

# ECS 162

## WEB PROGRAMMING

4/19

## Animation

- An animation (like a movie, like TV) is a series of still frames, producing the illusion of motion.
- Anything faster than about 12 frames per second is OK; this is about one frame per 80 milliseconds.
- Switching between recent doppler images produces a nice animation (at least when something is going on...)
- Also, pushing the arrow button in mobile should slide forecast up and down.

## Approaches to animation

- We can create animations on Web pages in several ways:
  - CSS built-in animation gradually changes CSS properties. Probably best approach for arrow button.
  - There is a <canvas> element, within which we can define 2D graphics and animations. Has a whole graphics language.
  - Using Javascript. Probably best approach for dopper.

## CSS animations

- Put properties to change in @keyframes:

```
@keyframes effectName {  
    from {background-color: #661199;}  
    to { background-color: #116699;}  
}
```
- Then use it in the css for the element.

```
animation-name: effectName;
```

## Overlays

- Images can have transparent, or partially transparent, regions.
- Css colors can include opacity as well as red, green and blue:

```
background-color: rgb(0,0,0,0);
```

is totally transparent.

```
background-color: rgb(200, 200, 100, 100);
```

is semi-transparent yellow.
- Doppler images are mostly transparent, the colored dots show the radar signal.

## Overlays

- How to put one element on top of another?
- Layout engines (default, flexbox, grid) try hard *not* to put elements on top of each other!
- CSS position commands place elements outside of the normal layout – makes an exception to the usual layout rules.
- Read the whole page on position at W3schools.

## CSS position command

position: relative;

- Places element relative to where it would be located by the regular layout algorithm. top, left, bottom, right properties position the edges of the element. Without any of those, it does nothing.

position: absolute;

- Places the element relative to it's nearest ancestor who used a position command (or the viewport, if no ancestor used position).

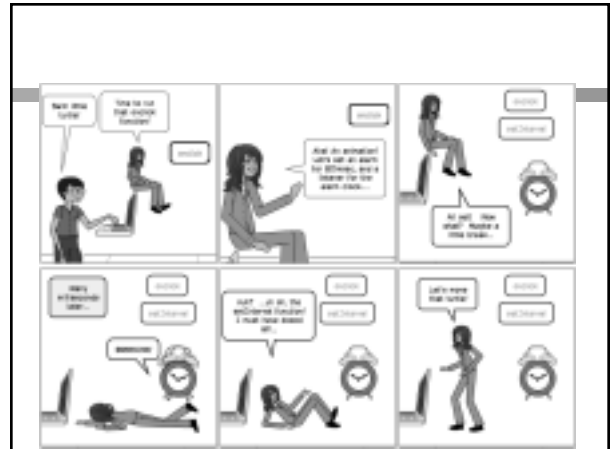
## The turtle



- Has transparent background. Is really square. It swims by placing it's upper-right corner at a different absolute position relative to it's containing div, which also contains the background.

## Javascript animation

- The browser runs a function at every frame.
- The function changes some properties of the DOM.
- In this case, the top and left absolute positions of the turtle.



## The code...

## Doppler animation

- How to do it as a Javascript animation?
- What CSS properties should change at every frame?

## Where to start animation?

- If all ten images have not been loaded yet, it's too soon.
- So find a point *after* all ten images are loaded.
- To find this point, we need to understand `collectPastDoppler`.

## `collectPastDoppler`

- Two problems
  - Obvious one: the file names on the NWS Web site keep changing. The file name includes the UTC date and time (UTC is the standardized time zone for the whole world).
  - Less obvious: downloading an image to the browser takes time, just like downloading a JSON file (or CSS or HTML or Javascript or...).

## Filenames problem

- Look at current UTC time, subtract one minute, check for file, repeat.
- Why can't we just get the Javascript to look at the directory?

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- Look at current UTC time, subtract one minute, check for file, repeat.
- Why can't we just get the Javascript to look at the directory?
- Because it is not CORS-enabled! The browser won't let our Javascript code have it because the server did not label it as available to all.
- How could this code be improved?

## Time to download images

- Again we find an asynchronous process!
- What exactly does setting the `src` property of an image do?

## Time to download images

- Again we find an asynchronous process!
- What exactly does setting the src property of an image do?
- Browser sends an HTTP message to the server for the image.
- Only when the HTTP response, containing the image data, comes back does the browser paint the image into the page.

## What about the SOP?

- Why can we get an image from anywhere, not just the rare CORS-enabled API sites?
- Because images are not subject to the SOP! The browser will take images from anywhere and paint them into the display.