

Spatial Navigation on the Web

TPAC 2018
Breakout Session

Jihye Hong, LG Electronics



Overview

- ❑ Spatial Navigation
- ❑ Use cases
- ❑ Spec
 - Heuristic processing model
 - API
- ❑ Next Steps
- ❑ Demo

Spatial Navigation?

- ❑ Two-dimensional navigation within the pages of web app.
- ❑ Navigate around your pages in an intuitive and robust way in various devices. (TV, PC, IVI, etc)

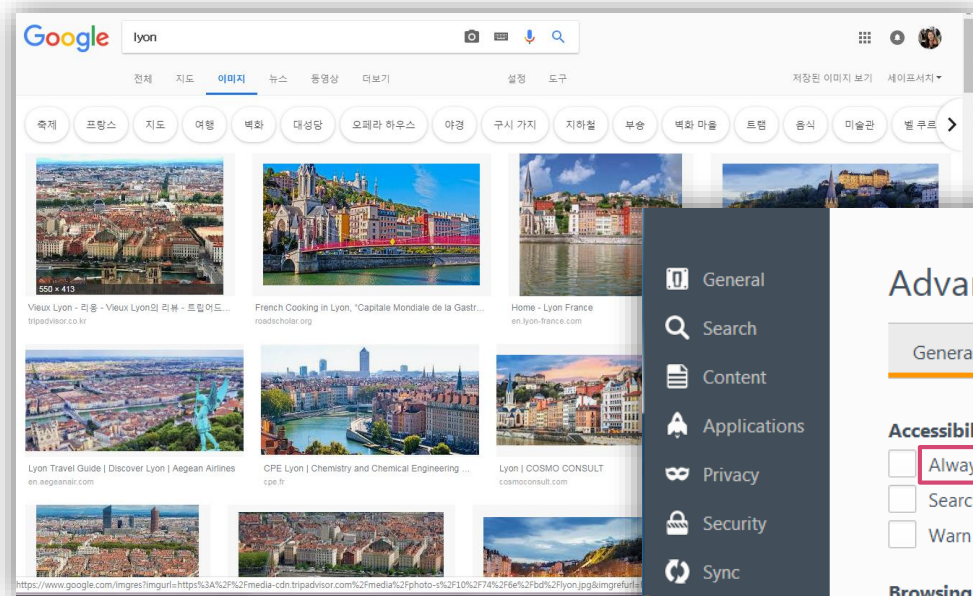


TV Web Application

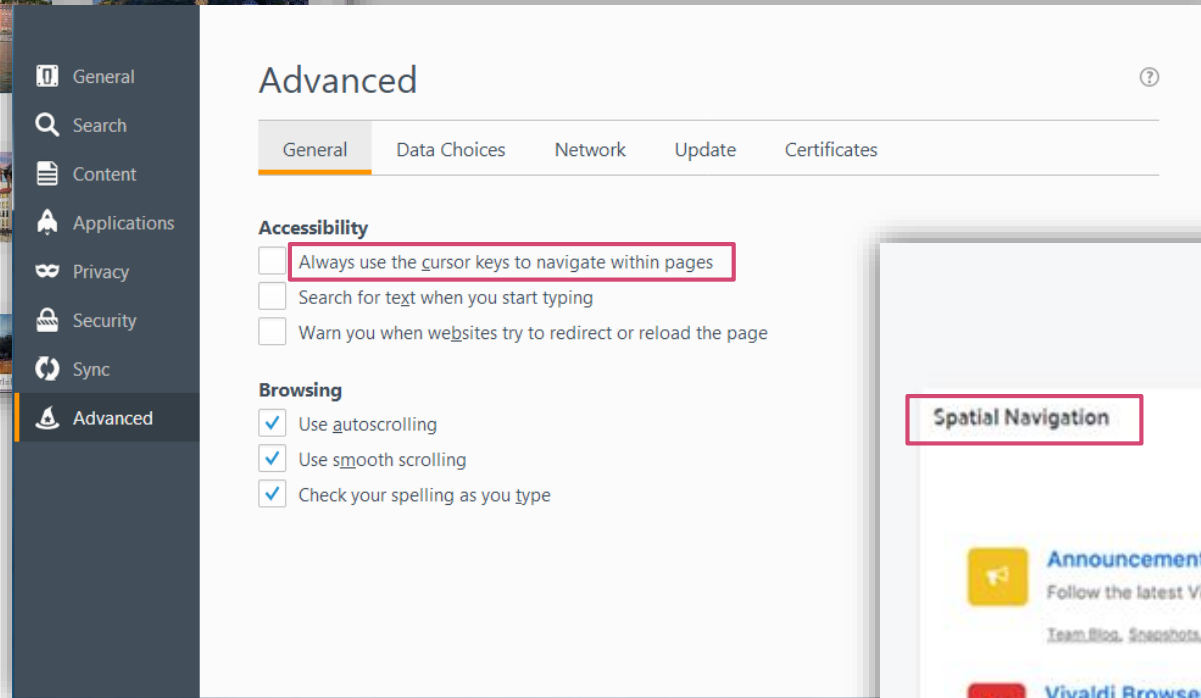


Grid-like Web Application

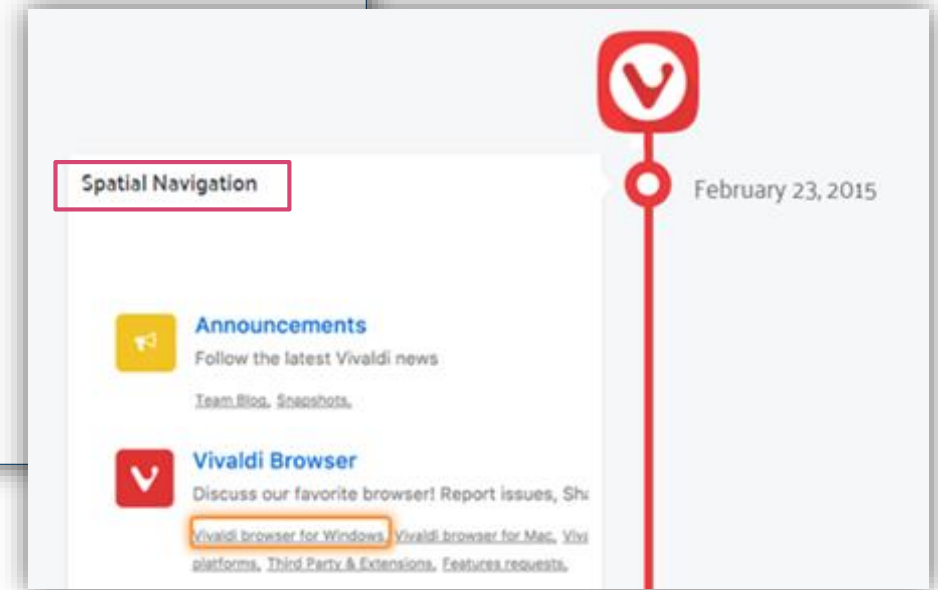
Use cases



Google's Product
(Image Search,
Gmail,
Google Docs)



Directional Cursor Navigation
in Firefox



Spatial Navigation Feature
in Vivaldi

Use cases

THE NETFLIX TECH BLOG [Follow](#)


May 18, 2017 · 7 min read

Pass the Remote: User Input on TV Devices

by [Andrew Eichacker](#)

The Netflix TV team works with device manufacturers to explore new input methods (like your phone!) and [improve the screens](#) we watch our favorite shows on. Beyond that, we're testing the boundaries for content discovery and playback while bringing Netflix to more users around the world.

BBC Home Getting Started Overview Widgets Other JS Doc Testing FAQ



Focus Management

Introduction

Spatial navigation (i.e. navigating around the UI via 5-point navigation) is handled for you by the framework if you make use of the *VerticalList*, *HorizontalList* and *Grid* widgets (or subclasses of them such as *HorizontalCarousel*).

- VerticalList* consumes up and down key events, preventing bubbling of the event to the list's parent widget if it successfully moved the focus to the next/previous item in the list
- HorizontalList* does the same for left and right key events
- Grid* consumes all directional (up, down, left and right) key events

Events that are not consumed bubble up through the Widget tree (not the DOM), until a higher-level widget can consume them. By nesting both Vertical and Horizontal lists within each other, you can build up a complex UI.

For more details about events, please see the [Events](#) section.

