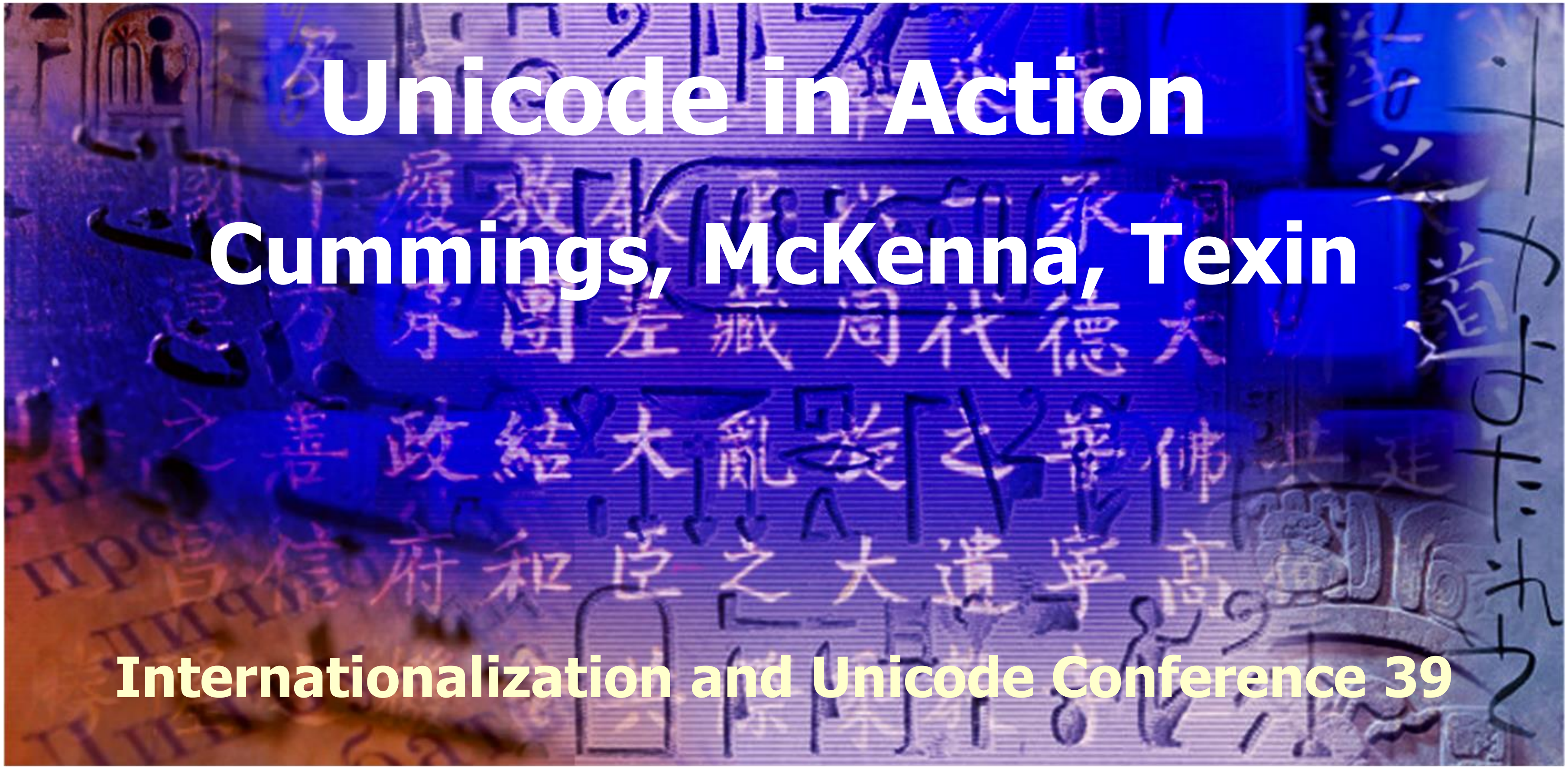


Unicode in Action

Cummings, McKenna, Texin

Internationalization and Unicode Conference 39

October 26, 2015

Presenters

- Tex Texin

  Globalization Architect, XenCraft

- Craig R. Cummings

  Principal Software Engineer - Internationalization, Informatica

- Michael McKenna

  I18n Product Owner, PayPal, Inc.

