

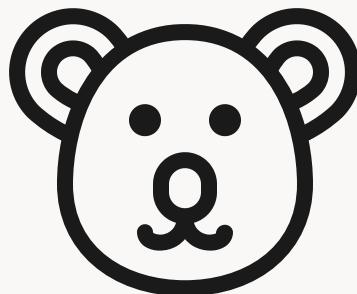
10 things I hate about animation

(and how to fix them)

Mozilla Roadshow 2019
Brian Birtles, Birchill, Inc.

birtles.github.io/mozdev2019/

Self-introduction



2004~2019



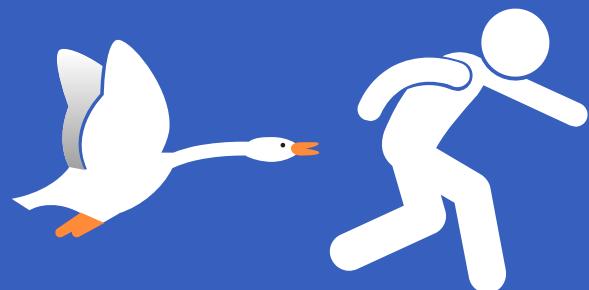
SVG WG 2011~
CSS WG 2015~



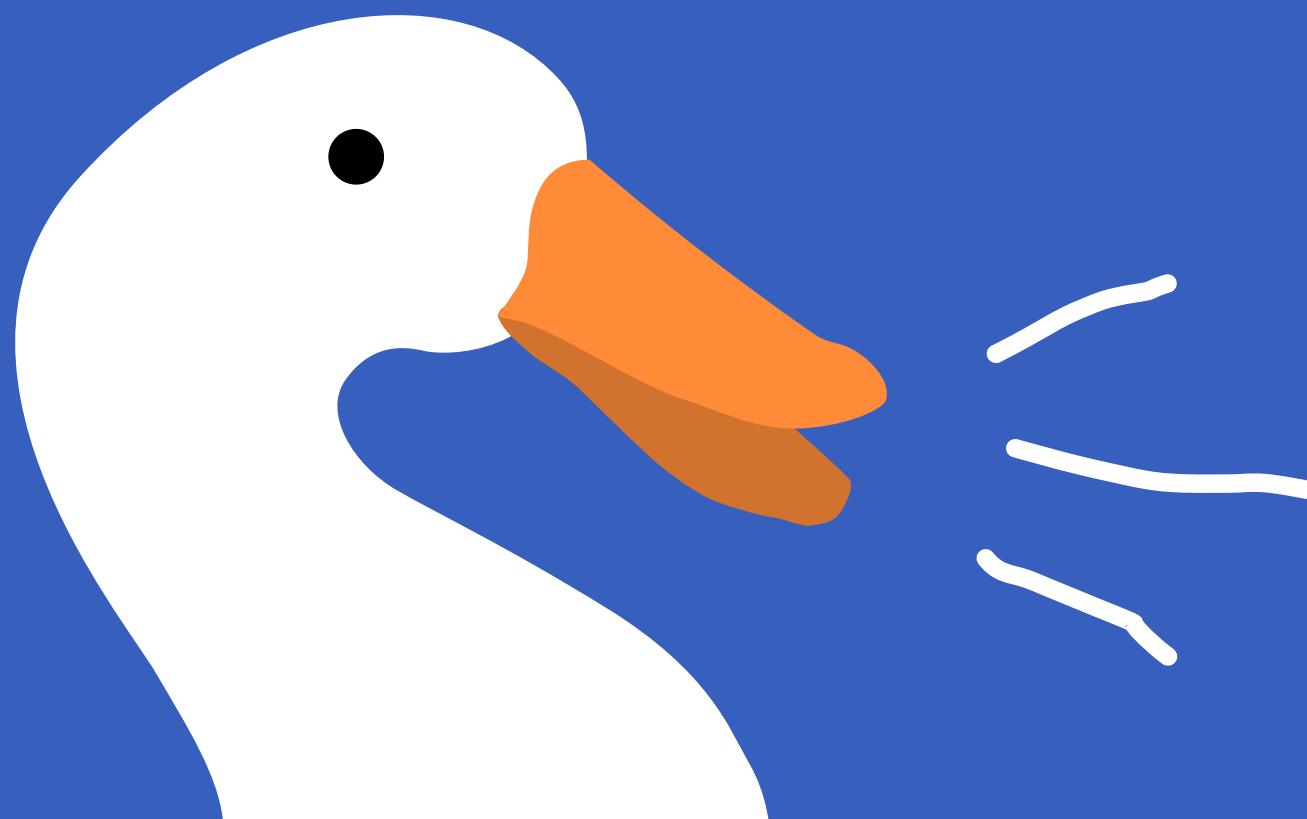
2019~

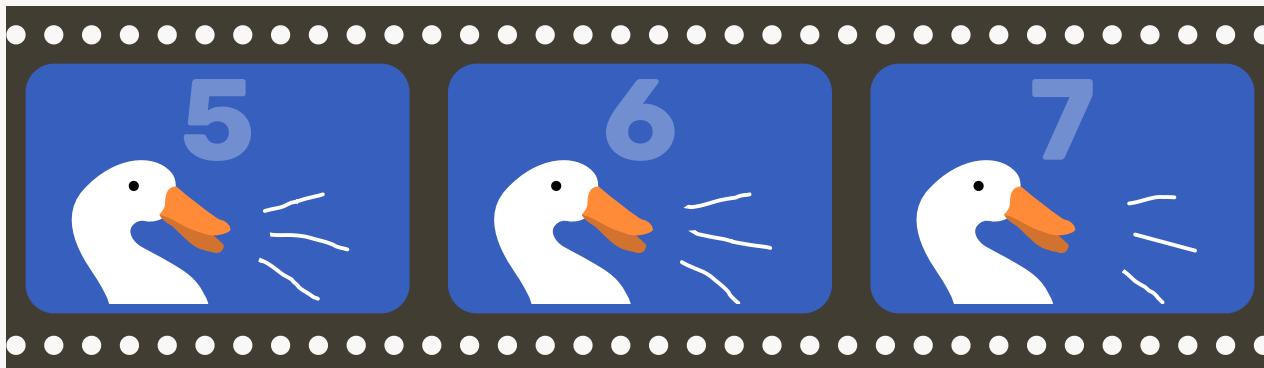
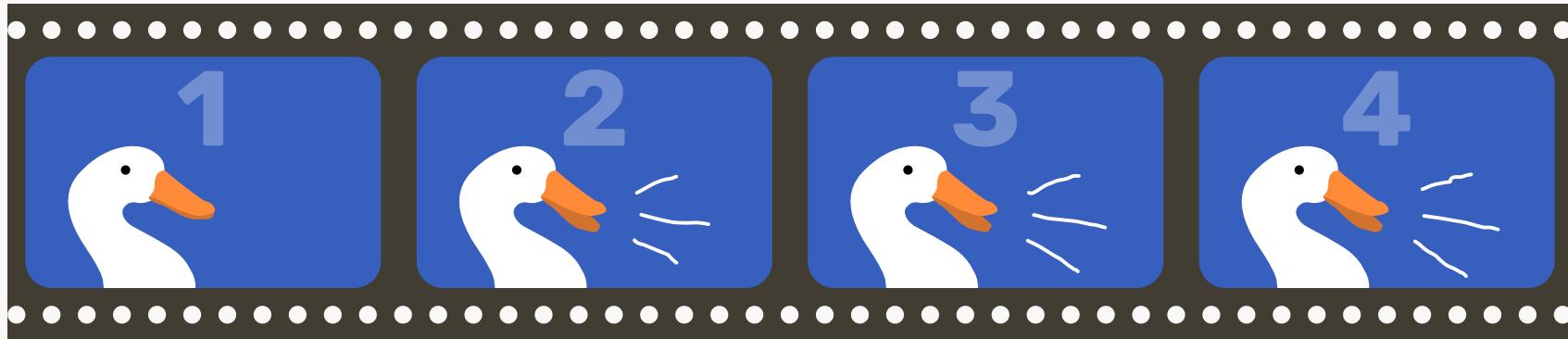
10 reasons why animations are...

