<Links>
Web programming without tiers

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Team Links

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Coauthors

Cooper, Topor & Yallop

Buneman & Wong

Hejlsberg & Meijer

Hasoya & Pierce

Boag, Chamberlin, Fernandéz, Florescue, Robie, & Siméon

Graunke, Findler, Krishnamurthi & Felleisen

Quenniec

Graham

Armstrong, Virding, Williams, & Wikström

Eich

A Grand Challenge

Design a programming language with
a sound basis in theory that becomes the
leader in its domain.

A *Jolly Good* Challenge

Design a programming language with a sound basis in theory that becomes the leader in its domain.

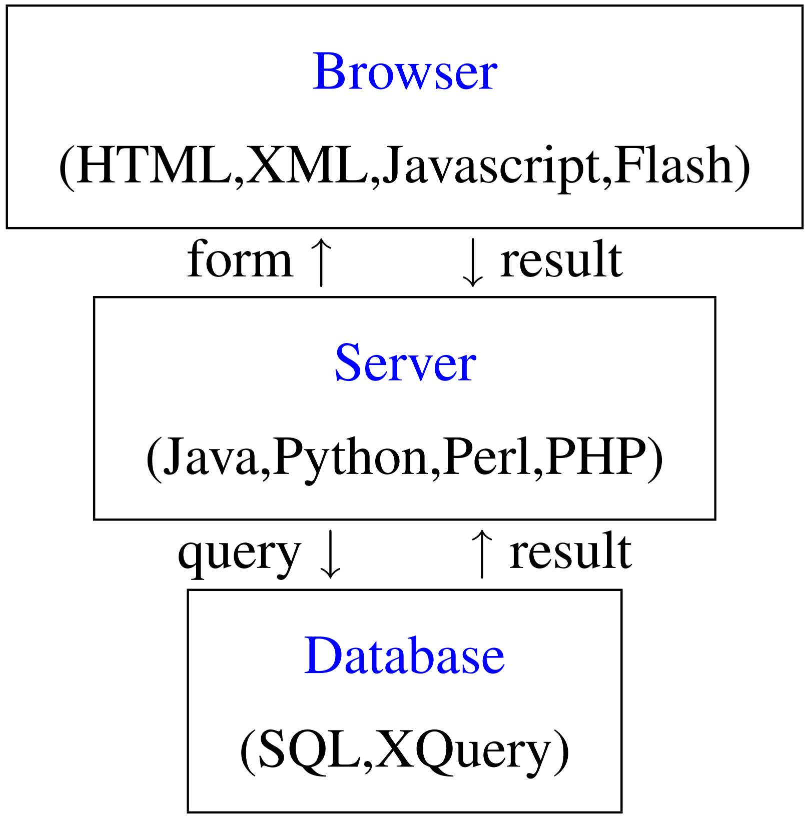
Wadler’s theorem of language adoption

A programming language will be adopted
if and only if
it permits its users to
do something that cannot be done in any other way.

Wadler's theorem of language adoption

A programming language will be adopted
if and only if
it permits its users to
boldly go where no progamming language has gone before.

Three-tier model



Links builds on successes of functional programming

- Databases Kleisli, LINQ
  Compile Links into SQL, XQuery
- XML Xduce, XQuery
  XML support with regular expression types
- Continuations PLT Scheme, Yahoo stores
  Continuations for web dialogue
- Distribution Erlang, JoCaml
  Reliablity as in Erlang/OTP
- Javascript AJAX
  Compile Links into Javascript

Part I

Kleisli:

Comprehensions for Queries

Comprehensions

$$[\,(x,y) \mid x \leftarrow [1,2,3],\; y \leftarrow [\text{‘a’}, \text{‘b’}]\,]$$

$$=$$

$$join\,[\,[\,(x,y) \mid y \leftarrow [\text{‘a’}, \text{‘b’}]\,] \mid x \leftarrow [1,2,3]\,]$$

$$=$$

$$join\,[\,[\,(x, \text{‘a’}), (x, \text{‘b’})\,] \mid x \leftarrow [1,2,3]\,]$$

$$=$$

$$join\,[\,[(1, \text{‘a’}), (1, \text{‘b’})],\; [(2, \text{‘a’}), (2, \text{‘b’})],\; [(3, \text{‘a’}), (3, \text{‘b’})]\,]$$

$$=$$

$$[\,(1, \text{‘a’}), (1, \text{‘b’}), (2, \text{‘a’}), (2, \text{‘b’}), (3, \text{‘a’}), (3, \text{‘b’})\,]$$