Code

- The demo code will be available on I18nGuy.com shortly after the conference

Abstract Unicode in Action

- The Unicode in Action tutorial is a 90 minute session that demonstrates programming with Unicode and related best practices.
- This tutorial will build a simple application and demonstrate the code and resulting behavior as internationalization functions are added. Attendees will be able to relate these prototype examples to the requirements of their own applications and reference them to code solutions.
- The program will show sorting of different strengths, regular expressions, Unicode normalization, bidirectional languages, and other features of the Unicode standard. The tutorial will highlight why each of these functions are needed so you can determine when to use them in your applications.

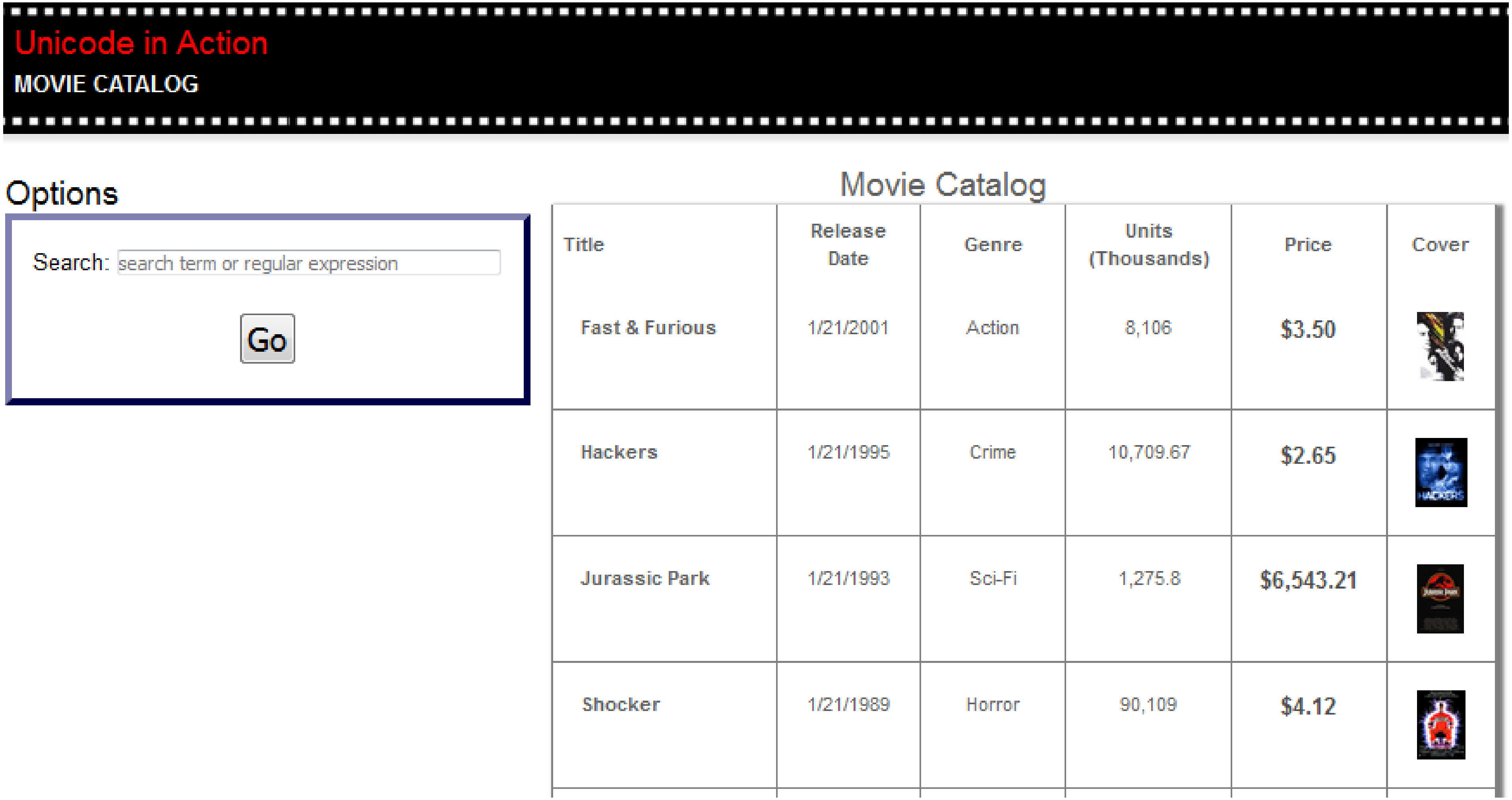
Objectives

- Be introductory level
- Simple examples
- The program will show
  - sorting of different strengths,
  - regular expressions,
  - Unicode normalization,
  - bidirectional languages,
  - and other features.
  - Highlight the need for these features.