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[Download TAR](#)
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npm

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Sort Packages: Optimal, Popularity, Quality, Maintenance, Who's Hiring?

[See all 19 companies](#)

spatial-navigation-polyfill
A polyfill for the spatial navigation
spatial-navigation polyfill web
jihyerish published 1.0.0 · a month ago

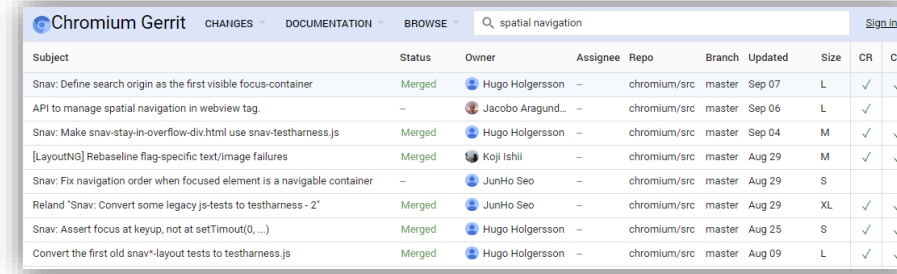
lrud
Left, Right, Up, Down. A spatial navigation library for devices with input via directional controls
tv navigation tv-apps react react-tv focus focus management spatial navigation smart tv
thunderchild15 published 2.6.0 · a month ago

vue-spatialnavigation
Spatial navigation support for VueJS
vue spatial navigation navigation tv typescript keyboard vue-spatialnavigation
twcapps published 1.2.1 · 4 months ago

Need for Standard!

- ❑ Evolving navigation for evolving layout in the web
- ❑ Limitation of JS lib for handling iframe, shadow DOM
- ❑ Less customization for consistent UX

History



Subject	Status	Owner	Assignee	Repo	Branch	Updated	Size	CR	CQ
Snav: Define search origin as the first visible focus-container	Merged	Hugo Holgersson	-	chromium/src	master	Sep 07	L	✓	✓
API to manage spatial navigation in webview tag.	-	Jacobo Aragund...	-	chromium/src	master	Sep 06	L	✓	✓
Snav: Make snav-stay-in-overflow-div.html use snav-testharness.js	Merged	Hugo Holgersson	-	chromium/src	master	Sep 04	M	✓	✓
[LayoutNG] Rebaseline flag-specific text/image failures	Merged	Koji Ishii	-	chromium/src	master	Aug 29	M	✓	✓
Snav: Fix navigation order when focused element is a navigable container	-	JunHo Seo	-	chromium/src	master	Aug 29	S		
Reland "Snav: Convert some legacy js-tests to testharness - 2"	Merged	JunHo Seo	-	chromium/src	master	Aug 29	XL	✓	✓
Snav: Assert focus at keyup, not at setTimeout(0, ...)	Merged	Hugo Holgersson	-	chromium/src	master	Aug 25	S	✓	✓
Convert the first old snav~layout tests to testharness.js	Merged	Hugo Holgersson	-	chromium/src	master	Aug 09	L	✓	✓

