

Accessible Charts by Means of SVG and WAI-ARIA

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Outline

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ARIA Charts

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Types of Data Visualisations

Which ones are we talking about ?

- ▶ only charts of tabular data
- ▶ important term: each item of the data is called **data point**

bar charts : x-y-coordinate system,
data points shown by **lengths of bars**

line charts : x-y-coordinate system,
data points shown by **positions of curve**

... many other types, beyond the scope of this presentation

Presenting Charts without Vision (1/2)

Numerous Solutions

- ▶ tactile graphics: static and refreshable
- ▶ acoustic exploration: speech and non-speech sounds (aka. sonification)
- ▶ multi-modal systems: combinations of several strategies

Presenting Charts without Vision (2/2)

Numerous Solutions

Screen-Reader-Friendly Output

- ▶ textual output of the chart
- ▶ can be read by screen readers
- ▶ can be navigated by keyboard
- ▶ for example, produced by certain Web software for charts such as Highcharts and FusionCharts
- ▶ How to do this ?

How to Make Accessible Digital Charts

- ▶ define chart **not** by visual layout but instead by **data and semantics**
- ▶ store data and semantics in machine-readable format along with visual chart
- ▶ recommended techniques to do this: SVG and ARIA

Scalable Vector Graphics (SVG)

- ▶ XML-based language for storing graphics, standardised by World Wide Web Consortium (W3C)
- ▶ defines graphics by text elements and attributes, for example: `<circle>`, `<line>`, `<rect>` (for rectangular boxes), `<path>` (for irregular shapes), ...
- ▶ advantages: less data, machine-readable, graphics structured by objects
- ▶ moreover: elements for **including text**: `<text>`, `<title >`, `<desc>`

Accessible Rich Internet Applications (1/2)

- ▶ text attributes for annotating Web content with data and semantics
- ▶ standardised by Web Accessibility Initiative (WAI) of W3C, therefore also called WAI-ARIA
- ▶ originally intended for Web pages and apps
- ▶ can also be used for graphics !

Accessible Rich Internet Applications (2/2)

The Basics

- ▶ special attributes assigned to HTML or SVG elements
- ▶ **role** states meaning of element,
examples: `role="button"`, `role="checkbox"`,
`role="article"`, ...
- ▶ **properties** attach data and other information to element,
examples: `aria-label="..."`, `aria-describedby="..."`,
`aria-haspopup="true"`, ...
- ▶ dozens of roles and properties defined
for Web pages and apps

ARIA Charts (1/2)

The Problem

- ▶ no dedicated roles and properties standardised for charts yet
- ▶ however, various solutions proposed on the Web
- ▶ part of my thesis: discussion of these solutions and derivation of a new proposal with as many standard keywords as possible
- ▶ role examples: `role="chart"`, `role="datapoint"`, `role="xaxis"`, ...

ARIA Charts (2/2)

Simplified Code Snippet of Sample Chart

```
<svg role="chart" aria-charttype="bar" ...>  
  <text role="heading">Fruit Consumption in 2020</text>  
  
  <g role="xaxis" aria-label="Fruit" ...> ... </g>  
  ...  
  <g role="dataset">  
    <rect role="datapoint" aria-label="Apples" ...>  
      <text role="datavalue" ...> 25 </text>  
    </rect>  
    ...  
  </g>  
  
</svg>
```

The AChart Software Project (1/3)

- ▶ AChart = Accessible Chart
- ▶ practical part of my thesis
- ▶ consists of 2 main components

AChart Creator : tool for producing SVG-ARIA charts
from tabular data (CSV files)

AChart Interpreter : Web app for exploring SVG-ARIA
charts by screen reader and keyboard

The AChart Project (2/3)

AChart Interpreter Live Demo

... Or try it yourself on:

<https://www.student.tugraz.at/kopel>

The AChart Project (3/3)

Future Work

- ▶ support for more chart types and higher dimensions
- ▶ sonification of data
- ▶ automatic overall chart descriptions (using AI algorithms)
- ▶ make it a browser extension
for use with arbitrary Web pages
- ▶ support for touch-sensitive tactile displays
↳ multimodal exploration !

**Thank you
for your attention !
Questions ?**