Base Program – Movie Catalog

- Our first example is a simple movie catalog.
- It could be any business application, listing products, customers, etc.
- It demonstrates typical data requirements:
  - text, dates, numbers, currencies, taxonomies, images.
- It is written in HTML5 and JavaScript
  - For simplicity and availability
  - Turns out, not all that portable. Firefox for now

Base Program – Movie Catalog



Unicode in Action

MOVIE CATALOG

Options

Search: search term or regular expression

Movie Catalog

Title	Release Date	Genre	Units (Thousands)	Price	Cover
Fast & Furious	1/21/2001	Action	8,106	$3.50	
Hackers	1/21/1995	Crime	10,709.67	$2.65	
Jurassic Park	1/21/1993	Sci-Fi	1,275.8	$6,543.21	
Shocker	1/21/1989	Horror	90,109	$4.12	

Simple Code HTML5 and JavaScript

HTML Excerpts

```
<!DOCTYPE html>
<html>
<head>
    <meta charset="utf-8">
    <title>Unicode in Action Movie Catalog</title>
    <link href="css/styles.css" rel="stylesheet“>
</head>
<body>
…
<h1>Options</h1>
<form id="options" name="settings"
        onsubmit="return myControls();" >
    <p>Search: <input type="text" name="search" size="40"
            placeholder="search term or regular expression"></p>

    <div class="controlbuttons">
        <input type="submit" value="Go">
    </div>
</form>
```

```
<div id="datalist">

<table class='products-list'>
    <caption>Movie Catalog</caption>
  <tr id="prodheading">
    <th>Title</th><th>Release Date</th><th>Genre</th><th>Units<br>(Thousands)</th><th>Price</th><th>Cover</th></tr>

    <tbody id="id01">

    </tbody>
</table>
</div>
</td></tr>
</table>
```

Simple Code HTML5 and JavaScript

JavaScript Excerpts

```
 <script type="text/javascript">
   function getProducts() {
       var products = readjson("","products.json");
       showProducts(products);
   }

   function myControls(){
       UIApattern =
        document.forms["settings"]["search"].value;

       getProducts();
       return false;
   }

   function myimage (value) {
     var intlvalue = "<img alt='movie cover
photo‘  src='" + value  + "'>";
   return(intlvalue);
   }
</script>
```

```
/* return true for records that do not match*/
function searchFilter(testValue, matchPattern) {
    var exclude = false;
    if (matchPattern == "") {
        return (exclude);
    }
  var REpattern = new RegExp(matchPattern,
"i");

exclude = (testValue.search(REpattern) == -1) ;
    /* if not found, exclude = true */
return (exclude);
}
```