- Hard
- Buggy
- Sluggish
- Frustrating



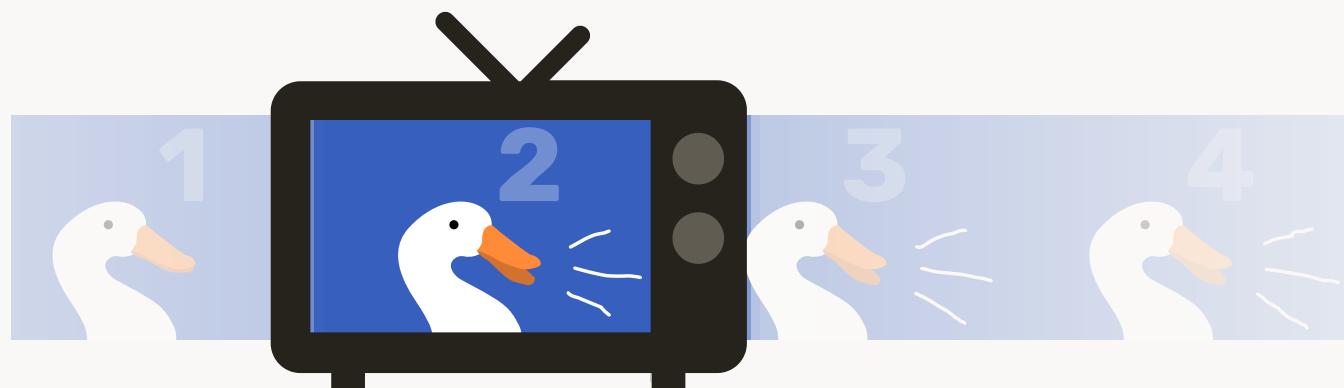
**#1: It's hard to do frame-based
animation**







```
.filmstrip {  
    animation: slide 1s infinite steps(7);  
}  
  
@keyframes slide {  
  
    to { transform: translate(-700px); }  
}
```

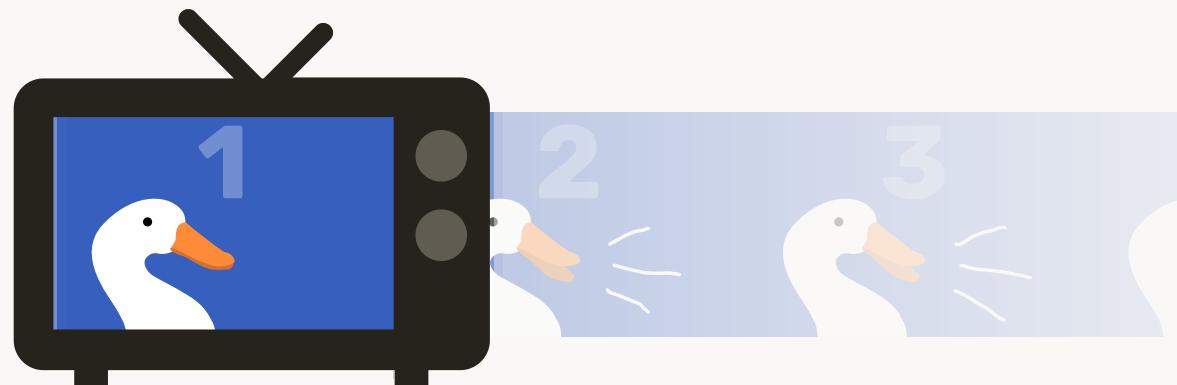


```
.filmstrip {
  /* steps(7) = 7 "changes" including the last one */
  animation: slide 1s infinite steps(7);
}

@keyframes slide {
  to { transform: translate(-700px); }
}
```

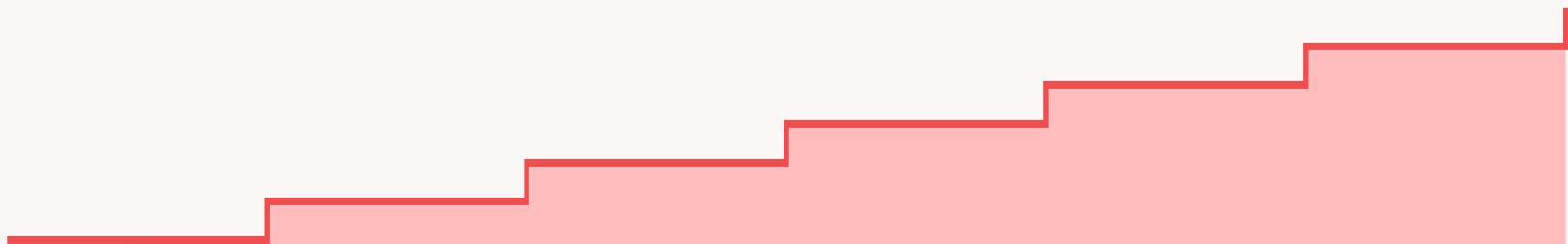


```
.filmstrip {  
    animation: slide 1s infinite steps(6);  
}  
@keyframes slide {  
    to { transform: translate(-700px) ; }  
}
```

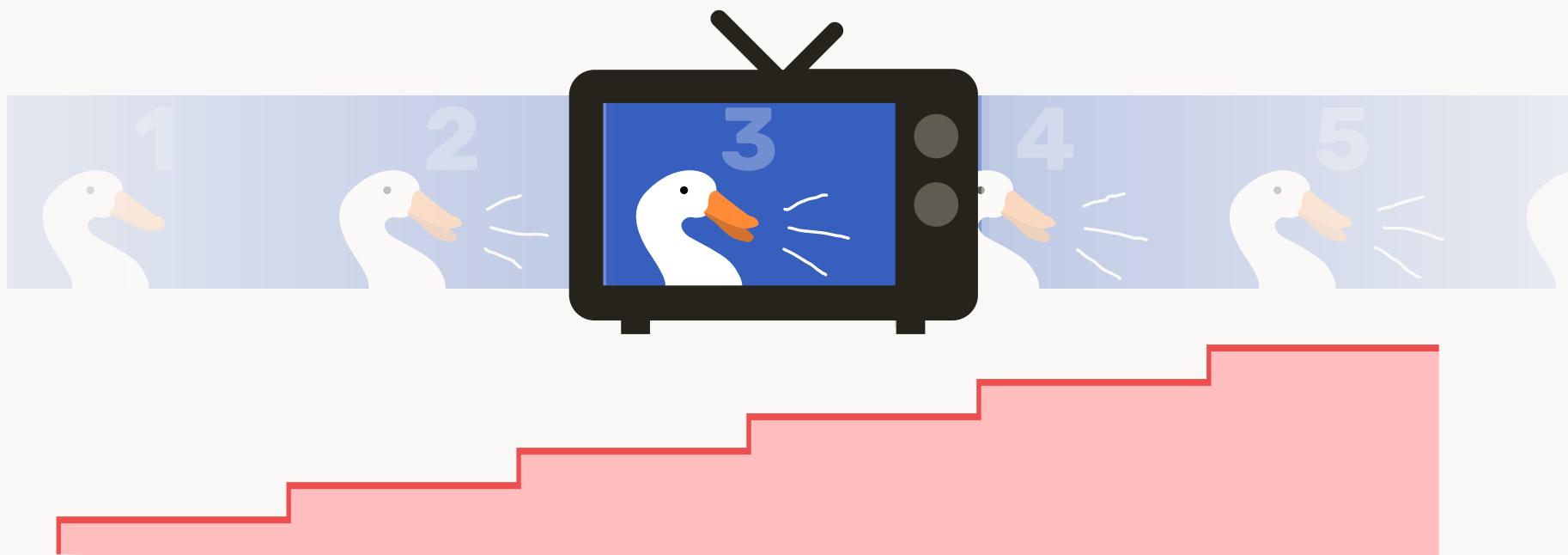


```
.filmstrip {
  /* steps(6) = steps(6, end) */
  animation: slide 1s infinite steps(6);
}
@keyframes slide {

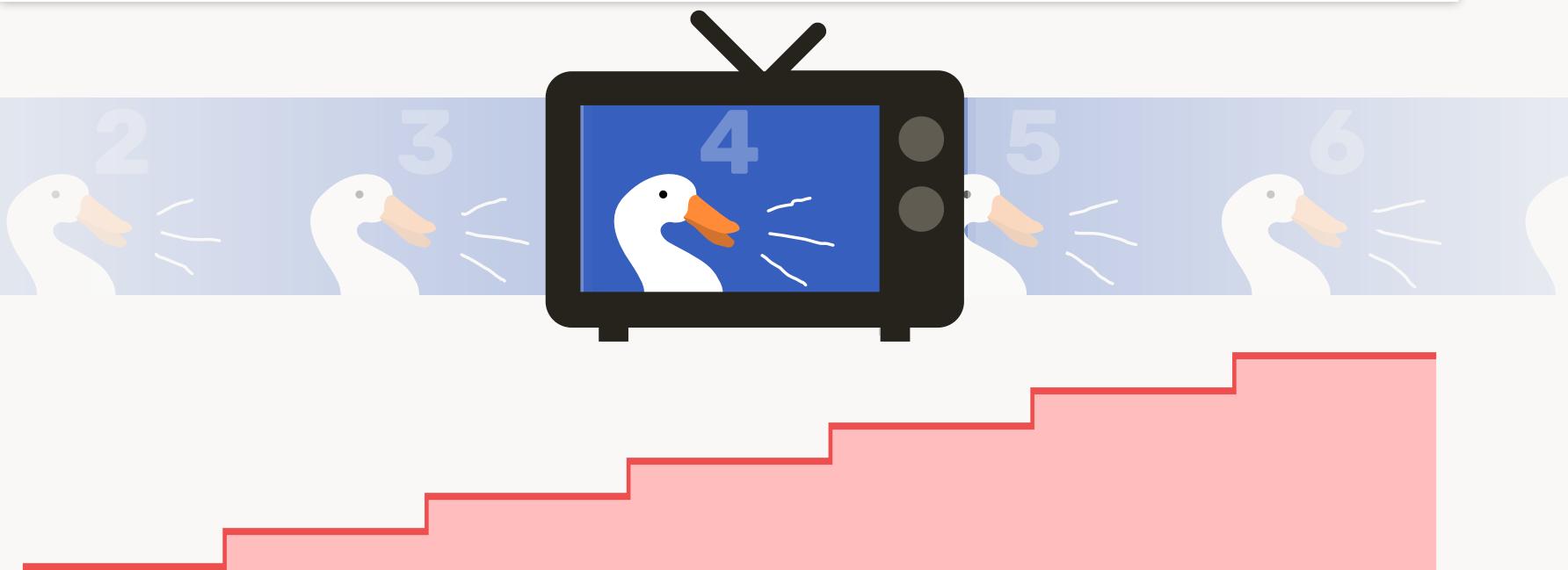
  to { transform: translate(-700px); }
}
```

