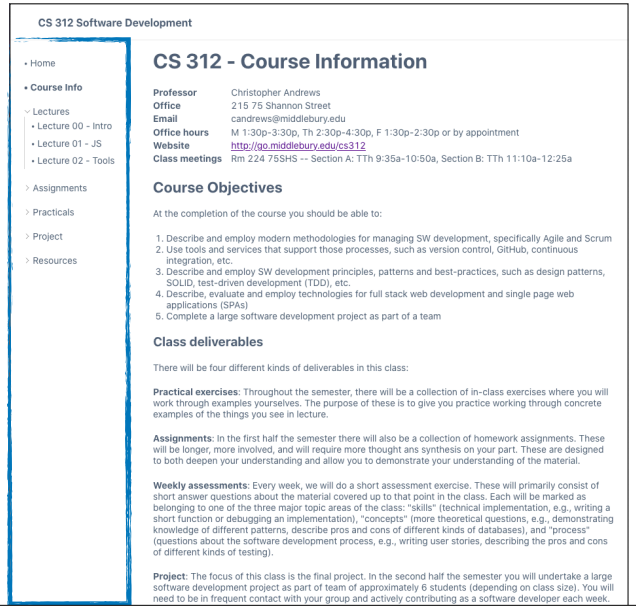
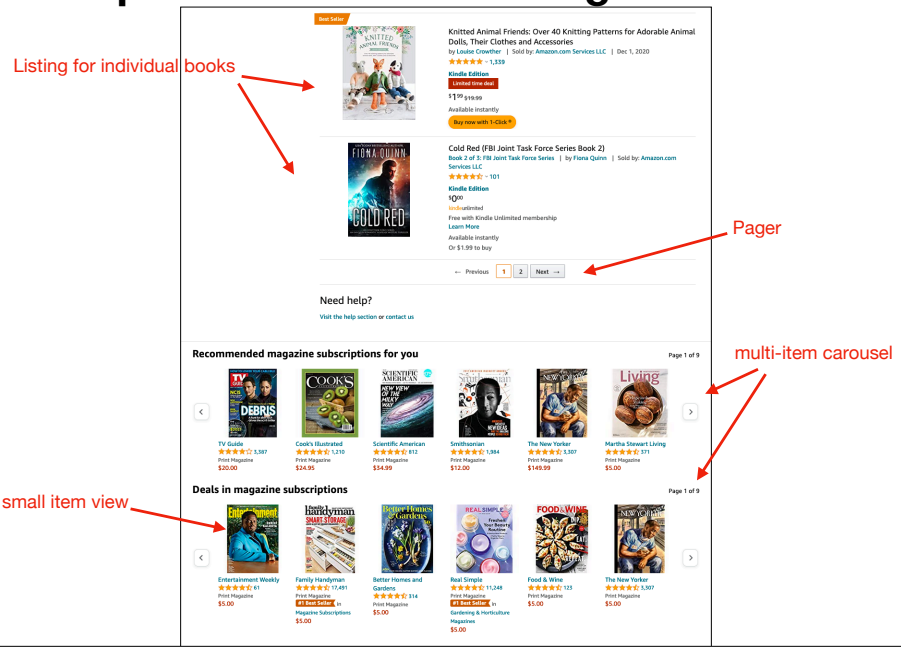
CS 312 Software Development

Introduction to React: Components

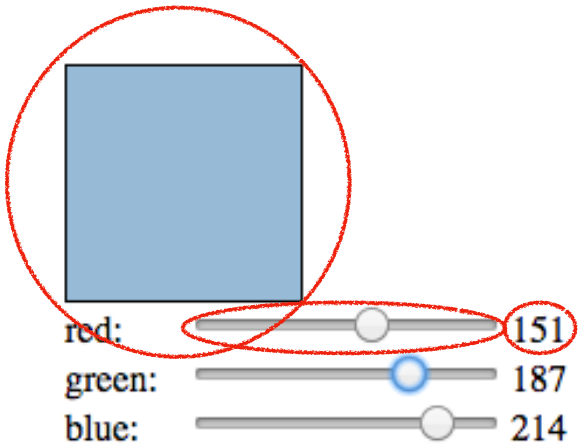
Component based web design



Component based web design



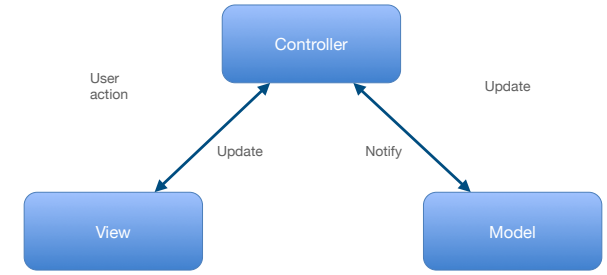
Color picker example



Frameworks

- Event based (e.g., Backbone, Vue)
  - Changing the data triggers an event
  - Views register event handlers
- Two-way binding (e.g. Angular)
  - Assigning to a value propagates to dependent components and vice versa
- Efficient re-rendering (e.g. React)
  - Re-render all subcomponents when data changes