Simple Code HTML5 and JavaScript

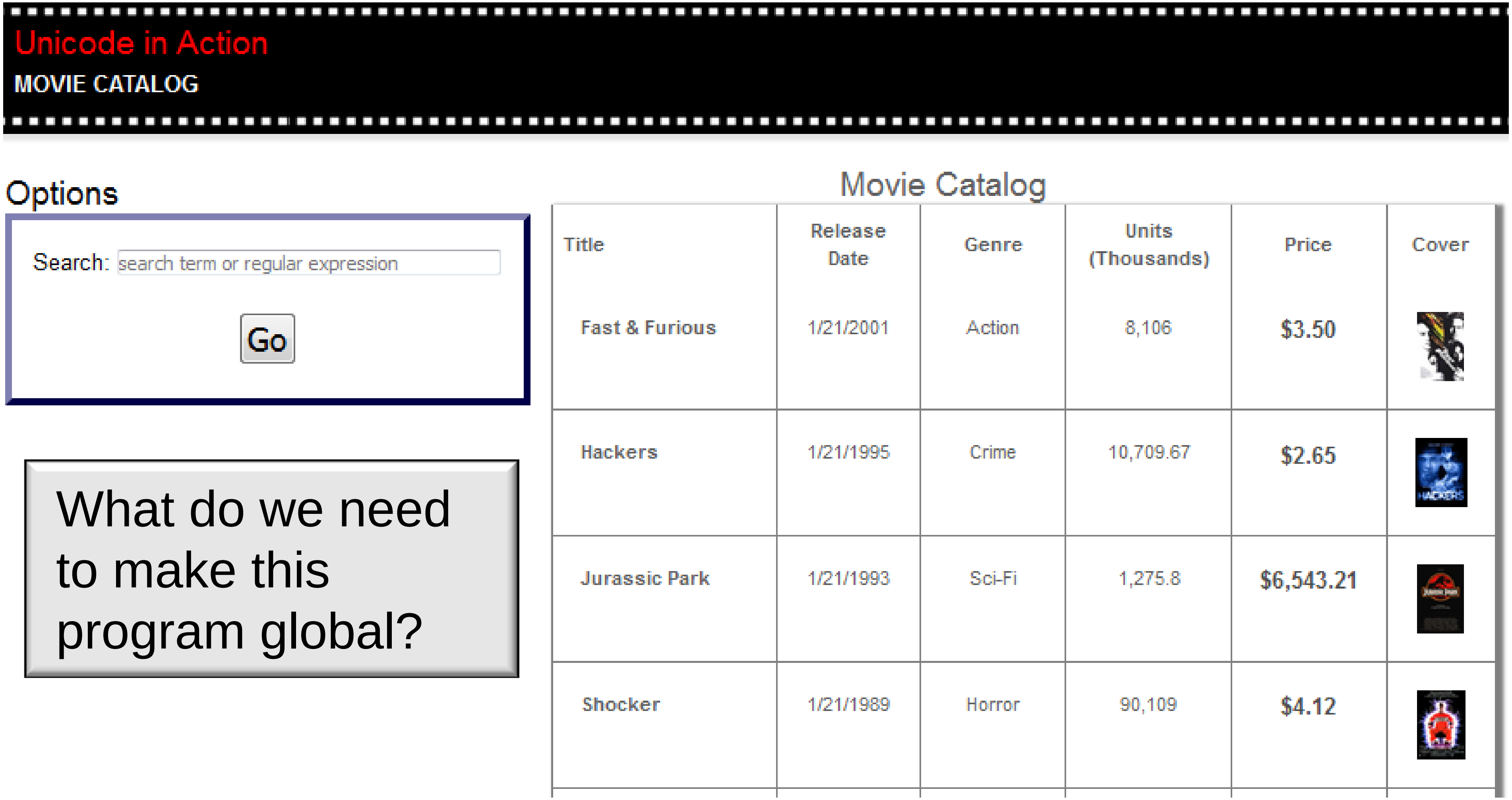
JavaScript Excerpts

```
function showProducts(data)    {
  var i;
  var out = "";
  for(i = 0; i < data.length; i++) {
      if (searchFilter(data[i].title, UIApattern)) {
            continue;
      }

    out += "<tr><td>" + data[i].title   +  "</td><td>" +   mydate(data[i].specs.year)  +   "</td><td>"   +
        mygenre(data[i].specs.genre) + "</td><td>" +   mynumber(data[i].specs.duration) +  "</td><td>“  +
        mycurrency(data[i].price)        +  "</td><td>“ +   myimage( data[i].image.small)       +  "</td></tr>\n";
 }

   document.getElementById("id01").innerHTML = out;
}
```