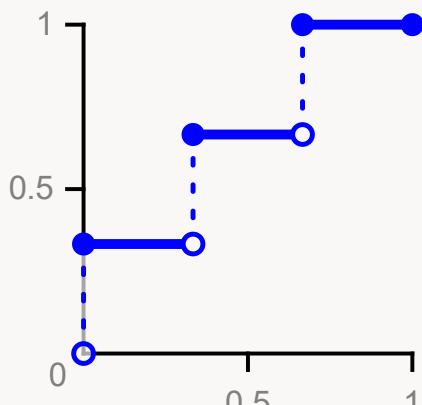


```
.filmstrip {  
    animation: slide 1s infinite steps(6, start);  
}  
  
@keyframes slide {  
    to { transform: translate(-700px); }  
}
```

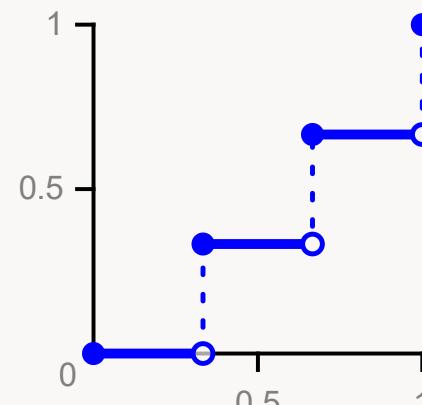


```
.filmstrip {  
    /* New! jump-none! */  
    animation: slide 1s infinite steps(7, jump-none);  
}  
  
@keyframes slide {  
    to { transform: translate(-700px); }  
}
```

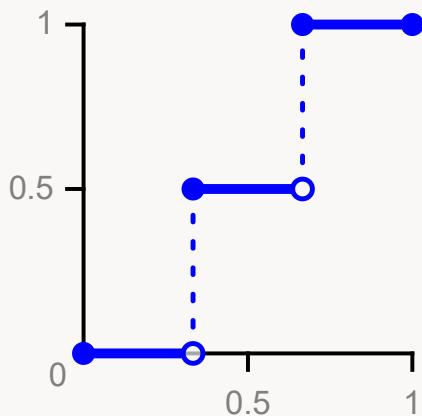




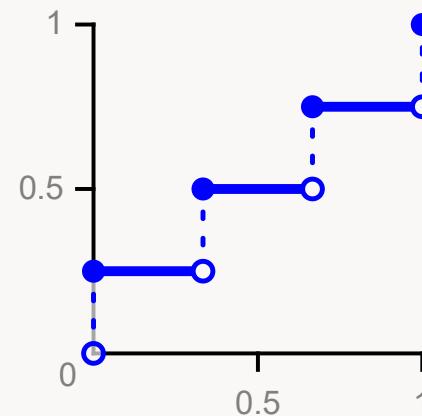
steps(3, jump-start)



steps(3, jump-end)



steps(3, jump-none)



steps(3, jump-both)

CSS Easing Functions

jump-none, jump-both



65+



77+



x



x



O

#2: Transitions are buggy

Bug 683696 Opened 8 years ago Updated 4 years ago

transitionend event does not fire on background tab, because transition doesn't run because the before-change style is never computed

Categories

| | |
|--|-------------------|
| Product: Core ▾ | Type: ⚙ defect |
| Component: CSS Parsing and Computation ▾ | Priority: Not set |
| Version: 6 Branch | |
| Platform: x86 Windows XP | |

Tracking

Bug 1206913 Closed Bug 1206913 Opened 4 years ago Closed 2 years ago

The side menu transition is not smooth in Notes

Categories

| | |
|---------------------------------|-------------------|
| Product: Firefox OS Graveyard ▾ | Type: ⚙ defect |
| Component: Gaia:Notes ▾ | Priority: Not set |
| Platform: ARM Gonk (Firefox OS) | |

Bug 1118361 Closed Bug 1118361 Opened 5 years ago Closed 5 years ago

[Email] Status Bar displays white icons on white background after in Settings of App

Categories

| | |
|---------------------------------|-------------------|
| Product: Firefox OS Graveyard ▾ | Type: ⚙ defect |
| Component: Gaia:System ▾ | Priority: Not set |
| Platform: ARM Gonk (Firefox OS) | |

Bug 1075333 Closed Bug 1075333 Opened 5 years ago Closed 4 years ago

[Browser]Sometimes Top sites screen is not shown after opening more than 20 new tabs

Categories

| | |
|---------------------------------|-------------------|
| Product: Firefox OS Graveyard ▾ | Type: ⚙ defect |
| Component: Gaia:Browser ▾ | Priority: Not set |
| Platform: ARM Gonk (Firefox OS) | |

Bug 1059650 Closed Bug 1059650 Opened 5 years ago Closed 5 years ago

[Browser]Back button stops working after clicking '+' icon multiple times

Categories

| | |
|---------------------------------|-----------------------------------|
| Product: Firefox OS Graveyard ▾ | Type: ⚙ defect |
| Component: Gaia:Browser ▾ | Priority: Not set Severity: major |
| Platform: ARM Gonk (Firefox OS) | |

1. Sometimes transitions don't run

2. Sometimes transitions don't finish

New events!

- **transitionrun**

- a transition was created NEW

- ok to wait for **transitionend** 

- **transitioncancel**

- element vanished  (dropped, re-“rendered”, **display:none** etc.)

