## Stack Overflow

1. [About](#)
2. Products
3. [For Teams](#)
1. [Stack Internal Implement a knowledge platform layer to power your enterprise and AI tools.](#)
2. [Stack Data Licensing Get access to top-class technical expertise with trusted & attributed content.](#)
3. [Stack Ads Connect your brand to the world's most trusted technologist communities.](#)
4. [Releases Keep up-to-date on features we add to Stack Overflow and Stack Internal.](#)
5. [About the company Visit the blog](#)



Loading...

### [current community](#)

- [Stack Overflow](#)
- [help chat](#)
- [Meta Stack Overflow](#)

### your communities

[Sign up](#) or [log in](#) to customize your list.

### [more stack exchange communities](#)

- [company blog](#)
  - 3. [Log in](#)
  - 4. [Sign up](#)
- [AI Assist is now on Stack Overflow.](#) Start a chat to get instant answers from across the network. Sign up to save and share your chats.
- [Home](#)
  - [Questions](#)
  - [AI Assist](#)
  - [Tags](#)
  - [Challenges](#)
  - 7. [Chat](#)
  - [Articles](#)
  - [Users](#)
  - [Companies](#)
  - [Collectives](#)

Communities for your favorite technologies. [Explore all Collectives](#)

### Stack Internal

Stack Overflow for Teams is now called **Stack Internal**. Bring the best of human thought and AI automation together at your work.

[Try for free](#) [Learn more](#)

### [Stack Internal](#)

Bring the best of human thought and AI automation together at your work. [Learn more](#)

### Collectives™ on Stack Overflow

Find centralized, trusted content and collaborate around the technologies you use most.

[Learn more about Collectives](#)

### [Stack Internal](#)

Knowledge at work

Bring the best of human thought and AI automation together at your work.

[Explore Stack Internal](#)

## [How do I implement one of the std::ops::{Add, Sub, Mul, Div} operators without moving out the the arguments?](#)

[Ask Question](#)

Asked 7 years, 3 months ago

Modified [7 years, 3 months ago](#)

Viewed 3k times

2

I'm writing a ray-tracer and I want to be able to subtract my 3D vectors:

```
use std::ops::Sub;

#[derive(Clone, Debug)]
pub struct Vec3 {
    pub v: [f64; 3],
}

impl Sub for Vec3 {
    type Output = Vec3;

    fn sub(self, other: Vec3) -> Vec3 {
        Vec3 {
            v: [
                self.v[0] - other.v[0],
                self.v[1] - other.v[1],
                self.v[2] - other.v[2],
            ],
        }
    }
}
```

This seems to work. However, when I try to use it:

```
fn main() {
    let x = Vec3 { v: [0., 0., 0.] };
    let y = Vec3 { v: [0., 0., 0.] };
    let a = x - y;
    let b = x - y;
}
```

I get complaints from the compiler:

```
error[E0382]: use of moved value: `x`
--> src/main.rs:26:13
|
25 |     let a = x - y;
|         - value moved here
26 |     let b = x - y;
|         ^ value used here after move
|
= note: move occurs because `x` has type `Vec3`, which does not implement the `Copy` trait

error[E0382]: use of moved value: `y`
--> src/main.rs:26:17
|
25 |     let a = x - y;
|         - value moved here
26 |     let b = x - y;
|         ^ value used here after move
|
= note: move occurs because `y` has type `Vec3`, which does not implement the `Copy` trait
```

How can I write the subtraction operator so that the code above works?

Please don't tell me I should an existing 3D math module. I'm sure there's something better, but I'm after learning how to do it myself to learn the language.

[How do I implement the Add trait for a reference to a struct?](#) doesn't help as it requires specifying lifetimes for object which I'm not at yet.