Base Program – Movie Catalog



Unicode in Action

MOVIE CATALOG

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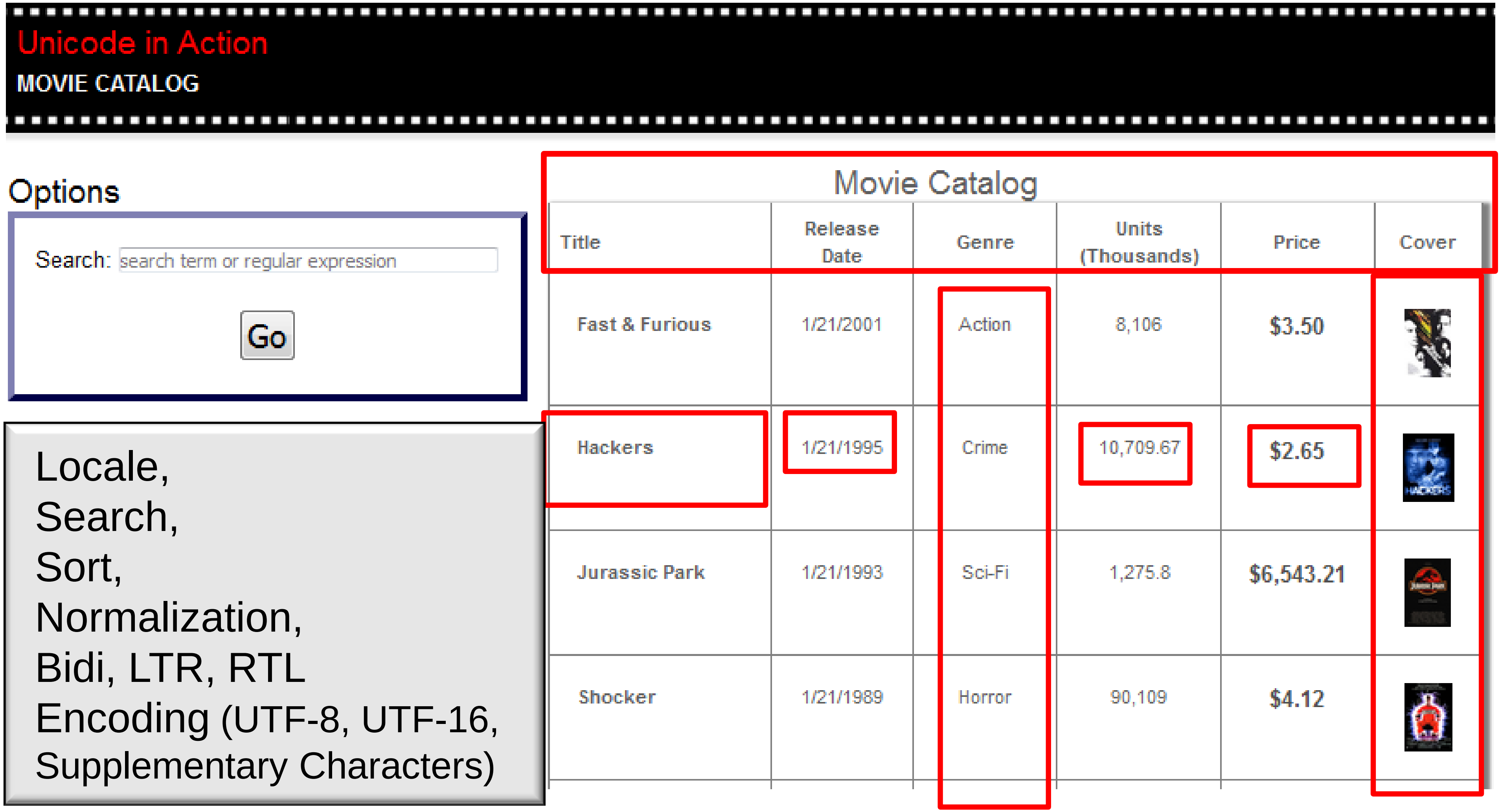
What do we need to make this program global?