17.11

Introduce the Spatial Navigation @W3C TPAC 2017

18.04

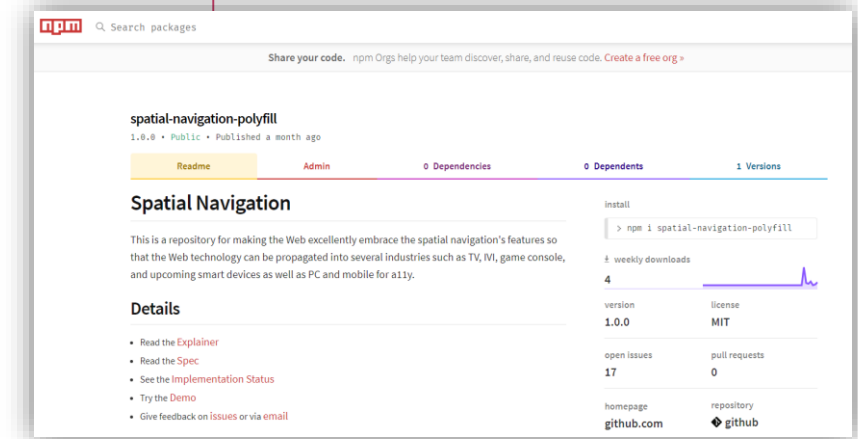
Introduce Spatial Navigation Spec Draft @CSS WG F2F

18.08

Contribute patch (#8) to Chromium upstream about the Heuristic Behavior of Spatial Navigation

18.09

Release polyfill



npm Search packages

Share your code. npm Orgs help your team discover, share, and reuse code. [Create a free org](#)

spatial-navigation-polyfill
1.0.0 • Public • Published a month ago

Readme Admin 0 Dependencies 0 Dependents 1 Versions

Spatial Navigation

This is a repository for making the Web excellently embrace the spatial navigation's features so that the Web technology can be propagated into several industries such as TV, IVI, game console, and upcoming smart devices as well as PC and mobile for a11y.

Install
> npm i spatial-navigation-polyfill

4 weekly downloads

version 1.0.0 license MIT

open issues 17 pull requests 0

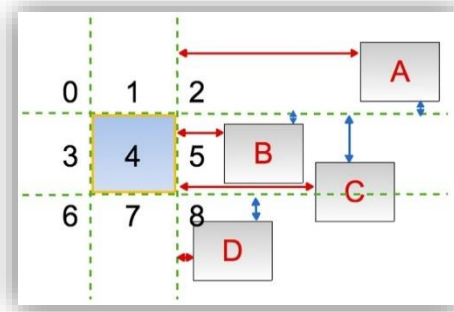
homepage github.com repository github

Details

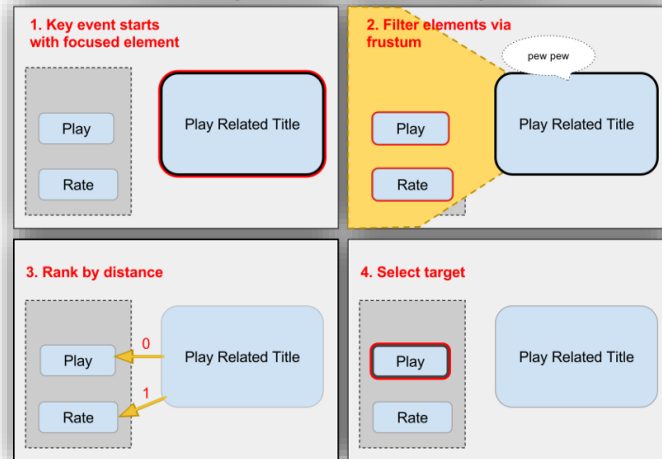
- Read the [Explainer](#)
- Read the [Spec](#)
- See the [Implementation Status](#)
- Try the [Demo](#)
- Give feedback on [Issues](#) or via [email](#)

Find the Primitive Features

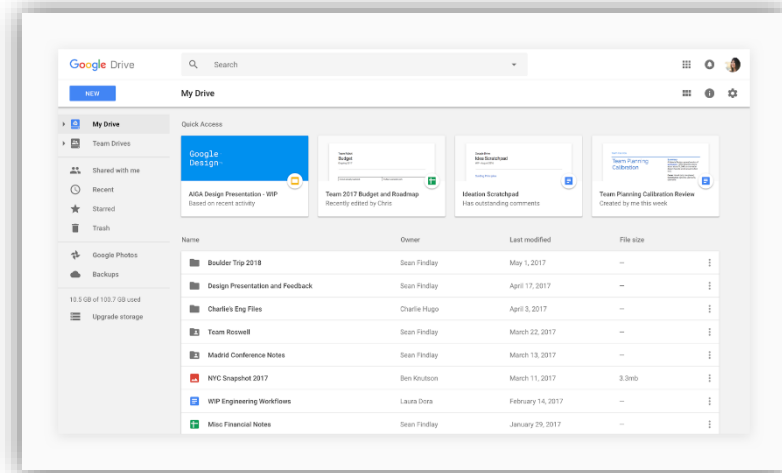
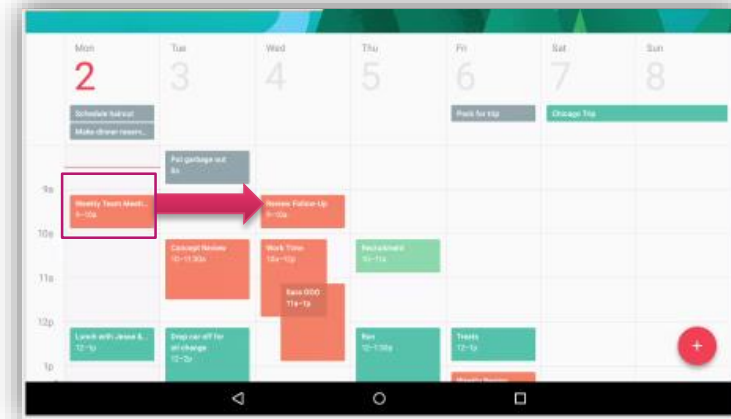
Processing Model



