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[How do I iterate over the coordinates of a line between two coordinates? \[closed\]](#)

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Asked 1 year, 10 months ago

Modified [1 year, 10 months ago](#)

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-3

Closed. This question needs [details or clarity](#). It is not currently accepting answers.

Want to improve this question? As written, this question is lacking some of the information it needs to be answered. If the author adds details in comments, consider [editing them into the question](#). Once there's sufficient detail to answer, vote to reopen the question.

Closed last year.

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I have a struct called `Point` with `x` and `y` coordinates and a tuple struct called `Line` which has two `Points`. I want to have a method on the `Point` struct which returns an iterator of all the points between those two points in that struct, including the points themselves. I already have some checks for if it isn't horizontal or vertical, so you can just panic there. What's the idiomatic way to do this? Is there a trait that I should implement for the `iter` method? I just can't find out how to do this with a range nor by creating my own iterator struct.

I had a load of other, more specific problems, but I don't want to mention them because I think they probably aren't even on the correct track and if I solved it the idiomatic way, I probably won't need it anyway and it would be a waste of time. This is intentionally quite a broad question.

Edit 2: It's for Battleships. I have a `HashSet` of all hit targets, I need to check if a ship is sunk, among other things.

Edit 1: And just my code which doesn't work just in case:

```
struct Point {
    x: u8,
    y: u8,
}

impl Point {
    fn new(x: u8, y: u8) -> Self {
        Self { x, y }
    }
}

struct Line(Point, Point);

impl Line {
    fn iter(&self) -> impl Iterator<Item = u8> {
        if self.0.x == self.1.x {
            to_iter_u8(self.0.y, self.1.y).map(|y| Point::new(self.0.x, y))
        } else if self.0.y == self.1.y {
            to_iter_u8(self.0.x, self.1.x).map(|x| Point::new(x, self.0.y))
        } else {
            panic!("Points must be horizontal or vertical to each other");
        }
    }
}

fn to_iter_u8(a: u8, b: u8) -> impl Iterator<Item = u8> {
    if a > b {
        b..=a
    } else {
        a..=b
    }
}
...

```

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[edited Feb 9, 2024 at 7:08](#)

[asked Feb 7, 2024 at 15:46](#)

[ihatenullptrs](#)

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"All points" meaning, what? Integer pixel values? Increments of some length? Mathematically speaking there is an infinite number of points on a line of any length.

tadman – [tadman](#)

2024-02-07 16:07:56 +00:00

Commented Feb 7, 2024 at 16:07

1

This is how an iterator is created: doc.rust-lang.org/rust-by-example/iterator.html maybe you show what you already have, so we can help more on the problem

trust_nickol – [trust_nickol](#)

2024-02-07 18:14:31 +00:00

Commented Feb 7, 2024 at 18:14

3

@ihatenupters They asked because it's an important and valid question. For example, if you are using floats then would you really want an iterator of every single possible set of floating point coordinates that may differ by only the epsilon? Your question is underspecified in this regard, and SO is not fond of making guesses regarding information that hasn't been provided to us.

cdhowie – [cdhowie](#)

2024-02-07 18:50:29 +00:00

Commented Feb 7, 2024 at 18:50

1

Please also note that your replies to comments have a hostile tone, which tends to frustrate people and make them less likely to help you. For a new user asking a (poor) first question, you may want to be especially mindful of your tone when replying to people who are only trying to help (instead, you appear to be vaguely insinuating that they are dumb, with statements like "it's quite obvious")

Codebling – [Codebling](#)

2024-02-08 21:48:16 +00:00

Commented Feb 8, 2024 at 21:48

1

@Codebling No, it's only horizontal or vertical lines, because ships in battleships can only be placed like that. It's confusing because the panic message was wrong and said horizontal and diagonal instead of horizontal and vertical. By diagonal I mean anything that is not horizontal or vertical.

ihatenupters – [ihatenupters](#)

2024-02-09 07:12:58 +00:00

Commented Feb 9, 2024 at 7:12

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1 Answer

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1

The `iter` function fails to compile for a few reasons.