Monads and Comprehensions

$$
\begin{array}{lrcl}
(1) & [\, t \mid () \,] & = & \mathit{unit}\; t \\
(2) & [\, t \mid x \leftarrow u \,] & = & \mathit{map}\; (\lambda x.\, t)\; u \\
(3) & [\, t \mid (p, q) \,] & = & \mathit{join}\; [\, [\, t \mid q \,] \mid p \,] \\
\\
(1') & \mathit{unit}\; x & = & [\, x \,] \\
(2') & \mathit{map}\; f\; xs & = & [\, f\; x \mid x \leftarrow xs \,] \\
(3') & \mathit{join}\; xss & = & [\, x \mid xs \leftarrow xss,\; x \leftarrow xs \,]
\end{array}
$$

Monad laws and Comprehension laws

$$
\begin{array}{lrcl}
(I) & join \cdot unit & = & id \\
(II) & join \cdot map\, unit & = & id \\
(III) & join \cdot join & = & join \cdot map\, join \\
\\
(I') & [\, t \mid (),\ q \,] & = & [\, t \mid q \,] \\
(II') & [\, t \mid q,\ () \,] & = & [\, t \mid q \,] \\
(III') & [\, t \mid (p,\ q),\ r \,] & = & [\, t \mid p,\ (q,\ r) \,]
\end{array}
$$

Relational Data

BOOKS

title	isbn	year
What Can You Do With a Shoe?	0613733266	1997
Where the Wild Things Are	0060254920	1963

AUTHORS

author	isbn
Beatrice Schenk de Regniers	0613733266
Maurice Sendak	0613733266
Maurice Sendak	0060254920

Relational Query

SQL

```
select b.title, a.author
from BOOKS b, AUTHORS a
where b.isbn = a.isbn
  and b.year < 2000
```

Kleisli (Buneman & Wong & others)

```
{ (title: b.title, author: a.author) |
  \b <--- BOOKS, \a <--- AUTHORS,
  b.isbn = a.isbn, b.year < 2000 }
```

LINQ (Hejlsberg & Meijer & others)

```
from b in BOOKS
from a in AUTHORS
where b.isbn == a.isbn && b.year < 2000
select new { title=b.title, author=a.author };
```

An odd relational Query

Kleisli

```
{ (title: b.title, author: a.author) |
   \b <--- BOOKS, \a <--- AUTHORS,
   b.isbn = b.isbn, b.year < 2000, odd(b.year) }
```

Optimized Kleisli

```
{ (title: t, author: a) |
   (title: \t, year: \y, author: \a)
     <--- { (title: b.title, author: a.author, year: b.year) |
             \t <--- BOOKS, \a <--- AUTHORS,
             t.isbn = a.isbn, t.year < 2000 }
   odd(y) }
```

Kleisli for bioinformatics

```
localblast-blastp (#name: "scop-blast", #db: "scopseq");
localblast-blastp (#name: "pat-blast", #db: "patseq");
scop-add "scop";
setindex-access (#name:"sid2seq", #file: "scopseq",
                 #key: "#sid");

{(#sf: (#desc: xinfo.#desc.#sf, #hit:x.#accession,
        #pscore:x.#pscore),
  #bridge: (#hit: s, #patent: p.#title, #pscore: p.#pscore))
| \x <- process SEQ using scop-blast, x.#pscore <= PSCORE,
  \xinfo <- process <#sidinfo: x.#accession> using scop,
  \s <- process <#numsid: xinfo.#type.#sf> using scop,
  \y <- process <#key: s> using sid2seq,
  \p <- process y.#seq using pat-blast, p.#pscore <= PSCORE };
```

Kleisli was first to perform “twelve impossible queries” identified by DoE Workshop for Human Genome Project