Focusing Left via Spatial Navigation



APIs



Spatial Navigation in WICG

❑ Processing Model

❑ APIs

The screenshot shows a web page for the 'Spatial Navigation' specification. On the left is a 'TABLE OF CONTENTS' with the following items:

- 1 Introduction
- 2 Module interaction
- 3 Overview
- 4 Triggering Spatial Navigation
- 5 JavaScript API
 - 5.1 Triggering Navigation Programmatically
 - 5.2 Low level APIs
- 6 Navigation Events
 - 6.1 Interface NavigationEvent
 - 6.2 Navigation Event Types
 - 6.2.1 navbeforefocus
 - 6.2.2 navbeforescroll
 - 6.2.3 navnotarget
- 7 Processing Model
 - 7.1 Groupings of elements
 - 7.2 Navigation
 - 7.3 Focus Navigation Heuristics

The main content area on the right has the following text:

Spatial Navigation

Editor's Draft, 18 October 2018

This version:
<http://wicg.github.io/spatial-navigation>

Issue Tracking:
[GitHub](#)
[Inline In Spec](#)

Editors:
[Jihye Hong](#) (LG Electronics)
[Florian Rivoal](#) (Invited Expert)

Copyright © 2018 the Contributors to the Spatial Navigation Specification, published by the [Web Platform Incubator Community Group](#) under the [W3C Community Contributor License Agreement \(CLA\)](#). A human-readable [summary](#) is available.

Abstract

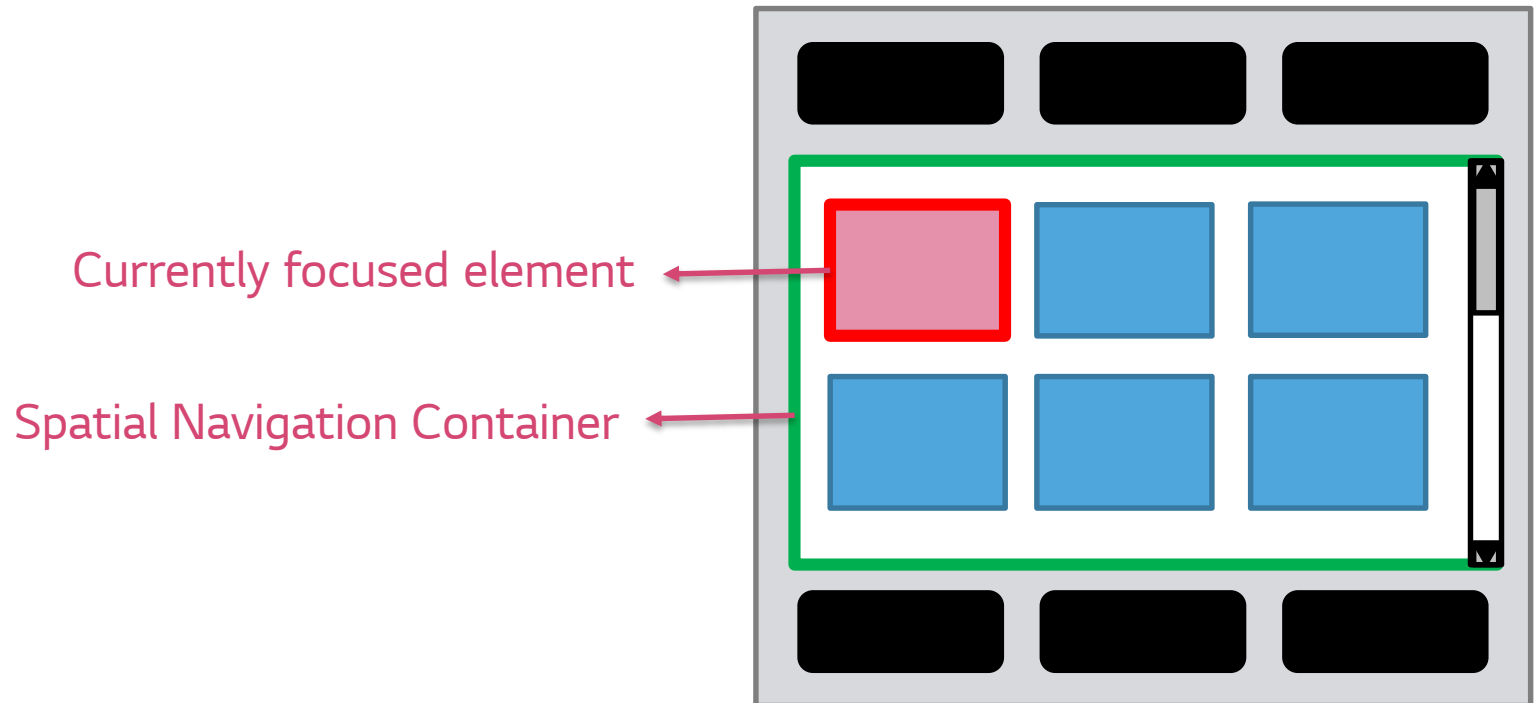
This specification defines a general model for navigating the focus using the arrow keys, as well as related CSS and JavaScript features.