Model View Controller (MVC)

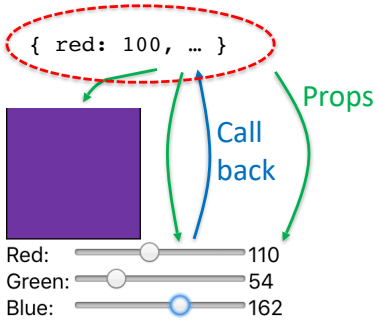


CS 312 Software Development

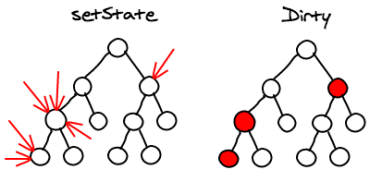
Introduction to React: Fundamentals

Philosophy of React

- There is a single source of truth (the state)
- Render the UI as it should appear for any given state of the application
- Update the state as a result of user actions
- Repeat (i.e., re-render the UI with the new state)

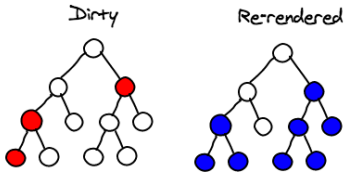


React mechanics



Batched updates

Sub-tree re-rendering



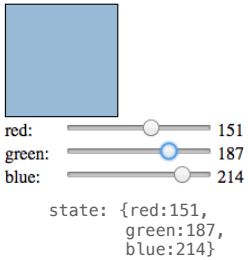
https://calendar.perfplanet.com/2013/diff/

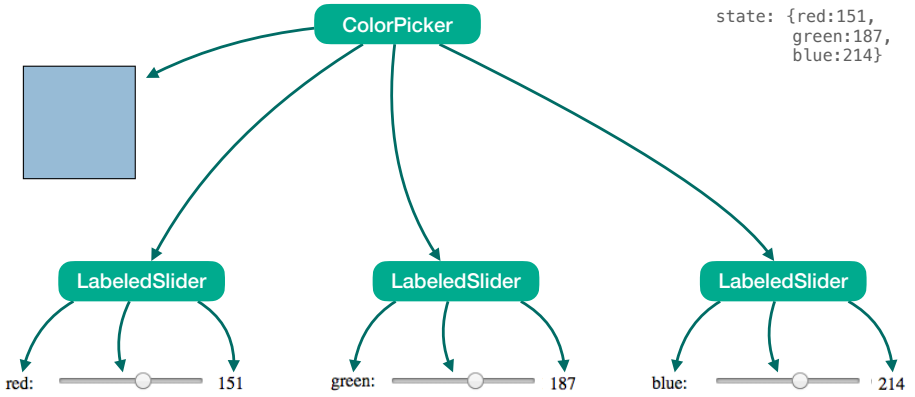
Thinking in React

1. Break the UI into a component hierarchy
2. Build a static version in React
3. Identify the minimal (but complete) representation of state
4. Identify where your state should live
5. Add “inverse” data flow (data flows down, callbacks flow up)

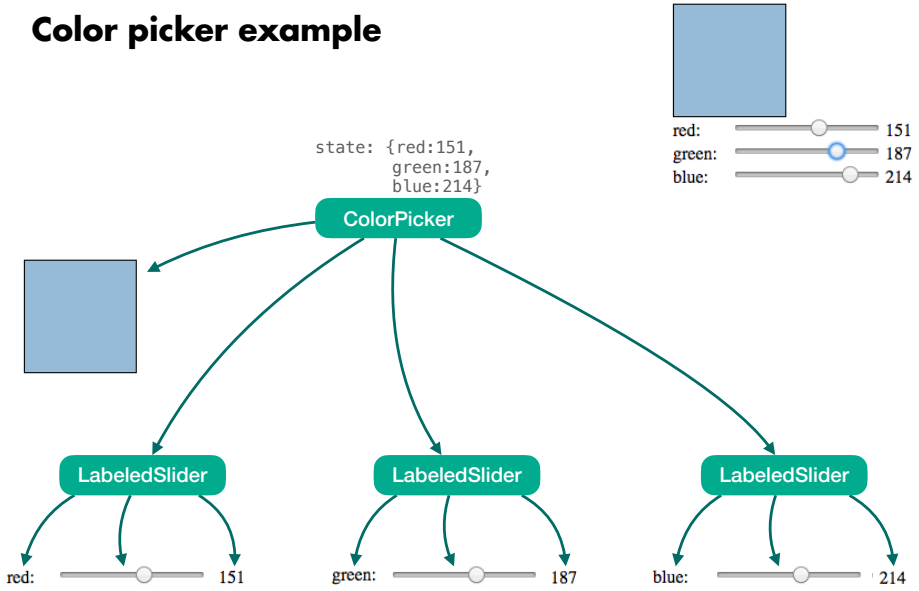
https://reactjs.org/docs/thinking-in-react.html