XML Data

```
<books>
  <book>
    <title>Where the Wild Things Are</title>
    <author>Maurice Sendak</author>
    <isbn>0060254920</isbn>
    <year>1963</year>
  </book>
  <book>
    <title>What Can You Do With a Shoe?</title>
    <author>Beatrice Schenk de Regniers</author>
    <author>Maurice Sendak</author>
    <isbn>061373266</isbn>
    <year>1997</year>
  </book>
</books>
```

XML Query

XQuery

```
for $b from input()/books/book
    $a from $b/author
where $b/year < 2000
return
  <book>{ $b/title, $a }</book>
```

Kleisli

```
{ (title: b.title, author: a) |
  \b <--- BOOKS, \a <-- t.authors,
  b.year < 2000 }
```

LINQ

```
from b in BOOKS
from a in b.authors
where b.isbn == a.isbn && b.year < 2000
select (b.title, a.author)
```

Links

- General-purpose, compiles to SQL or XQuery
  differs for Kleisli
- No syntactic distinction, one expression may query multiple sources
  differs from LINQ
- Other related work
  Mnesia in Erlang (Mattsson, Nilsson & Wikstrom)
  Natural Expert (Hutchison, Neuhaus, Schmidt-Schauss & Hall)

Part II

Xduce:

Regular expression types for XML

XML data

```
<addrbook>
  <person>
    <name>Haruo Hosoya</name>
    <email>hahosoya@kyoto-u</email>
    <email>hahosoya@upenn</email>
  </person>
  <person>
    <name>Benjamin Pierce</name>
    <email>bcpierce@upenn</email>
    <tel>123-456-789</tel>
  </person>
</addrbook>
```

Xduce types

```
type Addrbook = addrbook[Person*]
type Person = person[Name,Email*,Tel?]
type Name = name[String]
type Email = email[String]
type Tel = tel[String]

type TelBook = telbook[TelPerson*]
type TelPerson = person[Name,Tel]
```

XML Schema

```
<xs:element name="addrbook">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Person"
        minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="addrbook">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="name" type="xs:string"/>
      <xs:element name="email" type="xs:string"/>
        minOccurs="0" maxOccurs="unbounded"/>
      <xs:element name="tel" type="xs:string"/>
        minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
```

Xduce transformation

```
fun telbook(doc : Addrbook) : TelBook =
  match doc with
    addrbook[val persons as Person*] ->
      telbook[telpersons(persons)]

fun telpersons (val ps as Person*) : TelPerson* =
  match ps with
    person[name[val n as String], Email*,
           tel[val t as String]],
    val rest as Person*
      -> person[name[n], tel[t]],
         telpersons(rest)
   | person[name[val n as String], Email*],
    val rest as Person*
      -> telpersons(rest)
   | ()
      -> ()
```

XQuery transformation

```
<telbook>{
  for $person in input()/addrbook/person[tel] return
    <person>{ $person/name, $person/tel }</person>
}</telbook>
```

XQuery 1.0: An XML Query Language

W3C Working Draft 16 August 2002

This version:
http://www.w3.org/TR/2002/WD-xquery-20020816/
Latest version:
http://www.w3.org/TR/xquery/
Previous versions:
http://www.w3.org/TR/2002/WD-xquery-20020430/
http://www.w3.org/TR/2001/WD-xquery-20011220/
http://www.w3.org/TR/2001/WD-xquery-20010607/
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XQuery 1.0 and XPath 2.0 Formal Semantics

W3C Working Draft 16 August 2002

This version:
: http://www.w3.org/TR/2002/WD-query-semantics-20020816/

Latest version:
: http://www.w3.org/TR/query-semantics/

Previous versions:
: http://www.w3.org/TR/2002/WD-query-semantics-20020326/
: http://www.w3.org/TR/2001/WD-query-semantics-20010607/
: http://www.w3.org/TR/2001/WD-query-algebra-20010215/
: http://www.w3.org/TR/2000/WD-query-algebra-20001204/

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3.3.2 Matches

Notation

The judgment

$$\textit{Value}\ \textbf{matches}\ \textit{Type}$$

holds when the given value matches the given type.