Status of this document

<https://wicg.github.io/spatial-navigation/>

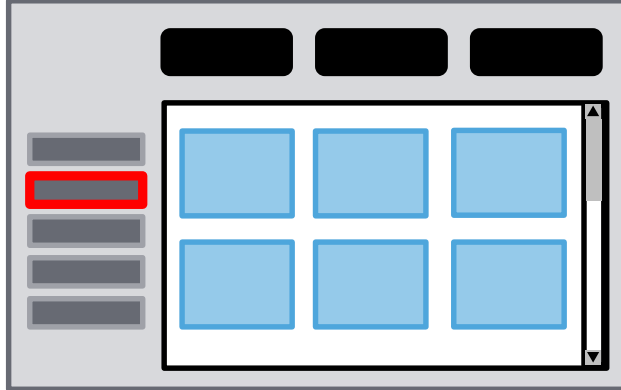
Spatial Navigation Container

- ❑ Scope for searching the focusable elements from the currently focused element
- ❑ Document, scrollable element (by default)

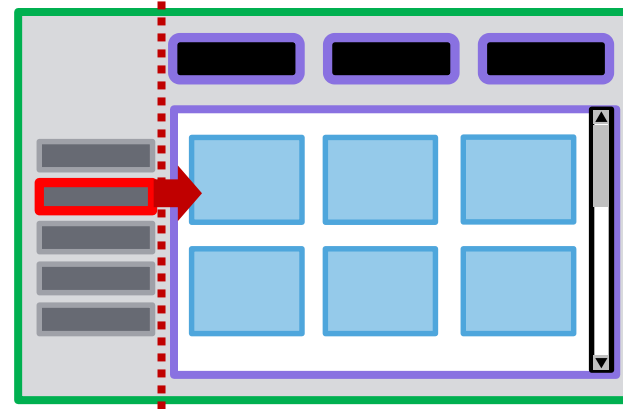


Basic Spatial Navigation Heuristics

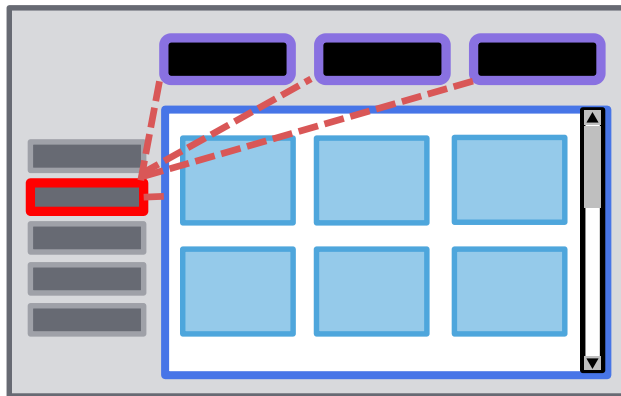
1. Pressing  from an **element**



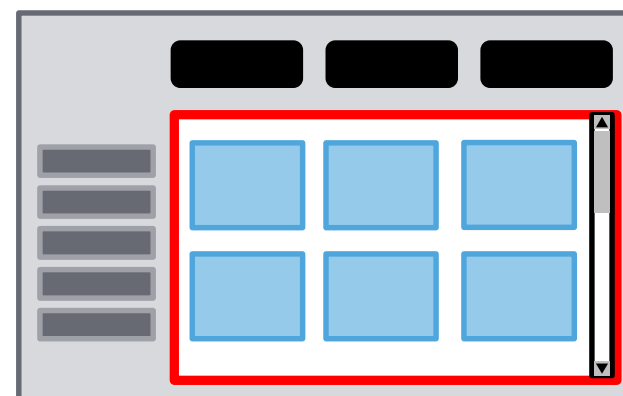
2. Find **candidates** within the **spatial navigation container**