- don't wait for **transitionend** 

- **transitionstart** (to match **animationstart**)

- **animationcancel** (as with **transitioncancel**)

transitioncancel and friends



53+

animationcancel



74+

No



Tech
Preview



x

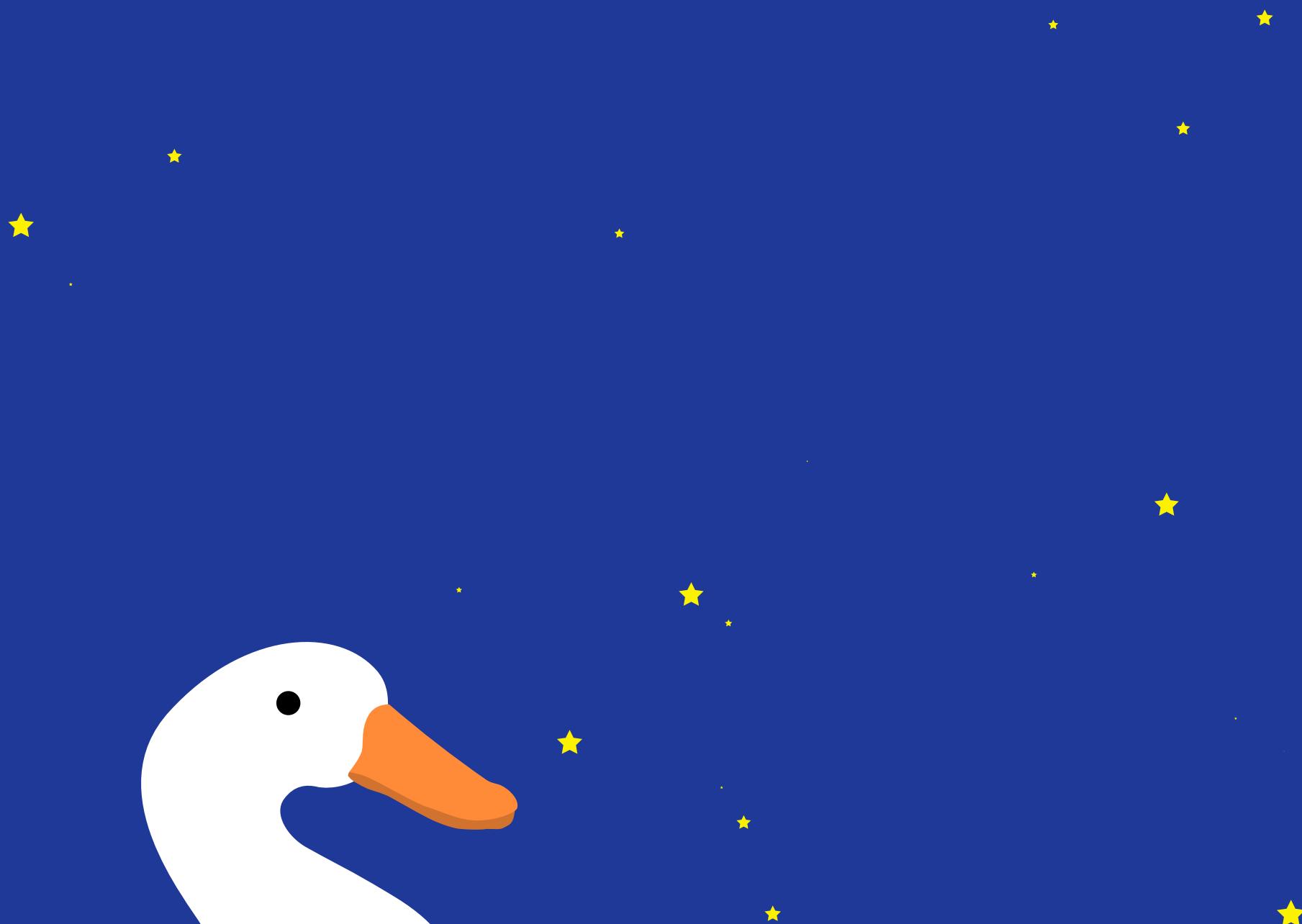
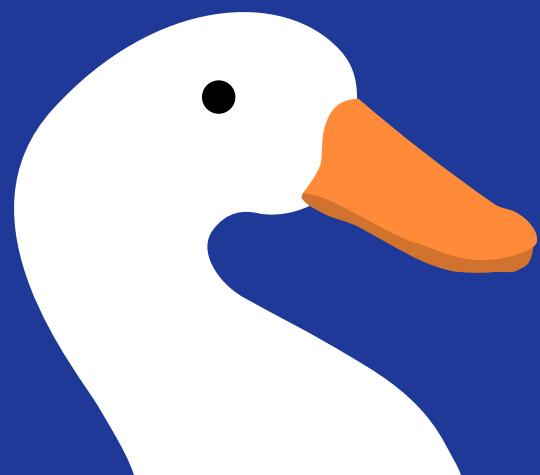
Only
transitionstart



O

animationcancel

#3: I ❤ JS

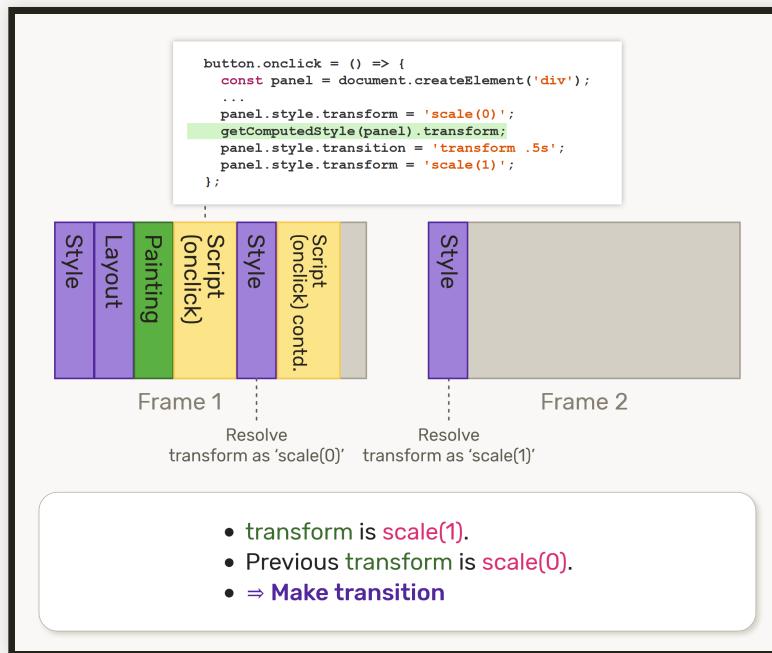


CSS animations from JS

```
const uniqueKeyframesName = generateUuid();
document.styleSheets[0].insertRule(
  `@keyframes ${uniqueKeyframesName} {
    from { transform: scale(0) }
    95% { transform: scale(${fullSize}) }
    to { transform: scale(0) }
  }`
);
star.style.animation =
`#${uniqueKeyframesName} ${duration}ms ` +
`${delay}ms infinite`;
// Don't forget to clean up!
```

CSS transitions from JS

- `transitionrun`, `transitioncancel` etc.
- Triggering transitions from JS is *hard...*



<https://birtles.github.io/cssconf2019/>

...using Element.animate()

```
star.animate(
  [
    { transform: 'scale(0)' },
    { transform: `scale(${fullSize})`, offset: 0.95 },
    { transform: 'scale(0)' },
  ],
  { easing, duration, delay, iterations: Infinity }
);
```

...using Element.animate()

```
const starAnimation = star.animate(  
  [  
    { transform: 'scale(0)' },  
    { transform: `scale(${fullSize})`, offset: 0.95 },  
    { transform: 'scale(0)' },  
  ],  
  { easing, duration, delay, iterations: Infinity }  
);  
  
// starAnimation.reverse();  
// starAnimation.cancel();  
// starAnimation.updatePlaybackRate(0.5);  
  
starAnimation.finished.then(() => { ... });
```

Element.animate()