Color picker example





Color picker example



CS 312 Software Development

Introduction to React: Writing code

ColorPicker

```
function ColorPicker() {
  const [red, setRed] = useState(0);
  const [green, setGreen] = useState(0);
  const [blue, setBlue] = useState(0);

  const color = {background: `rgb(${red}, ${green}, ${blue})`};
  return (
    <div className="color-picker">
      <div className="color-swatch" style={color} ></div>
      <LabeledSlider label="red"   value={red}   setValue={setRed}/>
      <LabeledSlider label="green" value={green} setValue={setGreen}/>
      <LabeledSlider label="blue"  value={blue}  setValue={setBlue}/>
    </div>
  );
}
```

ColorPicker

State with React Hooks (useState)

```
function ColorPicker() {
  const [red, setRed] = useState(0);
  const [green, setGreen] = useState(0);
  const [blue, setBlue] = useState(0);

  const color = {background: `rgb(${red}, ${green}, ${blue})`};
  return (
    <div className="color-picker">
      <div className="color-swatch" style={color} ></div>
      <LabeledSlider label="red"   value={red}   setValue={setRed}/>
      <LabeledSlider label="green" value={green} setValue={setGreen}/>
      <LabeledSlider label="blue"  value={blue}  setValue={setBlue}/>
    </div>
  );
}
```

```
const [currentValue, setter] = useState(initial value)
```

destructuring assignment

ColorPicker

```
function ColorPicker() {
  const [red, setRed] = useState(0);
  const [green, setGreen] = useState(0);
  const [blue, setBlue] = useState(0);

  const color = {background: `rgb(${red}, ${green}, ${blue})`};
  return (
    <div className="color-picker">
      <div className="color-swatch" style={color} ></div>
      <LabeledSlider label="red"   value={red}   setValue={setRed}/>
      <LabeledSlider label="green" value={green} setValue={setGreen}/>
      <LabeledSlider label="blue"  value={blue}  setValue={setBlue}/>
    </div>
  );
}
```

template literal

ColorPicker

```
function ColorPicker() {
  const [red, setRed] = useState(0);
  const [green, setGreen] = useState(0);
  const [blue, setBlue] = useState(0);

  const color = {background: `rgb(${red}, ${green}, ${blue})`};
  return (
    <div className="color-picker">
      <div className="color-swatch" style={color} ></div>
      <LabeledSlider label="red"   value={red}   setValue={setRed}/>
      <LabeledSlider label="green" value={green} setValue={setGreen}/>
      <LabeledSlider label="blue"  value={blue}  setValue={setBlue}/>
    </div>
  );
}
```

ColorPicker

Passing props

```
function ColorPicker() {
  const [red, setRed] = useState(0);
  const [green, setGreen] = useState(0);
  const [blue, setBlue] = useState(0);

  const color = {background: `rgb(${red}, ${green}, ${blue})`};
  return (
    <div className="color-picker">
      <div className="color-swatch" style={color} ></div>
      <LabeledSlider label="red"   value={red}   setValue={setRed}/>
      <LabeledSlider label="green" value={green} setValue={setGreen}/>
      <LabeledSlider label="blue"  value={blue}  setValue={setBlue}/>
    </div>
  );
}
```

passing state and setter as props

in JSX, we surround JS with {}

LabeledSlider

```
function LabeledSlider({ label, value, setValue }) {
  return (
    <div>
      <div className="color-label">{label}</div>
      <input type="range"
         min="0"
         max="255"
         value={value}
         onChange={(event)=>{setValue(parseInt(event.target.value,10))}}/>
      <span>{value}</span>
      </div>
  );
}
```

LabeledSlider

Props

single destructured argument “props”

```
function LabeledSlider({ label, value, setValue }) {
  return (
    <div>
      <div className="color-label">{label}</div>
      <input type="range"
         min="0"
         max="255"
         value={value}
         onChange={(event)=>{setValue(parseInt(event.target.value,10))}}/>
      <span>{value}</span>
      </div>
  );
}
```

LabeledSlider

Controlled components

```
function LabeledSlider({ label, value, setValue }) {
  return (
    <div>
      <div className="color-label">{label}</div>
      <input type="range"
         min="0"
         max="255"
         value={value}
         onChange={(event)=>{setValue(parseInt(event.target.value,10))}}/>
      <span>{value}</span>
      </div>
  );
}
```

any change updates state, forcing a re-render

Form elements (like input) are **controlled**

We exploit React’s re-render loop to get interaction
while maintaining a single source of truth