3. Select the **best candidate**



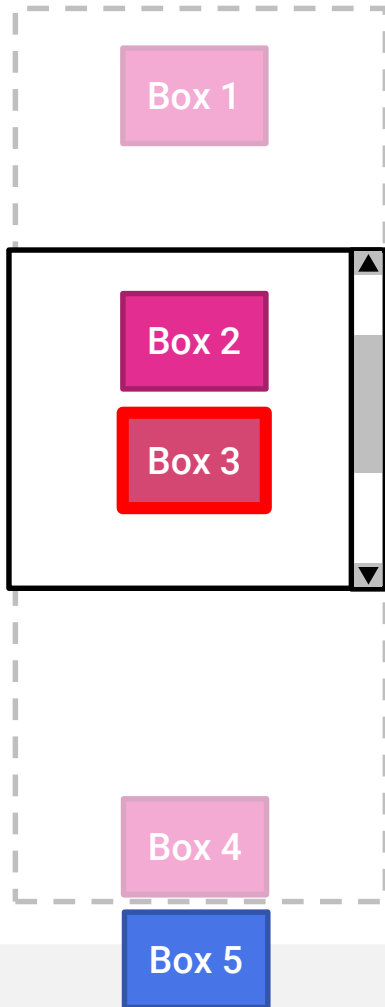
4. **Focus the best candidate**



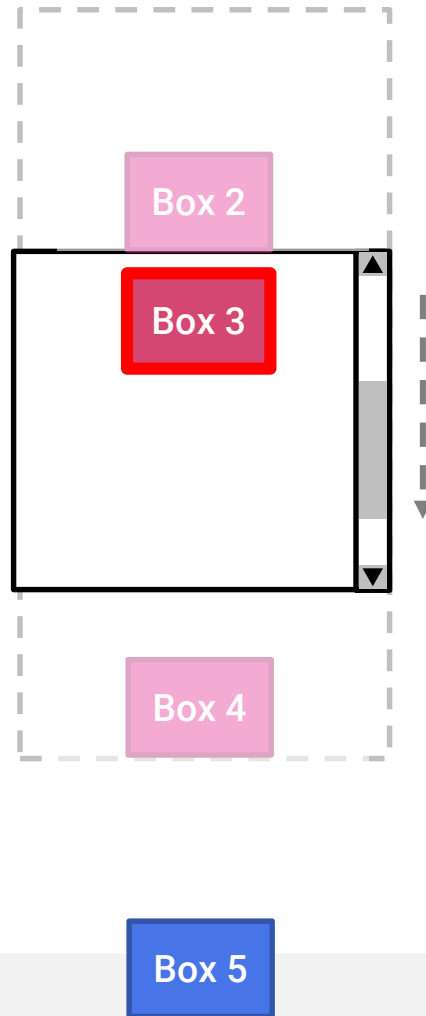
Spatial Navigation Heuristic Behavior

Combining the UA-defined arrow key behaviors

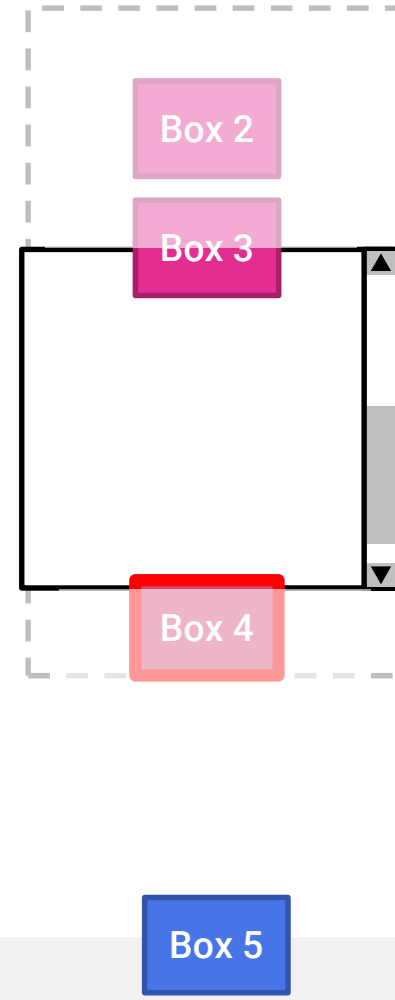
1. Box 3 gains the focus



2. Pressing  triggers the scrolling



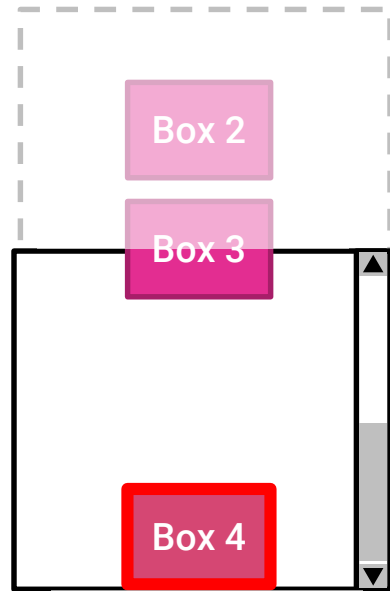
3. Box 4 gains the focus when it comes into the view



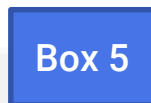
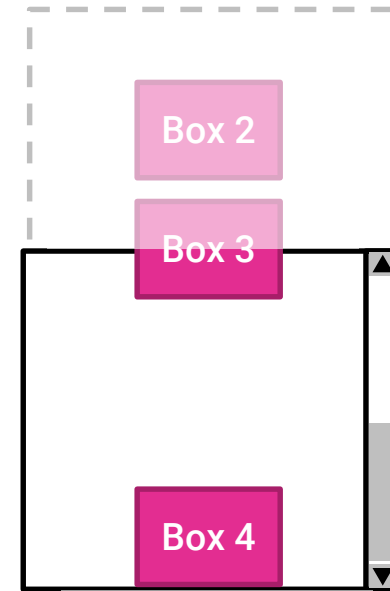
Spatial Navigation Heuristic Behavior

Combining the UA-defined arrow key behaviors

4. Pressing  moves down the scrollbar until the end



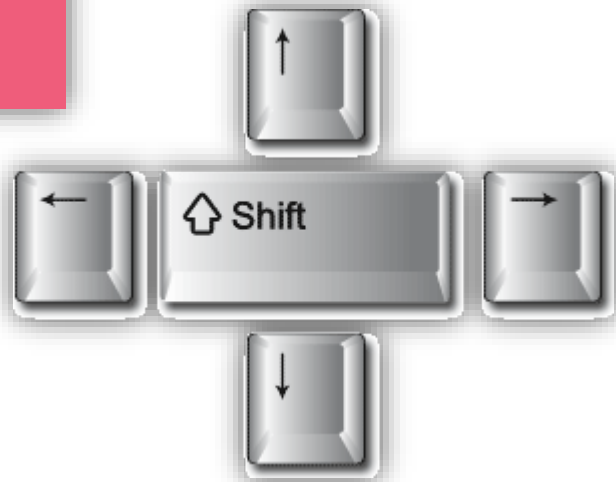
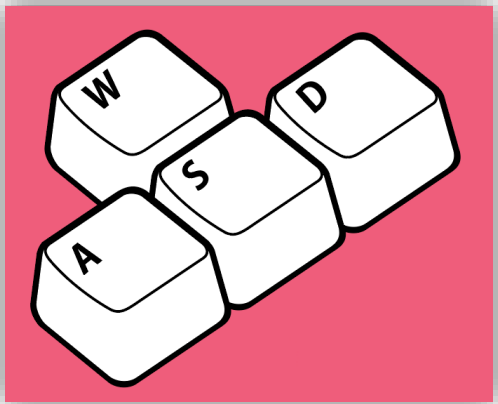
5. Pressing  moves the focus out of the scroll area and Box 5 gains the focus