Semantics

This judgment is specified by the following rules.

The empty sequence matches the empty sequence type.

$$\frac{}{\text{statEnv} \mid\!- \text{()}\ \textbf{matches}\ \text{()}}$$

If two values match two types, then their sequence matches the corresponding sequence type.

$$\frac{\text{statEnv} \mid\!- \textit{Value}_1\ \textbf{matches}\ \textit{Type}_1 \qquad \text{statEnv} \mid\!- \textit{Value}_2\ \textbf{matches}\ \textit{Type}_2}{\text{statEnv} \mid\!- \textit{Value}_1,\textit{Value}_2\ \textbf{matches}\ \textit{Type}_1,\textit{Type}_2}$$

Links

- Also use regular expressions for lists

  A, A?, A+, A*

  A? corresponds to maybe type of Haskell

- XML syntax that works for cut-and-paste

  `<greet>Hello, {x}</greet>` *vs.* `<greet>'Hello, ', x</>`

- Other related work

  Xtatic (Gapayev, Levin & Pierce)

  Cduce (Benzaken, Castagna & Frisch)

  Jwig (Schwartbach & Møller)

Part III

PLT Scheme:

Continuations for the Web

Orbitz

Graunke, Findler, Krishnamurthi, Felleisen

slides courtesy of Shriram Krishnamurthi

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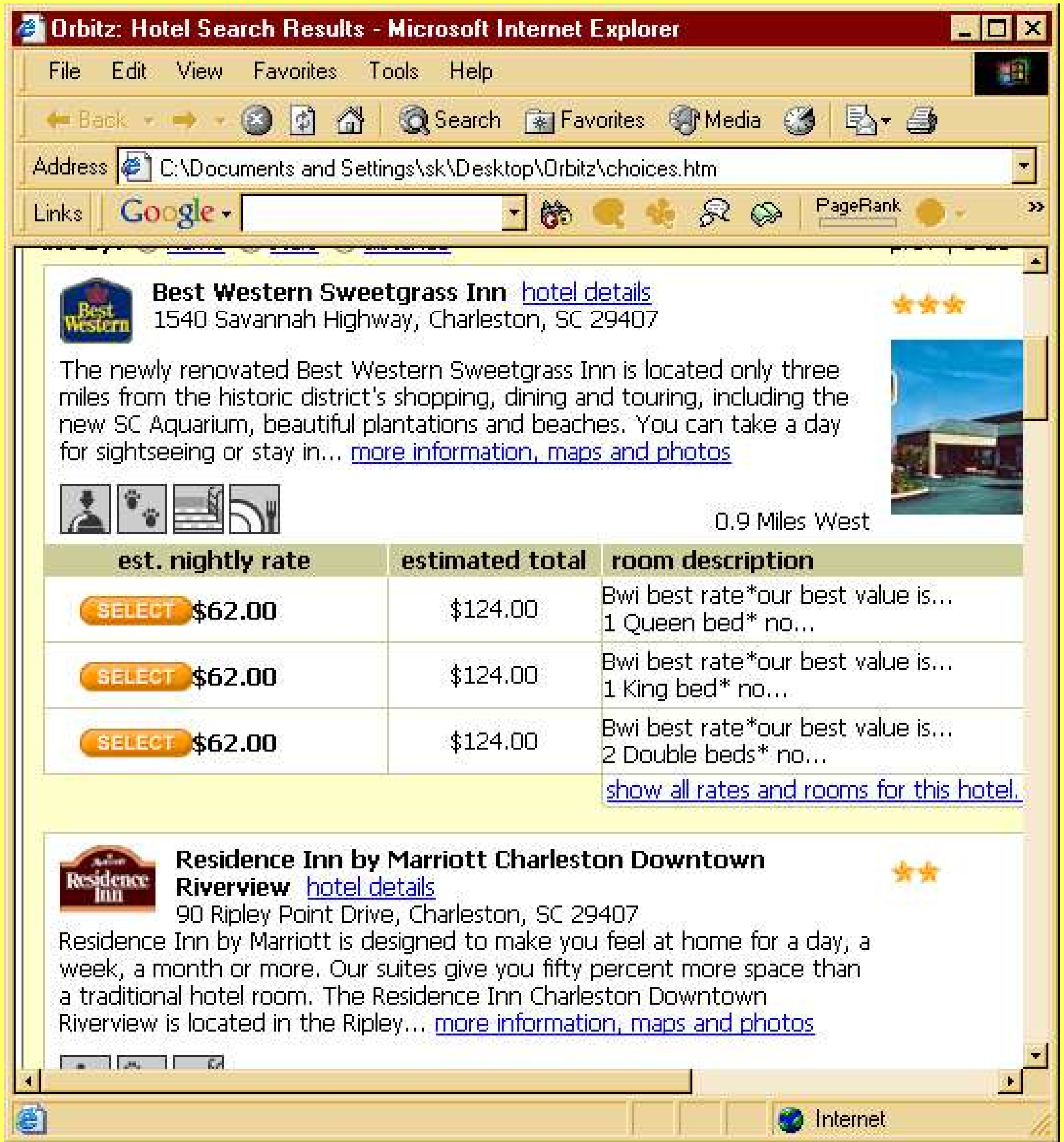
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0.9 Miles West
est. nightly rate
estimated total
room description
SELECT $62.00
$124.00
Bwi best rate*our best value is... 1 Queen bed* no...
SELECT $62.00
$124.00
Bwi best rate*our best value is... 1 King bed* no...
SELECT $62.00
$124.00
Bwi best rate*our best value is... 2 Double beds* no...
show all rates and rooms for this hotel.
Residence Inn by Marriott Charleston Downtown Riverview hotel details
90 Ripley Point Drive, Charleston, SC 29407
Residence Inn by Marriott is designed to make you feel at home for a day, a week, a month or more. Our suites give you fifty percent more space than a traditional hotel room. The Residence Inn Charleston Downtown Riverview is located in the Ripley... more information, maps and photos
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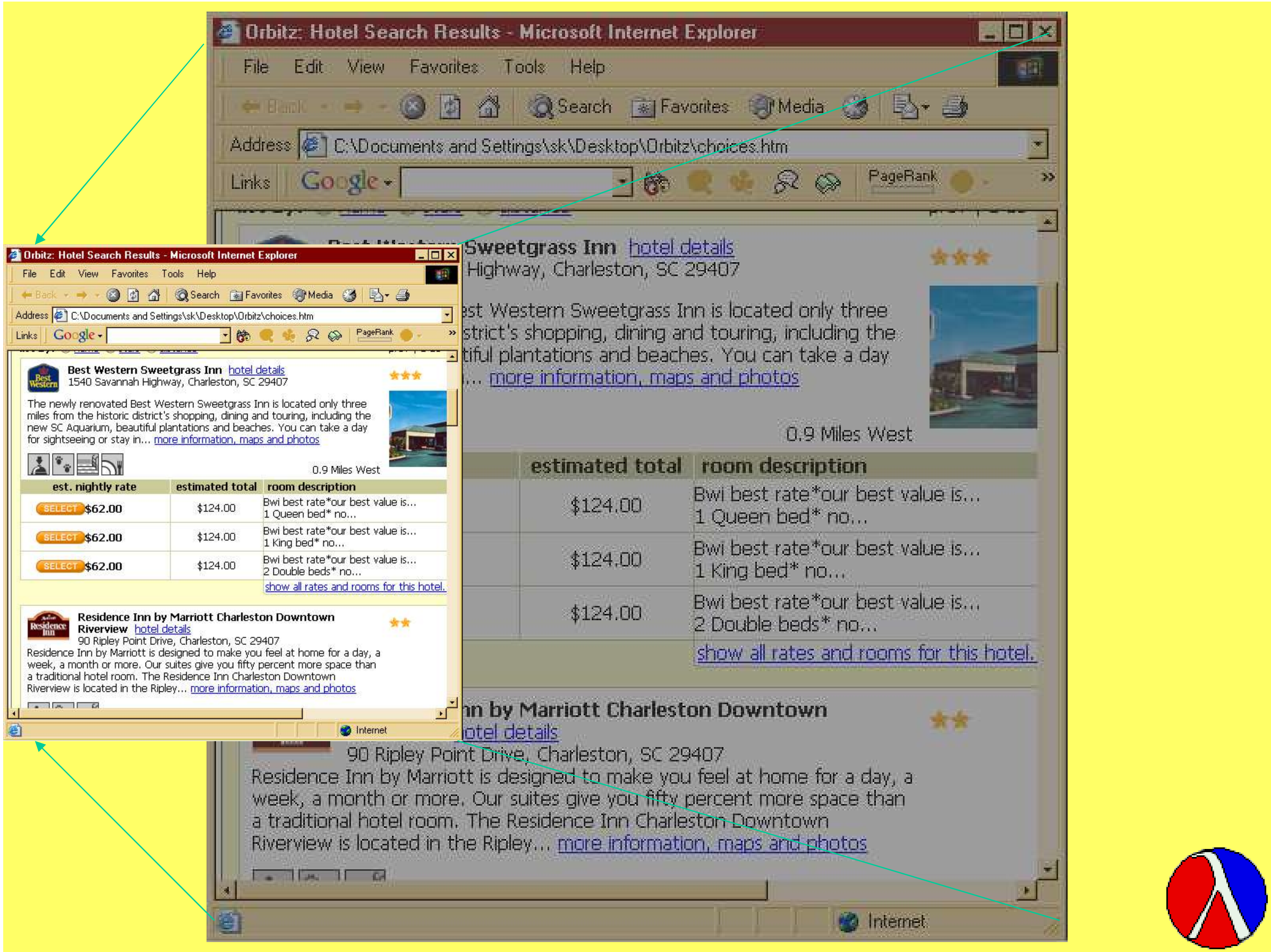