Base Program – Movie Catalog



Unicode in Action

MOVIE CATALOG

Options

Search: search term or regular expression

Go

Movie Catalog

Title	Release Date	Genre	Units (Thousands)	Price	Cover
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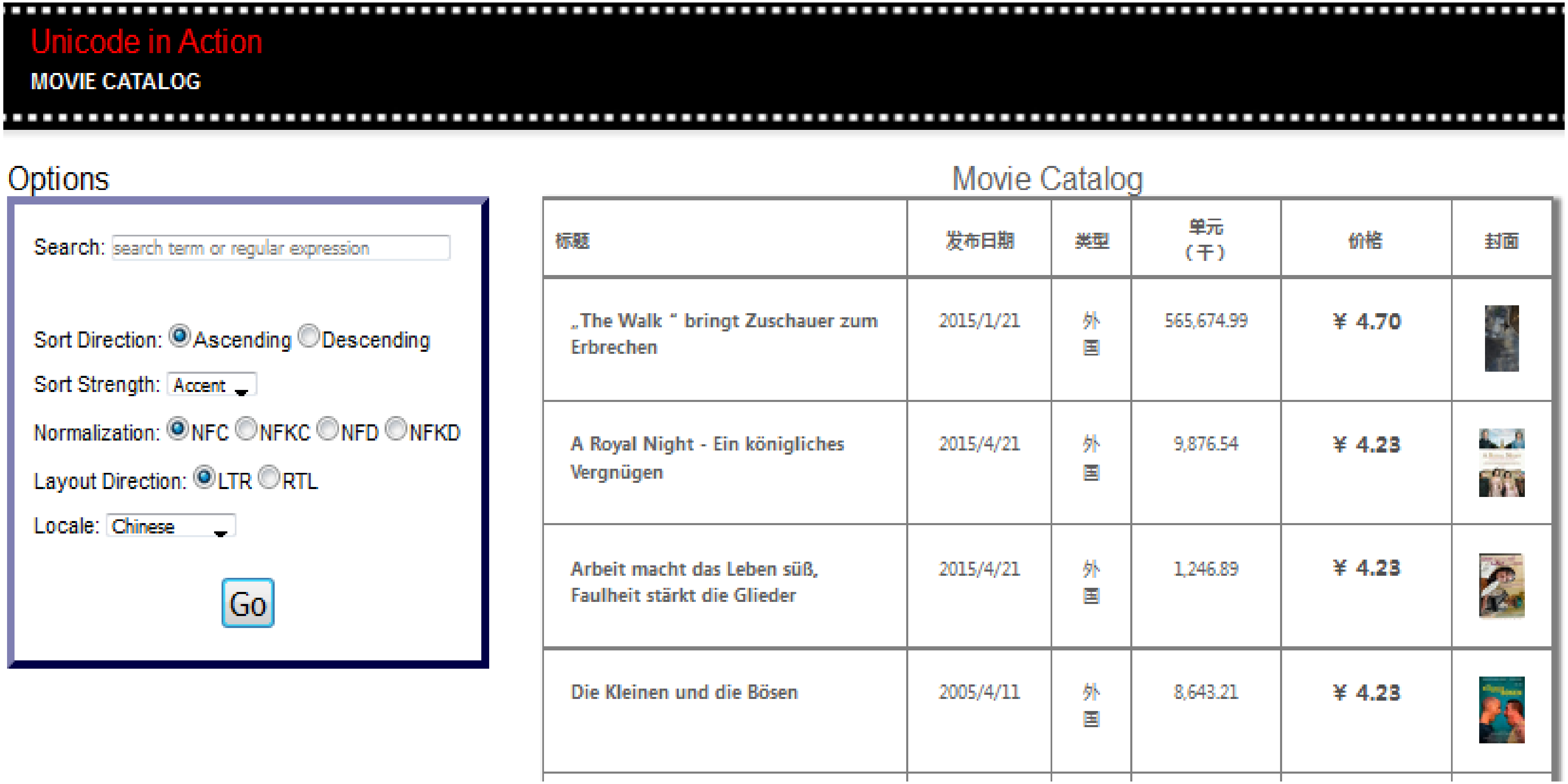
Locale,
Search,
Sort,
Normalization,
Bidi, LTR, RTL
Encoding (UTF-8, UTF-16,
Supplementary Characters)

Internationalized Movie Catalog



Unicode in Action

MOVIE CATALOG

Options

Search: search term or regular expression

Sort Direction: ● Ascending ○ Descending

Sort Strength: Accent

Normalization: ● NFC ○ NFKC ○ NFD ○ NFKD

Layout Direction: ● LTR ○ RTL

Locale: Chinese

Movie Catalog

标题	发布日期	类型	单元 （千）	价格	封面
„The Walk “ bringt Zuschauer zum Erbrechen	2015/1/21	外国	565,674.99	¥ 4.70	
A Royal Night - Ein königliches Vergnügen	2015/4/21	外国	9,876.54	¥ 4.23	
Arbeit macht das Leben süß, Faulheit stärkt die Glieder	2015/4/21	外国	1,246.89	¥ 4.23	
Die Kleinen und die Bösen	2005/4/11	外国	8,643.21	¥ 4.23	

Internationalized Movie Catalog Features

- Uses locales
  - (en-US, de-DE, zh-CN, sv, ar)
- Localized headings, taxonomy
- Formatted data (date, number, price)
- Normalization of input
- Localized sort
- Bidi

Normalization

Tex Texin

Internationalization Architect

Canonical & Compatibility Normalization

- Unicode characters can have more than 1 representation
- Canonical equivalence
  - Indistinguishable, fundamental equivalence
  - E.g. combining sequences, singletons
  - “Å” U+00C5 (A-ring pre-composed)
  - “A+˚ ” U+0041 + U+030A (A + combining ring above)
  - “Å” U+212B (Angstrom)
- Compatibility equivalence
  - E.g. Formatting differences, ligatures
  - “ｶ” U+FF76 “カ” U+30AB (KA half and full width)
  - “ﬁ” U+FB01 (ligature fi)