48+



36+



Tech
Preview

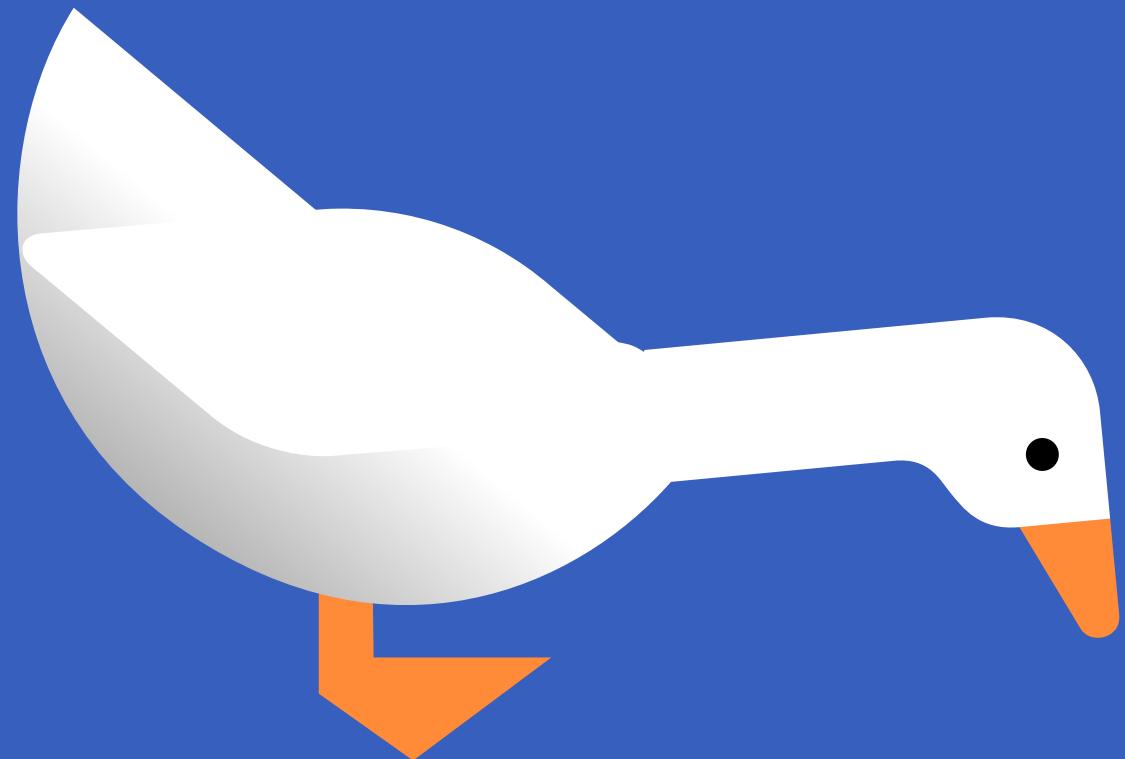


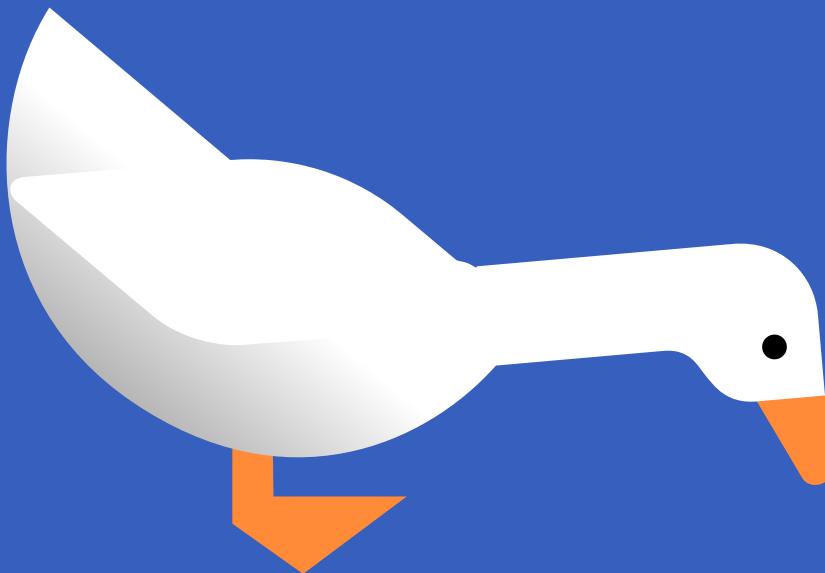
x



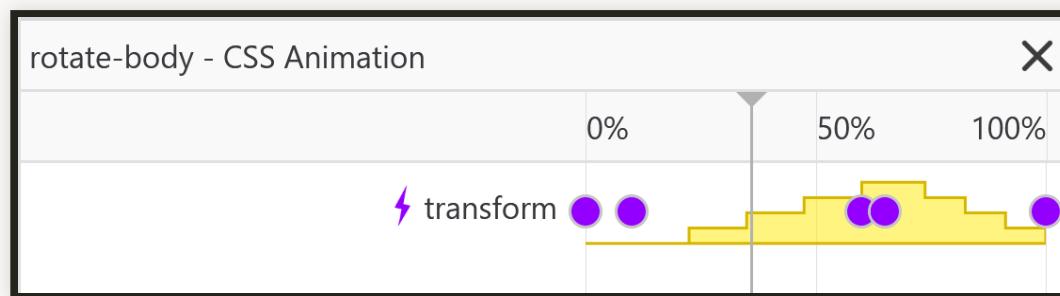
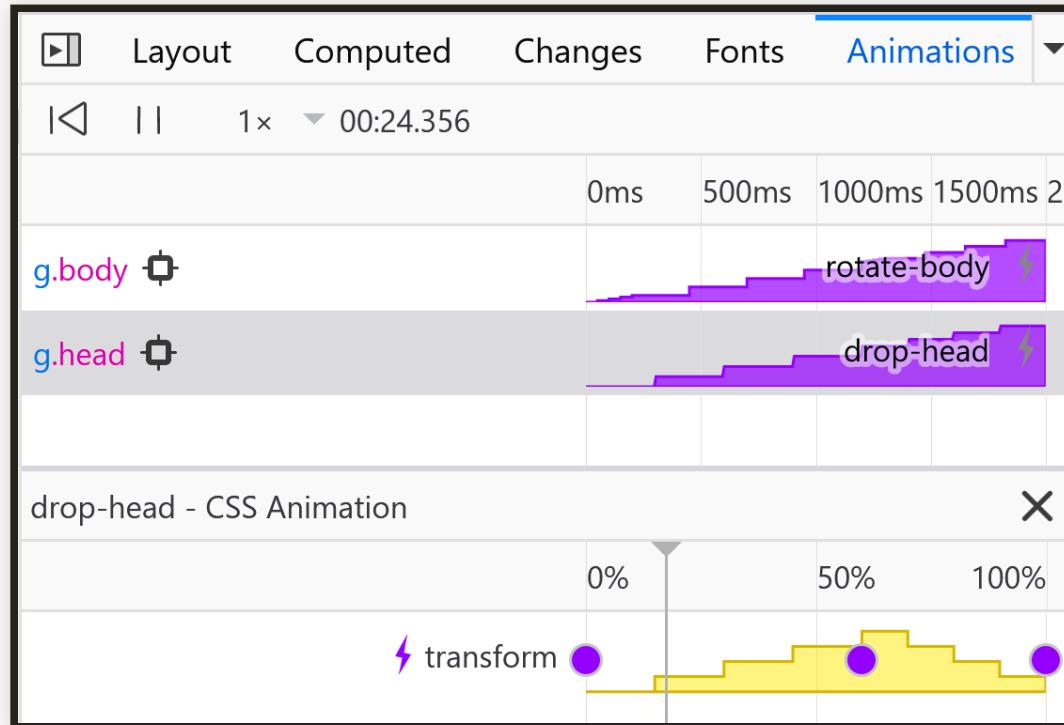
O

#4: Easing the *whole* animation is
hard



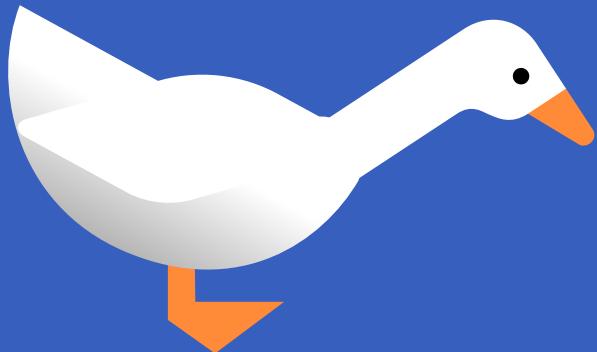


```
.body, .head {  
  animation-timing-function: steps(4);  
}
```

