

CMPS 356 – Fall 2022

Web Applications Design and Development

Lab 05

React Hooks and Routing

Objective

1. Using outlet contexts (`useOutletContext`)
2. Navigating programmatically (`useNavigate`)
3. Setting protected routes
4. Using multiple layouts with layout routes
5. Memoizing values and functions using callbacks (`useMemo` and `useCallback`)
6. Prioritizing updates using transitions and deferred values (`useTransition` and `useDeferredValue`)

Prerequisites

1. React Router tutorial: <https://reactrouter.com/en/main/getting-started/tutorial>
2. React hooks API reference: <https://reactjs.org/docs/hooks-reference.html>
3. Debouncing and throttling: <https://css-tricks.com/debouncing-throttling-explained-examples>

1. Outlet Contexts and Programmatic Navigation

1. Create a new directory 01-routing-navigation and reuse the code of the last exercise from the previous lab under it.
2. Fetch the list of country facts and store it in the App component:

```
const App = () => {  
  const [facts, setFacts] = useState(null);  
  useEffect(() => {  
    fetchFacts()  
    ...  
  }, []);  
}
```

3. Rename your Gallery page to Facts and display the list of countries in a dropdown list instead of using multiple links.
4. Navigate to the corresponding country and display its facts when the selection changes. Add an extra default option for the index page.

```
const navigate = useNavigate();
```

5. Use an outlet context to pass the list of country facts to the Country component to avoid the redundant requests used to fetch the facts for each country.
6. Navigate to the Facts page as fallback when the country provided is not part of the list. Use the path parameter to check whether the country code is valid or not, i.e., whether the country code is part of the list of facts or not, then update the selection accordingly.
7. How can the country selection be enhanced to work better on a mobile device?

2. Protected Routes and Multiple Layouts

1. Create a new directory 02-protected-routes and reuse the code of the previous exercise.
2. Add a Login page that allows the end-user to authenticate by providing their name and email address. Store the user state and move your router and routes to the App component.
3. Use a different layout for the Login page that does not include a header nor a footer. This requires regrouping your routes using parent layout routes and creating a Basic component for the new layout.

```
<Route element={<Layout />}>
  ...
</Route>
<Route element={<Basic />}>
  ...
</Route>
```

4. Display the name and email in the header along with a button to deauthenticate.
5. Create a new Photos page that is only accessible after the user has authenticated. This requires a new route entry and component, ProtectedRoute, to handle such protected pages (also called private pages). Update your navigation bar to link to this new page.
6. Create a protected Profile page that allows the end-user to update their name or email address. Add the corresponding route entry and navigation bar link.
7. Update your deauthentication button such that it reflects the de/authenticated state and allows the end-user to manually authenticate by clicking it.
8. Hide the protected links from the navigation bar when the end-user is not authenticated.

3. Memoization, Deferral, and Prioritization

1. Create a new directory 03-memoization-deferral and an application under it.
2. Add a textbox to your App component and bind it to a state variable, lorem.
3. Create an Input component with two textboxes. One textbox is bound to a state variable, ipsum, and the second textbox is read-only. Input also receives lorem as a property through value. Add an instance of Input to your application and pass lorem from App to it.

```
<Input value={lorem} />
```

4. The content of the second textbox is the result of a function that returns the property value after busy waiting a certain duration in milliseconds. Use the following function to simulate a time-consuming computation:

```
const wait = (value, duration) => {
  const date = Date.now();
  while (Date.now() - date < duration);
  return value;
};
```

5. Try changing the text input, bound to ipsum, quickly and observe the responsiveness of the overall user interface when dealing with increasingly longer waiting duration for updating the content of the textbox using `wait()` based on the `value` property.
6. Use a hook to memoize the return value of `wait(value, duration)`, since it is independent of ipsum. This memoized value will now be reused whenever the component is rendered.
7. Instead of using the value of `value` directly, wrap it in a function, identity, that returns it instead. What do you observe? Memoize identity as a callback so that it is created only once.

```
const identity = (arg) => arg;
```

8. Add a slider that, when changed, returns its value through a function after busy waiting a certain duration in milliseconds. The value of the slider is bound to a state variable, slider, and the returned value is displayed in a read-only textbox and bound to a state variable, dolor.
9. Try changing the slider value quickly. How responsive is the experience with increasingly longer waiting durations for setting dolor using `wait(slider, duration)`?
10. Use a hook to defer the value of slider. Is that sufficient to enhance the overall feel of the experience?
11. How can the end-user be kept updated about whether the value of dolor still being computed? Use a transition hook to provide a more informative experience.
12. Add another read-only textbox bound to a state variable, amit, that is updated to the value of slider asynchronously after a certain duration in milliseconds; we are trying to simulate an asynchronous request. Use the following function to simulate a request that resolves with a given value after a certain given duration:

```
const sleep = (value, duration) => {
  return new Promise((resolve) =>
    setTimeout(() => resolve(value), Math.random() * duration)
  );
};
```

13. Try changing the slider value quickly. How responsive and linear is the experience with increasingly longer waiting durations for setting amit using `sleep(slider, duration)` as a side effect?
14. How can the end-user be kept updated about the status of the simulated request, i.e., the request that is initiated to set the value of amit? How to abort a pending request when a new one is generated? How can we make sure to have the latest value of slider reflected in the textbox content?