First, you've declared the type of `Iterator::Iter` to be `u8`, but the function is actually trying to return an iterator of `Point` values. This is easily solved by changing the declared return type to match.

Second, you accept `self` by reference but you don't indicate that the returned `Iterator` captures the lifetime of the reference. There's two ways to fix this:

1. Indicate the captured lifetime (`impl Iterator<Item = Point> + 'a`).
2. Make `Point` implement `Copy` and take `self` by value.
3. Extract the `x` or `y` value in `iter` before returning the iterator.

The second option is probably better since the type is very small, and it should probably implement `Copy` anyway. You'll have to make your closures move in order to copy `self` into them.

Up to this point, the fixed code looks like this (code not changed has been omitted):

```
#[derive(Clone, Copy)]
struct Point {
    x: u8,
    y: u8,
}

impl Line {
    fn iter(self) -> impl Iterator<Item = Point> {
```

```

    if self.0.x == self.1.x {
        to_iter_u8(self.0.y, self.1.y).map(move |y| Point::new(self.0.x, y))
    } else if self.0.y == self.1.y {
        to_iter_u8(self.0.x, self.1.x).map(move |x| Point::new(x, self.0.y))
    } else {
        panic!("Points must be horizontal or diagonal");
    }
}
}
}

```

The last problem is that `impl Iterator` doesn't mean "any type implementing `Iterator`," it means "one type implementing `Iterator` inferred from the function body." The two returning conditionals both return a value implementing `Iterator`, but the closure passed to `map` in both cases is of a different type (they have to be different types to behave differently), and the closure's type is part of the iterator's type. Therefore, the two conditional blocks do not return the same type, and compilation fails.

There's a few ways this problem can be solved.

The easiest (but least efficient) option would be to return a `Box<dyn Iterator>`. This requires a heap allocation to hold the iterator and dynamic dispatch to iterate over the items, but allows you to return iterators of different types.

```

impl Line {
    fn iter(self) -> Box<dyn Iterator<Item = Point>> {
        if self.0.x == self.1.x {
            Box::new(to_iter_u8(self.0.y, self.1.y).map(move |y| Point::new(self.0.x, y)))
        } else if self.0.y == self.1.y {
            Box::new(to_iter_u8(self.0.x, self.1.x).map(move |x| Point::new(x, self.0.y)))
        } else {
            panic!("Points must be horizontal or diagonal");
        }
    }
}

```

Another option would be to use the [either crate](#), which provides an enum type `Either` with two variants (`Left` and `Right`), each of which can hold a different type. This type implements many traits (including `Iterator`) as long as both the left and right types do.

```

impl Line {
    fn iter(self) -> impl Iterator<Item = Point> {
        if self.0.x == self.1.x {
            Either::Left(to_iter_u8(self.0.y, self.1.y).map(move |y| Point::new(self.0.x, y)))
        } else if self.0.y == self.1.y {
            Either::Right(to_iter_u8(self.0.x, self.1.x).map(move |x| Point::new(x, self.0.y)))
        } else {
            panic!("Points must be horizontal or diagonal");
        }
    }
}

```

The last option would be to roll your own iterator type. In many cases this can be more efficient than using `Either`, but in this particular case, the generated code will be very similar and have about the same performance characteristics: a custom iterator is going to require a conditional to handle vertical vs. horizontal iteration, just as `Either` requires a conditional to determine if the wrapped iterator is the left or right type.

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answered Feb 8, 2024 at 16:36

[cdhowie](#)

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2 Comments

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ihatenullptrs

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I managed to do the `Box` pointer, `dyn` and `lifetime` with some help for the compiler on my own, (which I should have said but I didn't because it didn't feel like a real answer), but I wouldn't have thought of cloning it.

2024-02-09T07:19:17.33Z+00:00

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