Unicode Normalization Forms

- Unicode Consortium has defined canonical and compatibility decomposition formats and 4 different sets of rules for normalization:

“ Unicode Normalization Forms”

http://www.unicode.org/unicode/reports/tr15/

	Composed	Decomposed
Canonical	NFC	NFD
Canonical+ Kompatibility	NFKC	NFKD

Sorting

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Internationalization Architect

Collation

- Dependencies
- Language
- Application
  - Dictionary
  - Phonebook
- “Strength”
  - Accent
  - Case
  - Ignorables

Example Collation Differences

Language	Swedish:	z < ö
	German:	ö < z
Usage	Dictionary:	öf < of
	Telephone:	of < öf
Customizations	Upper–first	A < a
	Lower–First	a < A

Comparison Levels

Level	Description	Examples
L1	**Base characters**	**role < roles < rule**
L2	**Accents**	**role < rôle < roles**
L3	**Case**	**role < Role < rôle**
L4	**Punctuation**	**role < “role” < Role**
Ln	**Tie-Breaker**	**role < ro□le < “role”**

Box represents format character

Purple chars more significant than differences indicated by underscores

Accent Ordering

Forward Accent Ordering	**cote < coté < côte < côté**
French Accent Ordering	**cote < côte < coté < côté**

French gives more weight to accents at the end of the string than the beginning.
Cote and Coté are more similar in forward ordering, but in French, Côte orders between the two.

Language Identifiers

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Internationalization Architect

Language Identification

- HTTP: `Content-Language` header
- HTML: `LANG` attribute (e.g. in `<html>`)
- XML: `xml:lang` attribute
- **`<p xml:lang="la" lang="la">Verba.</p>`**
- XHTML 1.1: `xml:lang` attribute

BCP47 Language Identifiers

language-extlang-script-region-variants-extensions-privateuse

Subtag	Standard	Syntax	Examples
Language	ISO 639	2 or 3 letter code	en, yue
Extlang	ISO 639-2	3 letter code	(Legacy only) zh-yue
Script	ISO 15924	4 letter code	Latn, Cyrl, Hans, Hant
Region	ISO 3166 UN M49	2 letter code 3 digit code	US, GB 419
variants			
extensions			
privateuse			

http://www.iana.org/assignments/language-subtag-registry

Example Language Identifiers

Tag	Language	Tag	Language
en	English	zh	Chinese
en-US	American English	zh-Hant	Traditional Chinese
es-US	Spanish as spoken in U.S.	zh-Hans	Simplified Chinese
en-CA	Canadian English	cmn	Mandarin
fr-CA	Canadian French	yue	Cantonese
fr-FR	French French	cmn-Hans-CN	Mandarin for China in Simplified Chinese
es-ES	Iberian Spanish	cmn-Hant	Mandarin in Traditional Chinese
es-419	Latin American Spanish	pt-BR	Brazilian Portuguese
es-MX	Mexican Spanish	zh-yue	retired, use yue instead
		zh-CN	Chinese spoken in China

Language Identification – CSS

There are two methods to refer to the language attribute in CSS:

- The `lang` pseudo-class.

```
*:lang(zh)  { font-family:SimSun }
```

- The attribute selector.

```
*[lang|=fr] { font-weight:bold }
```

- Both use the same matching mechanism as the `lang()` function in XPath.

➔ Example: LanguagesCSS.htm

Text Layout Standards

More content and example code are available at:

www.xencraft.com/training/webstandards.html

Feature
Lang()
Lang pseudo-class
Lang attr selector
Quote:qo
Text-transform
Css list-style-type
Xsl number

Feature
Xsl format-number
Html bi-directional text
Css bi-directional text
Vertical text (SVG losing ground)
Ruby annotation
Css3 combined sort
Xsl:sort

Bidirectional Support

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Bidirectional (Bidi) Language Support

- HTML 4 DIR attribute

  dir="ltr" | dir="rtl"

  - Sets base direction
  - Direction is inherited
- Direction affects alignment and flow
  - Ordering of text and table columns
  - Text alignment, Alignment of overflowing blocks
- Control Characters
  - Right to Left and Left to Right Marks &rlm;/&lrm;
  - Useful for correct positioning of neutrals