- [rust](#)

[Share](#)

[Improve this question](#)

Follow

[edited Aug 15, 2018 at 2:34](#)

[Shepmaster](#)

439k116116 gold badges1.3k1.3k silver badges1.5k1.5k bronze badges

asked Aug 14, 2018 at 15:17

[Jeffrey](#)

11.1k11 gold badge2626 silver badges4646 bronze badges

4

1

Possible duplicate of [How do I implement the Add trait for a reference to a struct?](#)

mcarton – [mcarton](#)

2018-08-14 15:28:03 +00:00

Commented Aug 14, 2018 at 15:28

@trentcl thanks!! Consider making this an answer. I'm still processing the other options, but since I don't know yet what a lifetime is, I'm having difficulty comparing them. Your suggestion fixes my issue, but I'm not sure the copy is the correct trade-off.

Jeffrey – [Jeffrey](#)

2018-08-14 15:38:11 +00:00

Commented Aug 14, 2018 at 15:38

@Jeffrey The `Copy` marker permits to silently copy your struct when needed.

Boiethios – [Boiethios](#)

2018-08-14 15:44:08 +00:00

Commented Aug 14, 2018 at 15:44

I don't think the last paragraph is a legitimate constraint to put on a question. Would you ask your driving teacher "How do I parallel park? Oh, but I can't turn the wheel, because I'm not at *steering* yet." Fortunately, in this case lifetimes are not required (witness my answer), and the linked question does not address the question as posed anyway (you would have to use `&x - &y` instead of `x - y`).

trent – [trent](#)

2018-08-15 13:33:36 +00:00

Commented Aug 15, 2018 at 13:33

[Add a comment](#) |

## 1 Answer

Sorted by: [Reset to default](#)

Highest score (default) Trending (recent votes count more) Date modified (newest first) Date created (oldest first)

6

In the example, the compiler tells you why `x` has been invalidated by the move:

```
= note: move occurs because `x` has type `Vec3`, which does not implement the `Copy` trait
```

In this case, you can simply add `#[derive(Copy)]` to give `Vec3` *copy semantics*:

```
#[derive(Clone, Copy, Debug)]
pub struct Vec3 {
    pub v: [f64; 3],
}
```

`Copy` is a marker trait that indicates to the compiler that values of a type do not become invalid when they are moved from. A type with this property is said to have *copy semantics*, while a type that does not implement `Copy` is said to have *move semantics*. [Is it possible to make a type only movable and not copyable?](#) and [How does Rust provide move semantics?](#) explain this concept in more detail.

---

However, you can only implement `Copy` for types that contain only other `Copy` types. If `Vec3` actually held a `Vec` inside it, the compiler would not let you implement `Copy` for it. Fortunately, references do implement `Copy`, so you can instead implement `Sub` for a *reference* to `Vec3`, using the approach described in [How do I implement the Add trait for a reference to a struct?](#)

[Share](#)

[Improve this answer](#)

Follow

answered Aug 14, 2018 at 16:07

[trent](#)

28.6k1010 gold badges6363 silver badges100100 bronze badges  
Sign up to request clarification or add additional context in comments.

## Comments

Add a comment

## Your Answer

Thanks for contributing an answer to Stack Overflow!

- Please be sure to *answer the question*. Provide details and share your research!

But avoid ...

- Asking for help, clarification, or responding to other answers.
- Making statements based on opinion; back them up with references or personal experience.

To learn more, see our [tips on writing great answers](#).

[Sign up](#) or [log in](#)

Sign up using Google

Sign up using Email and Password

Submit

## Post as a guest

Name

Email

Required, but never shown

## Post as a guest

Name

Email

Required, but never shown

Post Your Answer Discard

By clicking "Post Your Answer", you agree to our [terms of service](#) and acknowledge you have read our [privacy policy](#).

Start asking to get answers

Find the answer to your question by asking.

[Ask question](#)

Explore related questions

- [rust](#)

See similar questions with these tags.