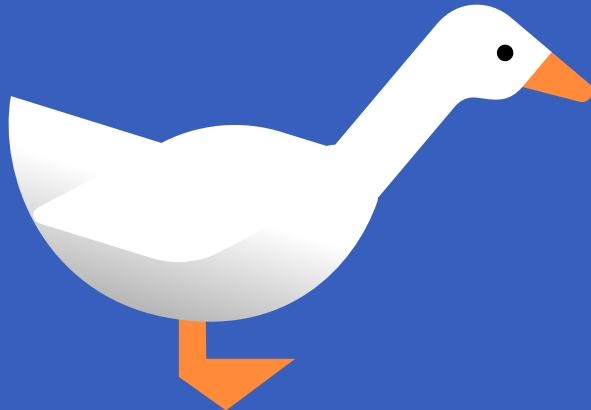


```
.head {  
  animation-timing-function: steps(4);  
}  
  
@keyframes drop-head {  
  60% { transform: rotate(45deg) }  
}
```

```
@keyframes drop-head {  
  0% {  
    transform: none;  
    animation-timing-function: steps(4);  
  }  
  
  50% {  
    transform: rotate(45deg);  
    animation-timing-function: steps(4);  
  }  
  
  100% { transform: none; }  
}
```

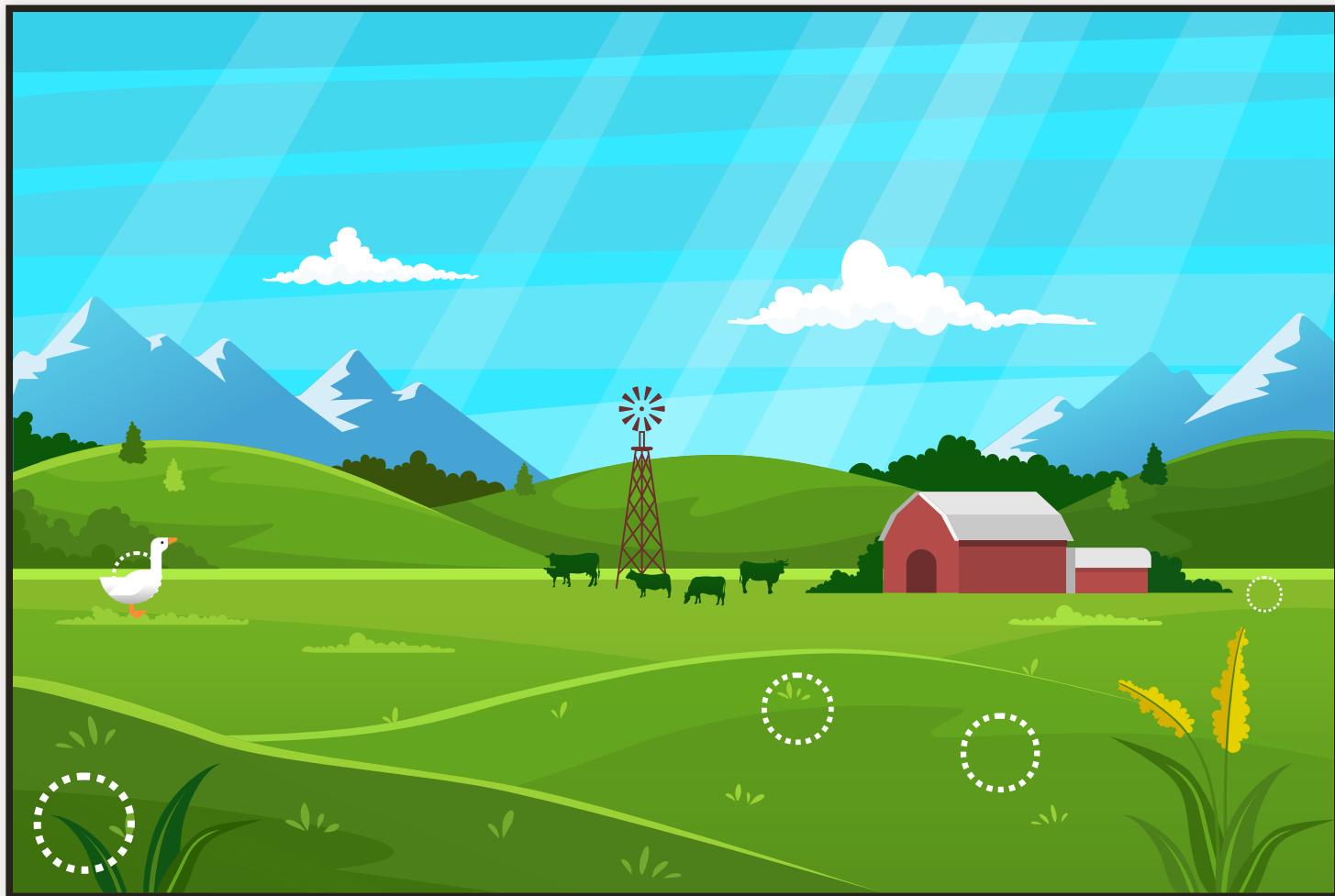


```
head.animate(  
  {  
    // Implicit 0%/100% keyframes are not yet  
    // shipping in Chrome/Firefox  
    transform: ['none', 'rotate(60deg)', 'none'],  
    offset: [0, 0.6, 1],  
  },  
  {  
    duration: 2000,  
    iterations: Infinite,  
    easing: 'steps(4)'  
  }  
);
```



```
head.animate(  
  {  
    transform: ['none', 'rotate(60deg)', 'none'],  
    offset: [0, 0.6, 1],  
    easing: 'ease-in',  
  },  
  {  
    duration: 2000,  
    iterations: Infinite,  
    easing: 'steps(4)'  
  }  
);
```

**#5: You can't define animations by
speed instead of time**



Background by pikisuperstar

CSS “Working” Group

Hurry up, add speed-based animations!



Source: Jen Simmons' Twitter

Element.getAnimations()

```
document.addEventListener('transitionrun', evt => {
  if (evt.propertyName !== 'transform') {
    return;
  }

  const transition = evt.target
    .getAnimations()
    .find(animation => animation.transitionProperty === 'transform');

  const keyframes = transition.effect.getKeyframes();
  const distance = calculateDistance(
    keyframes[0].transform,
    keyframes[1].transform
  );

  // Move at 700px per second
  const duration = (distance / 700) * 1000;
  transition.effect.updateTiming({ duration });
  // NOTE: `transition.updatePlaybackRate()` would be even better
});
```

Element.getAnimations()



Nightly



Canary



Tech
Preview

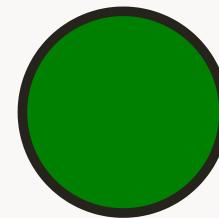
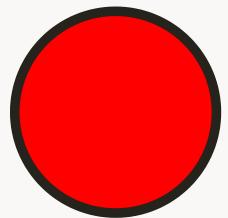


x



Canary

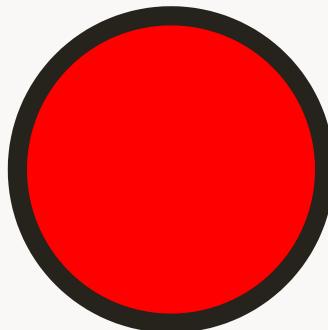
**#6: You can't define transitions with
midpoints**

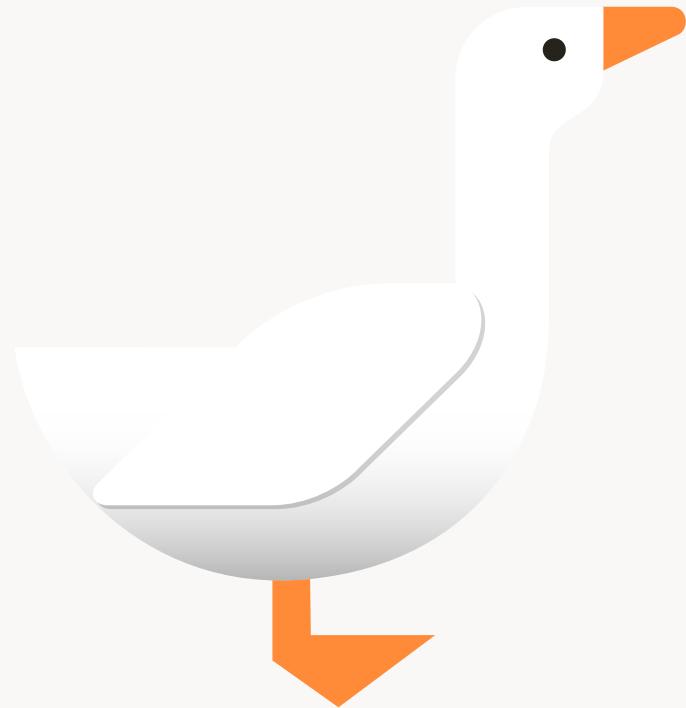


rgb(255, 0, 0)

rgb(128, 64, 0)

rgb(0, 128, 0)