APIs

❑ window.navigate(direction)

- Move the focus to the best candidate in the corresponding direction
- Mapping other key combinations



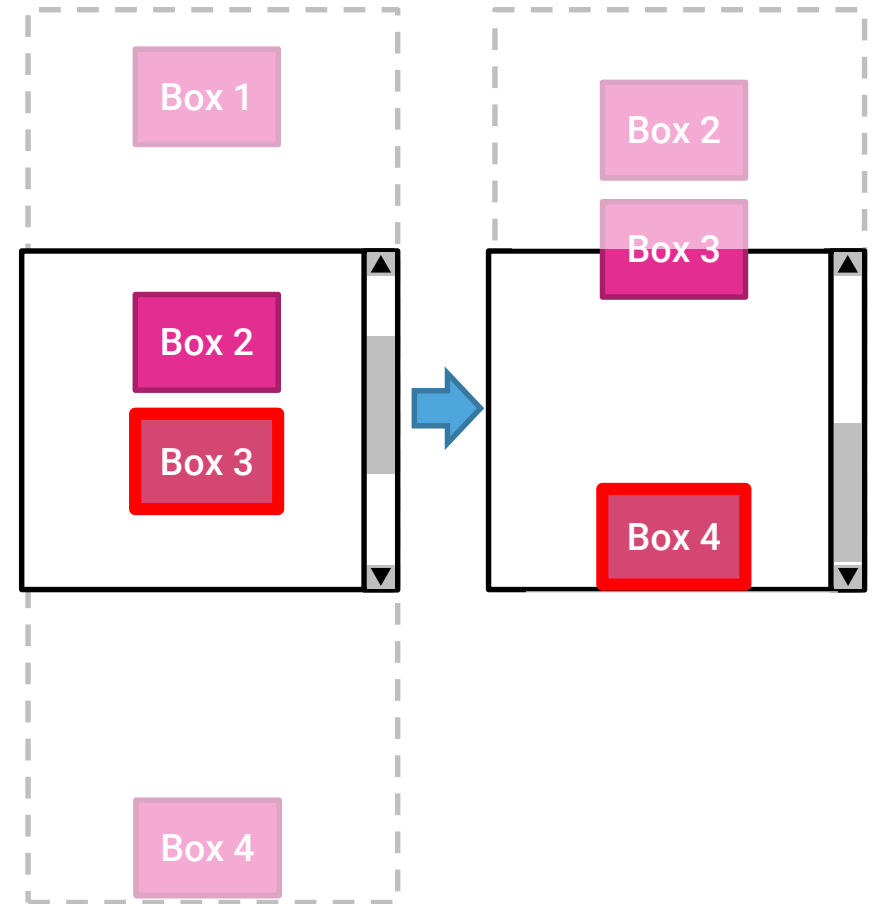
```
const redContainer = document.getElementsByClassName("container c1")[0];
redContainer.addEventListener('keydown', function(e) {
  const dir = WASD_KEY_CODE[e.keyCode];
  if(window.navigate && dir) {
    window.navigate(dir);
    e.preventDefault();
  }
}, true);
```

APIs

❑ `element.focusables(option)`

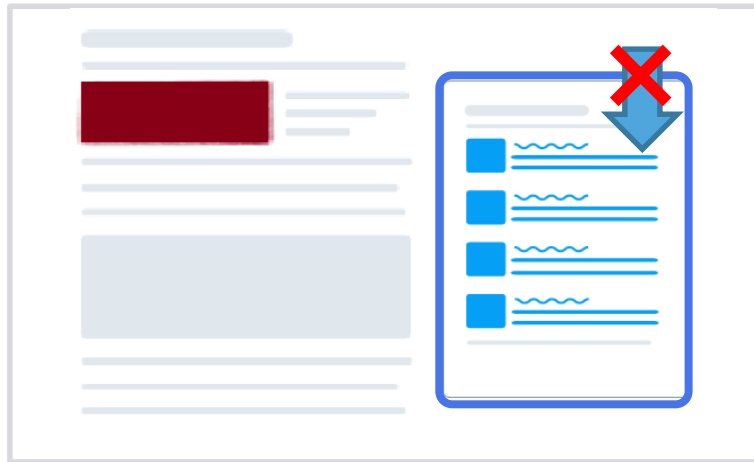
- Finds all the focusable elements inside the container
- Directly move the focus without manually scrolling

```
enum FocusableAreaSearchMode {  
    "visible",  
    "all"  
};  
  
dictionary FocusableAreasOptions {  
    FocusableAreaSearchMode mode;  
};
```

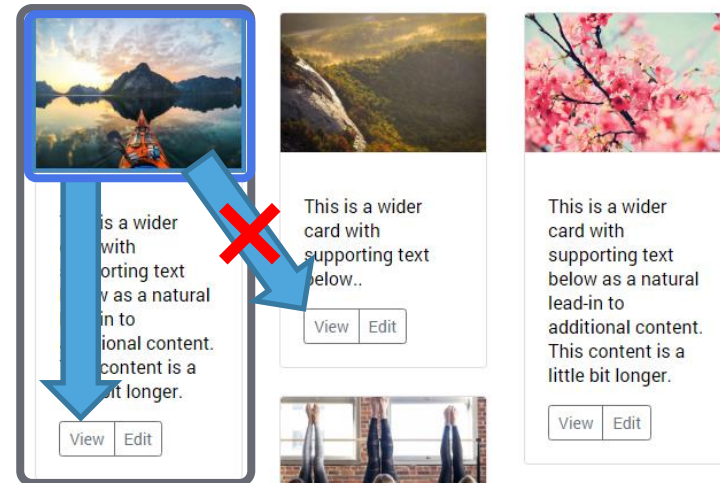


❑ Customize finding the best candidate

- [spatialNavigationSearch\(\)](#), [getSpatialNavigationContainer\(\)](#)
- [Navigate Events](#)
- [spatial-navigation-contain](#) CSS property



Infinite scroll



Grouped elements

❑ Customize finding the best candidate

- CSS UI nav-* properties

- Auto

“The user agent determines which element to navigate the focus to in response to directional navigational input.”