Bidirectional (Bidi) Language Support

- HTML 5 – Isolates

  <bdi dir=rtl> </bdi>

- Flow doesn’t change with container changes!
- DIR=AUTO
  - Detects direction, based on first strong character
- CSS Selectors
  - :dir (rtl) for rtl elements
  - :dir(ltr) for ltr elements

Bidi References

- W3C Bidi Tutorial
  - www.w3.org/International/tutorials/bidi-xhtml/
- Inline markup and bidirectional text in HTML
  - www.w3.org/International/articles/inline-bidi-markup/
- Additional Requirements for Bidi in HTML and CSS
  - www.w3.org/TR/html-bidi/
- Unicode Bidirectional Algorithm
  - (Unicode Standard Annex #9)
  - www.unicode.org/reports/tr9/
- A Tale of Opposing Directions: Bidirectional Text in HTML and CSS
  - Elika J. Etemad (fantasai) Mozilla Project W3C CSS Working Group
  - fantasai.inkedblade.net/style/talks/bidi/

Character Counting

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Character Counting, Indexing, Length

- How long is a string?
  - Ångstrom 8 or 9 characters
  - ﬁre 3 or 4 characters
  - 😧 1 or 2 characters?

Character Counting, Indexing, Length

- How long is a string?
  - Ångstrom 8 or 9 characters
    - 8 if composed characters, 9 if combining
    - A + combining ring above U+030A
  - fire 3 or 4 characters
    - 3 if “fi” is a ligature U+FB01
  - 😱 1 or 2 characters?
    - 1 if an abstract character 0x1F631
    - 2 if UTF-16 code units \uD83D\uDE31
    - www.i18nguy.com/unicode/surrogatetable.html

Character Counting, Indexing, Length

- Beware inconsistencies in your code as well as your platforms
  - JavaScript supports 6 digit escapes 0x1F631
  - JSON uses surrogates \uD83D\uDE31
  - string.length counts abstract characters
  - string.substring counts code points
  - Both treat combining characters as separate characters
  - Both treat a ligature as one character
    - Normalization can aid consistency

Internationalized Code

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HTML5 Language, Direction, Encoding

```
<!DOCTYPE html>
<html lang="en" dir="ltr" id="html01">
<head>
    <meta charset="utf-8">
```

Locale Aware Collation

```
function collSort(data, locale, sortDir, strength) {
  var coll = Intl.Collator(locale, {sensitivity :strength});

  for (var i = data.length - 1; i >= 0; i--) {

    for (var j = 0; j < i; j++) {
      if (sortDir == "asc") {
       if (coll.compare(data[j].title, data[j+1].title)> 0)   _swap(data, j, j+1);
      } else
        if (coll.compare(data[j].title, data[j+1].title)< 0)  _swap(data, j, j+1);
    }
  }
}
```

Locale Aware Data Formats

```
function mydate (value) {
    var datevalue= new Date(value);
    var intlvalue = new
         Intl.DateTimeFormat(UIAlocale).format(datevalue);
    return(intlvalue);
}

function mynumber (value) {
    var intlvalue = new
                  Intl.NumberFormat(UIAlocale).format(value);
    return(intlvalue);
}
```

Locale Aware Data Formats

```
function mycurrency (value) {
  var currencylist =
    {'en-US': 'USD',  'de-DE':'EUR', 'zh-CN': 'CNY', 'ar': 'SAR', 'sv': 'SEK'};

    var mycur = currencylist[UIAlocale];

    var intlvalue = new Intl.NumberFormat( UIAlocale, {
        style: 'currency',  currency: mycur
         }).format(value);
    return(intlvalue);
}
```

Questions

Tex Texin

“**XenCraft**”, “**TexTexin**” and “**I18nGuy**” are Trademarks of Tex Texin.

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Tex is an industry thought leader specializing in business and software globalization services. His expertise includes global product strategy, Unicode and internationalization architecture, and cost-effective implementation and testing. Over the past two decades, Tex has created numerous global products, led internationalization development teams, and guided companies in taking business to new regional markets.

Tex is a contributor to internationalization standards for software and on the Web.

Tex is a popular speaker at conferences around the world and provides on-site training on Unicode, internationalization, and globalization QA worldwide.

Tex is the author of the popular, instructional web site www.I18nGuy.com

Tex is founder and Chief Globalization Architect for XenCraft. XenCraft provides global business consulting and software design, implementation, test and training services on globalization product strategy and software internationalization architecture.