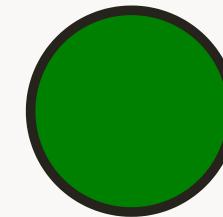
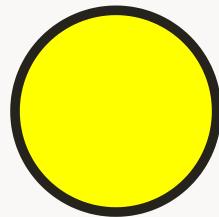
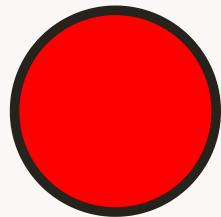


Color #1:



Color #2:

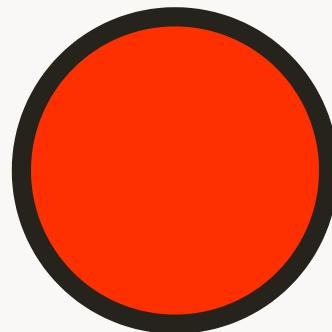


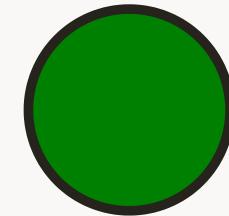
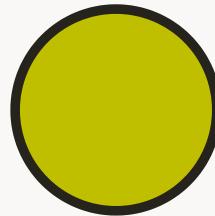
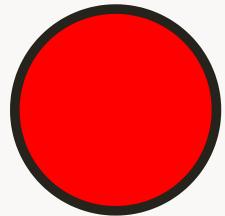


rgb(255, 0, 0)

rgb(255, 255, 0)

rgb(0, 128, 0)

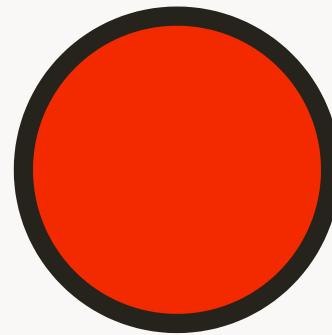




hsl(0, 100%, 50%)

hsl(60, 100%, 37.5%)

hsl(120, 100%, 25%)



?

CSS “Working” Group

Hurry up, add more interpolation modes!



Source: Jen Simmons' Twitter

CSSTransition.setKeyframes()

```
document.addEventListener('transitionrun', evt => {
  if (evt.propertyName !== 'fill') {
    return;
  }

  const transition = evt.target
    .getAnimations()

    .find(animation => animation.transitionProperty === 'fill');

  const keyframes = transition.effect.getKeyframes();
  const hslKeyframes = generateHslKeyframes(
    keyframes[0].fill,
    keyframes[1].fill
  );

  transition.effect.setKeyframes(hslKeyframes);
});
```

`CSSTransition.setKeyframes()` `(Element.getAnimations)`



Nightly



Canary



Tech
Preview



Canary



#7: I want to fly



offset-path

```
.goose {  
  offset-path: path('M100 100...');  
  animation: fly 10s linear infinite;  
}  
@keyframes fly {  
  to { offset-distance: 100%; }  
}
```

offset-path



72+



55+

(⚠ offset-
anchor
preffed off)



x



x



○

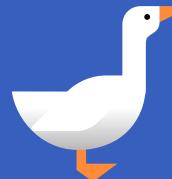
(⚠ offset-
anchor
preffed off)

