How can a nested loop with mutations on a HashMap be achieved in Rust?

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I have the following (trimmed down) Rust code:

```
use std::collections::HashMap;

struct Node {
    weight:   f64,
    outbound: f64,
}

struct Graph {
    edges: HashMap<u32, HashMap<u32, f64>>,
    nodes: HashMap<u32, Node>,
}

impl Graph {
    fn mutate(&mut self) {
        for (key, value) in self.nodes.iter() {
            if self.edges.contains_key(key) {
                for (target, weight) in self.edges[key].iter() {
                    self.nodes.entry(*target).or_insert(Node::new()).weight;
                }
            }
        }
    }
}
```

However, I cannot get the code to compile due to Rust ownership rules (playground):

```
graph.rs:88:25: 88:35 error: cannot borrow `self.nodes` as mutable because it is also borrowed as immutable [E0502]
graph.rs:88                     self.nodes.entry(*target).or_insert(Node::new()).weight;
                                ^~~~~~~~~~
```

If I change the first loop to use `HashMap::iter_mut()` instead, I get a different error (playground):

```
graph.rs:88:25: 88:35 error: cannot borrow `self.nodes` as mutable more than once at a time [E0499]
graph.rs:88                     self.nodes.entry(*target).or_insert(Node::new()).weight;
                                ^~~~~~~~~~
```

How can this kind of nested loop with mutations be achieved in Rust?

rust ownership borrow-checker

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edited Mar 29 '16 at 13:22
Shepmaster
305k 59 824 1083

asked Mar 29 '16 at 10:22
Pascalito
85 1 5

Hint: What would happen to your `nodes` iterator if inserting into `node` via `entry` had to reallocate the storage? Additionally, should the newly-inserted node be included in the iterator or not? – Shepmaster
Mar 29 '16 at 17:39

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You can't insert or delete elements in a data structure while you are iterating over it.

As far as I know Rust iterators don't support modification either (like Java iterators' `remove()`).

So you are left with these options:

- If there are only a few modifications, you can collect them and execute them after the iteration is finished.
- If most of the data structure is modified, or if it is small enough that the overhead of copying doesn't matter, you can create a new, modified data structure that replaces the original one after the iteration. This is usually the idiomatic solution, using higher-order functions on iterators like `map`, `flat_map` or `filter`.

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edited Mar 29 '16 at 18:19

Shepmaster
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answered Mar 29 '16 at 18:13

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52.7k • 14 • 92 • 146

Is this still true? Sounds like a major limitation for a high-performance language such as Rust...
– static_rtti
Mar 27 '20 at 11:39

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