Spatial Navigation Heuristics

§ 5.3. Keyboard control

§ 5.3.1. Directional Focus Navigation: the `'nav-up'`, `'nav-right'`, `'nav-down'`, `'nav-left'` properties

<i>Name:</i>	<code>'nav-up'</code> , <code>'nav-right'</code> , <code>'nav-down'</code> , <code>'nav-left'</code>
<i>Value:</i>	auto <code><id></code> [<code>current</code> <code>root</code> <code><target-name></code>]?
<i>Initial:</i>	auto
<i>Applies to:</i>	all enabled elements
<i>Inherited:</i>	no
<i>Percentages:</i>	N/A
<i>Computed value:</i>	as specified
<i>Canonical order:</i>	per grammar
<i>Animation type:</i>	discrete

<https://drafts.csswg.org/css-ui/#nav-dir>

Try the Spatial Navigation!

Spatial Navigation Laboratory

All demo pages support spatial navigation. Please use arrow keys for moving the focus.

- Introduction
- Processing model
 - Default focus moving
 - Overflow regions
 - Scrollable region
 - <iframe> element
 - <input> elements
 - Spatnav container
- API Function
 - getSpatnavContainer
 - focusableAreas
 - spatNavSearch
 - navigate
- Web applications

This site aims to show several behaviors of spatial navigation using [a polyfill](#).

Please use only arrow keys with several shortcuts to navigate all pages.

Submit bug reports, requests and comments on [github issues](#).

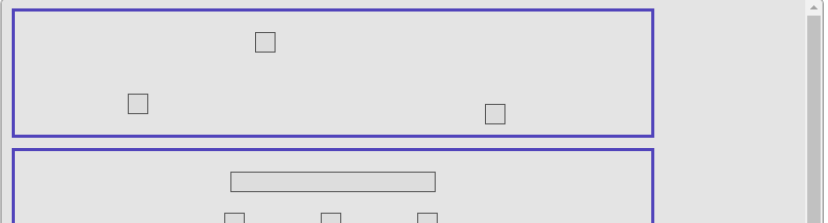
1. Why spatial navigation?

[Introduction of spatial navigation](#)

2. Processing model

* **Default focus moving behavior**

You can check the **default spatial navigation behavior using arrow keys**.



<https://wicg.github.io/spatial-navigation/demo/>

<https://www.npmjs.com/package/spatial-navigation-polyfill>

Next Steps

□ Implementation

- Google
 - Chromium Open Source, Accessibility
- Vewd
 - Chromium Patch and Spec Reviews
- Vivaldi
 - Investigating about applying the Spatial Navigation

Next Steps

□ Spec Extension

- Handling the various focusable elements
- Improving the distance function
- Managing the focus

Focusable Elements - Browser Compatibility Table

The following tables show which elements individual browsers consider focusable or tabbable (keyboard focusable). The tables are based on the [focusable test document](#).

Note that touch devices (without a physical keyboard) only show elements as tabbable (keyboard focusable), that can be navigated to through the on-screen keyboard (or "v-keyboard").

Table Of Contents

- [Document Elements](#)
- [Form Control Elements](#)
- [Form Element](#)
- [Fieldset Element](#)
- [Label Element](#)
- [Editable Elements](#)
- [TabIndex Attribute](#)
- [Navigation Elements](#)
- [Image Maps](#)
- [Media Elements](#)
- [Shadow DOM](#)
- [Iframe Element](#)
- [Embed Element](#)
- [Object Element](#)
- [SVG Element](#)
- [SVG foreignObject element](#)
- [SVG use element](#)
- [SVG Document in Iframe Element](#)
- [SVG Document in Embed Element](#)
- [SVG Document in Object Element](#)
- [Hidden Attribute](#)
- [CSS Property Visibility](#)
- [Canvas Fallback Content Elements](#)
- [Details Element](#)
- [Scrollable Elements](#)
- [Image Element Ismap Attribute](#)
- [CSS Flexbox Layout](#)
- [Table Elements](#)
- [Questionable Elements](#)
- [Footnotes](#)

<https://allyjs.io/data-tables/focusable.html>

Discussion

❑ Open Questions

- <https://github.com/WICG/spatial-navigation/blob/master/explainer.md#open-questions>

❑ Github issues

- <https://github.com/WICG/spatial-navigation/issues>

WICG / spatial-navigation

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Code Issues 18 Pull requests 1 Projects 0 Wiki Insights Settings

Filters is:issue is:open Labels Milestones New issue

18 Open 45 Closed Author Labels Projects Milestones Assignee Sort

- 🟢 Moving the focus to a fragmented target `topic:spec`
#124 opened 3 days ago by frivoal
- 🟢 Tweak the distance function to prioritize elements that are aligned `needs:feedback` `topic:spec` `type:bug`
#122 opened 3 days ago by frivoal
- 🟢 Improve the name of window.navigate `needs:feedback` `topic:spec` `type:question`
#120 opened 3 days ago by frivoal
- 🟢 Improve the distance function `topic:polyfill` `topic:spec` `type:enhancement`
#114 opened 9 days ago by jihyerish
- 🟢 Revise selecting best candidate policy `needs:laison` `topic:spec` `type:question`
#94 opened on 20 Aug by junhoseo

Thank you! :)