#8: Performance is painful

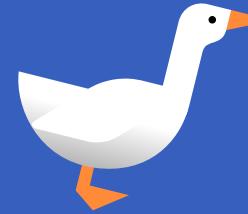
transform and opacity



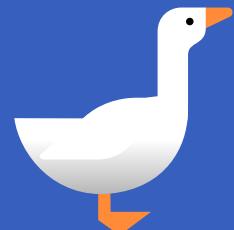
move



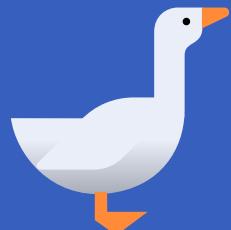
grow



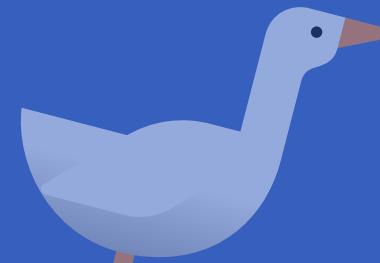
spin



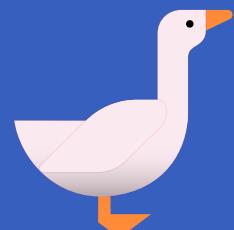
3D



fade



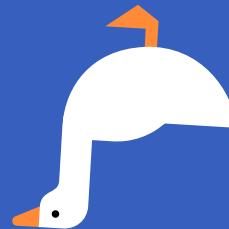
grow + spin + fade



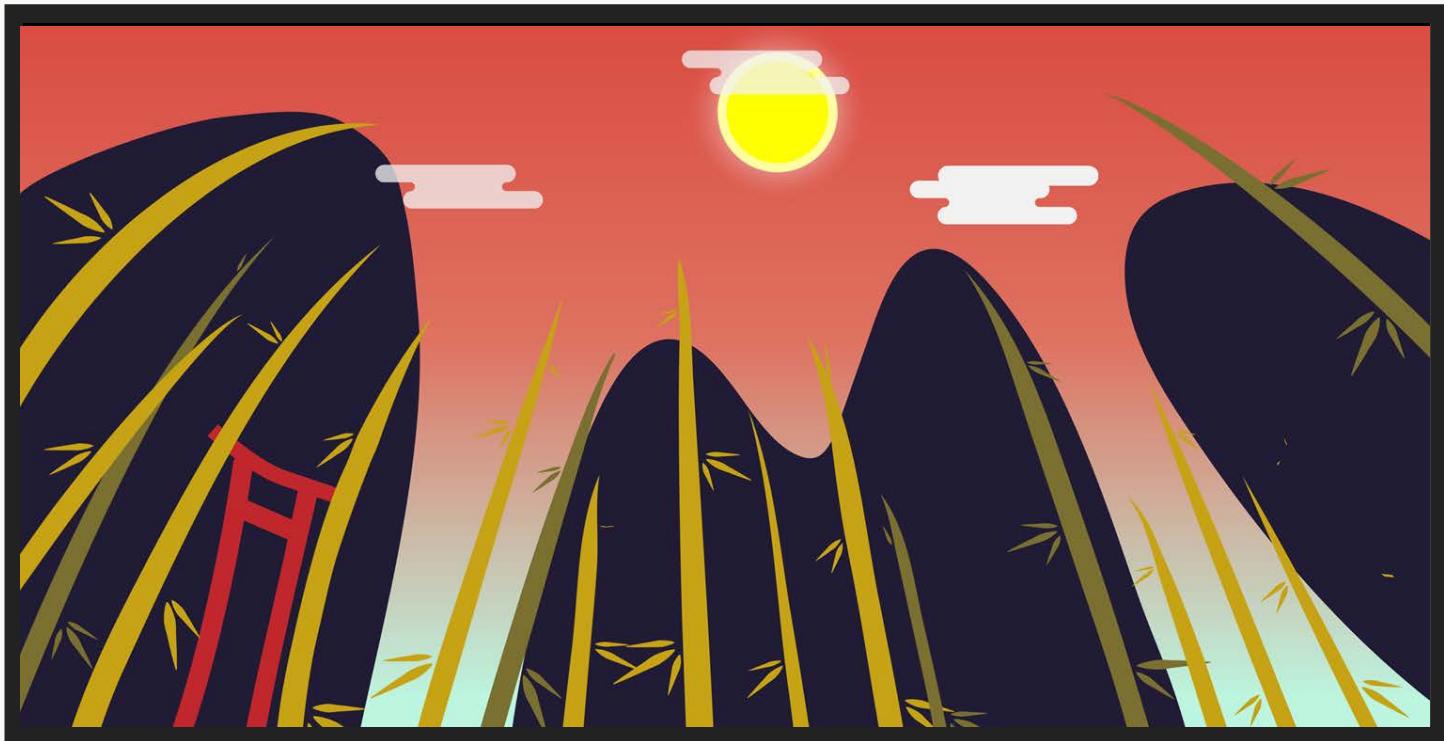
color change



shadow effect

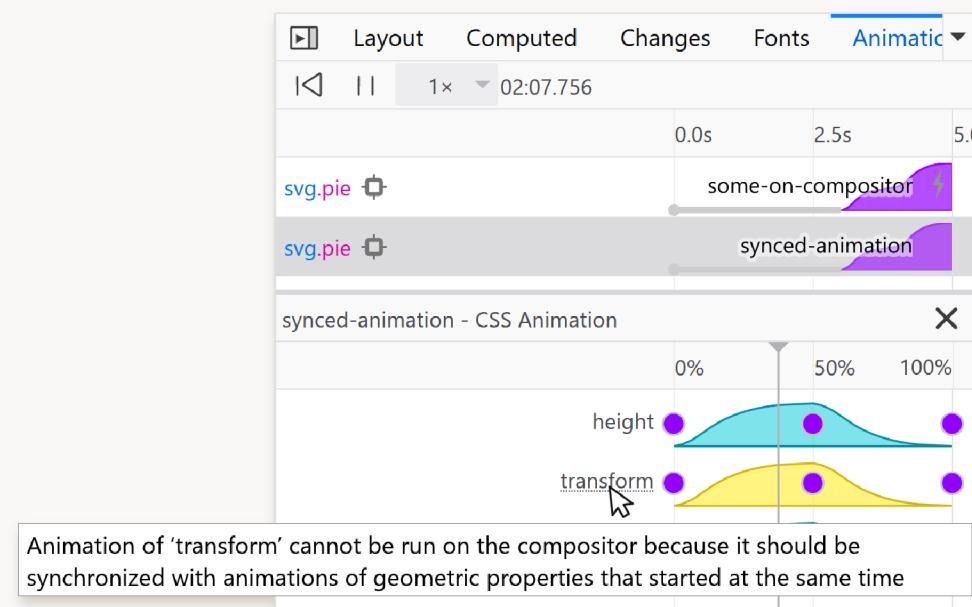
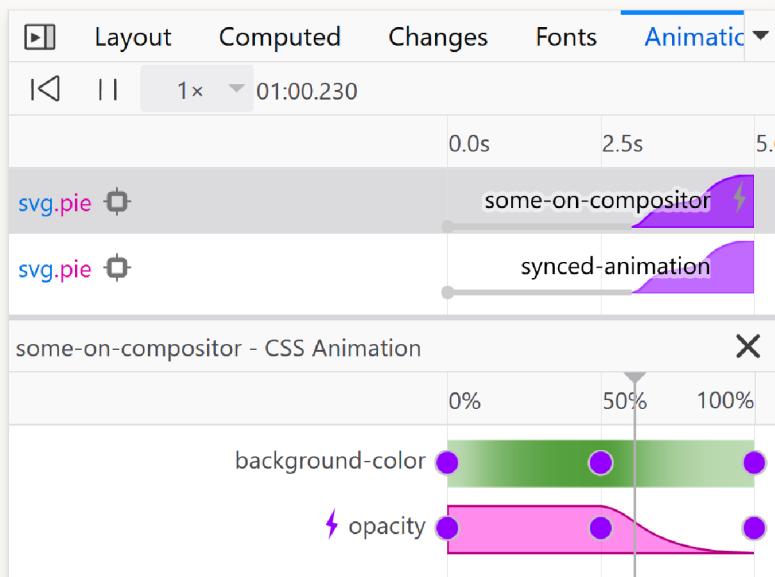


fly



mozanime.github.io/taketori/

Firefox Animation DevTools

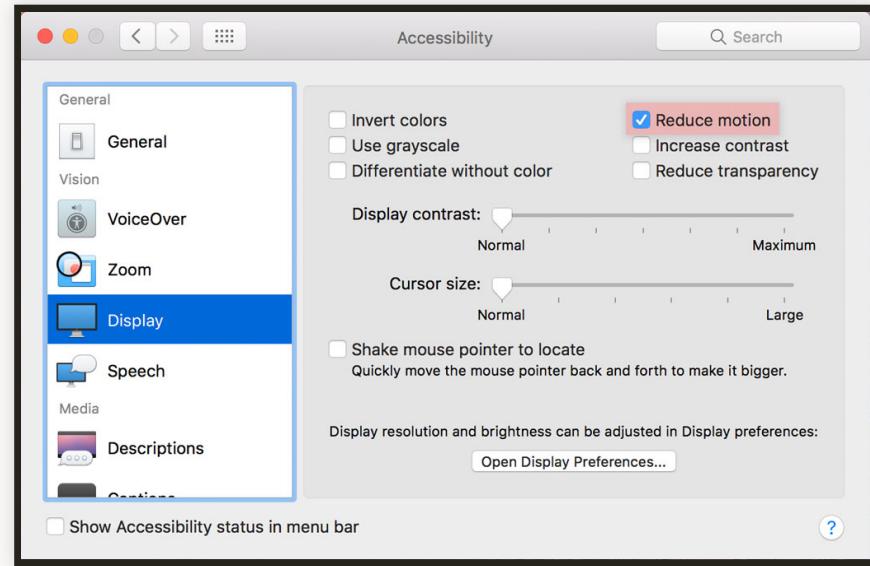
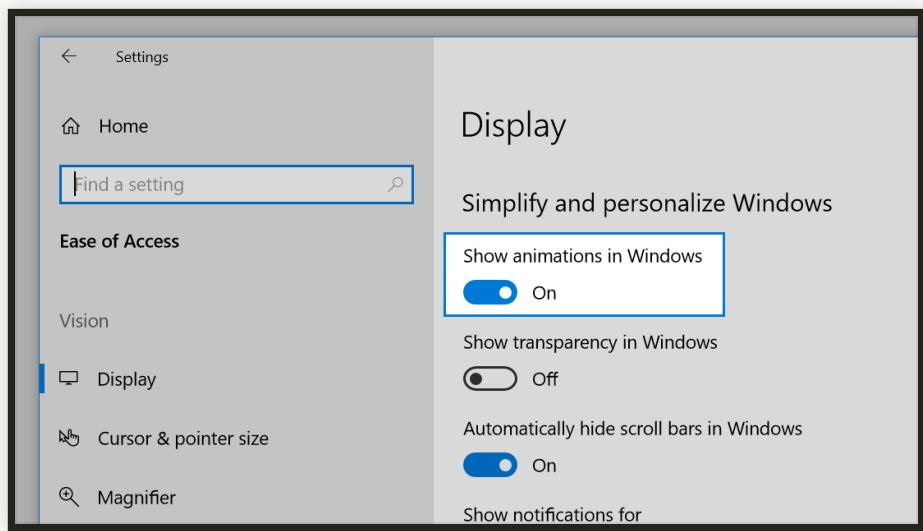


#9: Animations give me a headache

Sick of Animation



Headaches, dizziness, migraines, epilepsy...



Windows

Mac

prefers-reduced-motion: reduce | no-preference

```
div {  
  animation: ...  
  transition: ...  
}  
  
@media (prefers-reduced-motion: reduce) {  
  * {  
    animation-name: none !important;  
    transition-property: none !important;  
  
    /* Or to ensure events still fire, e.g.  
     * transition-duration: 0.01s !important;  
     * transition-delay: 0s !important;  
     * ...  
     */  
  }  
}
```

From JS...

```
// Check for browser support
if (!('animate' in elem)) {
    return;
}

// Check for user support
if (matchMedia(' (prefers-reduced-motion) ').matches) {
    return;
}

// Animate away...
```

prefers-reduced-motion



64+



74+



10.1+



x



O

10 things I hate about animations...

1. Frame-based animations...

`jump-none`

2. Transition bugs...

`transitioncancel`

3. Creating animations from JS...

`Element.animate`

4. Easing the *whole* animation...

`Element.animate`

5. Defining animation *speed*...

`Element.getAnimations`

6. Transition *midpoints*...

`Element.getAnimations`

7. Flying... `offset-path`

8. Performance... Firefox Animation DevTools

9. Headaches...

`prefers-reduced-motion`

10. ...they are too much fun!

Thank you!

birtles.github.io/mozdev2019/



@brianskold



birchill.co.jp