- The Overflow Blog
  - [Introducing Stack Overflow AI Assist—a tool for the modern developer](#)
  - [Treating your agents like microservices](#)
- Featured on Meta
  - [Chat room owners can now establish room guidelines](#)
  - [AI Assist is now available on Stack Overflow](#)
  - [Policy: Generative AI \(e.g., ChatGPT\) is banned](#)

## Linked

- 80  
[How does Rust provide move semantics?](#)
- 101  
[Is it possible to make a type only movable and not copyable?](#)
- 98  
[How do I implement the Add trait for a reference to a struct?](#)

## Related

- 21  
[Can we create custom Rust operators?](#)
- 15  
[How can I overload the += "plus equals" operator?](#)
- 34  
[How do I require a generic type implement an operation like Add, Sub, Mul, or Div in a generic function?](#)
- 14  
[Overloading the Add-operator without copying the operands](#)
- 3  
[How can I implement an operator like Add for a reference type so that I can add more than two values at once?](#)
- 0  
[How to implement arbitrary add operator in Rust?](#)
- 0  
[How to overloading operator without using ops::Add trait?](#)
- 2  
[Generic math in Rust without Copy \(std::ops::Add, etc.\)](#)
- 3  
[Overloading of addition for arrays in Rust](#)
- 4  
[Implementing Add, Sub, Mul, Div for all combinations of move and borrow](#)

## Hot Network Questions

- ["Creatures your opponents control" after the ability is activated](#)
- [is it possible to keep the space when using url in latex](#)
- [PNP BJT transistor for switching and sourcing to IC](#)
- [Documentation for DUSHIN software](#)
- [Where in the world is the chicken?](#)
- [TikZ word search diagram v2](#)
- [Best Welding Method to Fix a Damaged Steel Surly Frame](#)
- [Recent time traveling TV show. The lead might have been Asian\(?\), set in San Francisco\(?\)](#)
- [When the fuel governor fails, why is autorotation the only option for landing?](#)
- [Obscure method of suppression of transient voltage spike in CLC-circuit](#)
- [Vertical alignment of equations inside tabularx](#)
- [TV program where real actors interact with 2-Dimensional characters](#)
- [Is it possible to use LaTeX to create RPG-related PDFs, such as character sheets or adventure modules?](#)
- [Is Codepage 1252 guaranteed to be available on all Windows systems?](#)
- [Preservation of universal sentences under substructures in higher-order logic](#)
- [When should I use tied notes vs. the whole note duration?](#)

- [Looking for a proper formal substitute for "quick fix" for formal letter](#)
- [I2C bus problems when using two distance sensors in Arduino](#)
- [What's the point of swapping polarity between mod slots?](#)
- [PSE Advent Calendar 2025 \(Day 5\): Cinnamon overdose](#)
- [Proportional odds logistic regression for ordered category outcome - how to convert odds ratios to probabilities in this case?](#)
- [Trying to understand UK tax brackets for salary above 150k](#)
- [How to use Bézier curves in 'TikZ' to draw a quotation mark?](#)
- [Correct website for Thailand ETA application form](#)

[more hot questions](#)

[Question feed](#)

## Subscribe to RSS

[Question feed](#)

To subscribe to this RSS feed, copy and paste this URL into your RSS reader.

### [Stack Overflow](#)

- [Questions](#)
- [Help](#)
- [Chat](#)

### [Business](#)

- [Stack Internal](#)
- [Stack Data Licensing](#)
- [Stack Ads](#)

### [Company](#)

- [About](#)
- [Press](#)
- [Work Here](#)
- [Legal](#)
- [Privacy Policy](#)
- [Terms of Service](#)
- [Contact Us](#)
- [Cookie Settings](#)
- [Cookie Policy](#)

### [Stack Exchange Network](#)

- [Technology](#)
- [Culture & recreation](#)
- [Life & arts](#)
- [Science](#)
- [Professional](#)
- [Business](#)
- [API](#)
- [Data](#)
- [Blog](#)
- [Facebook](#)
- [Twitter](#)
- [LinkedIn](#)
- [Instagram](#)