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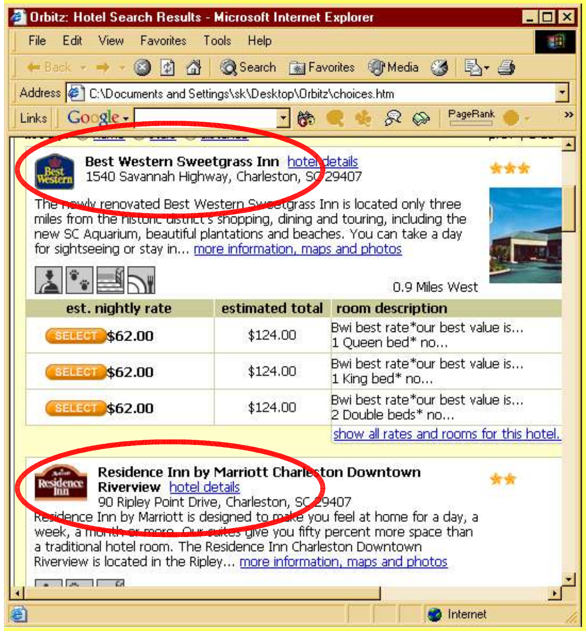

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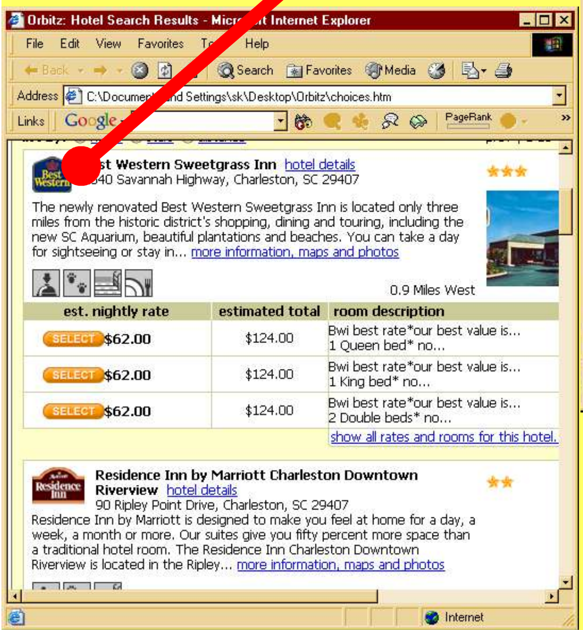

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Charleston, SC 29407
check in Wed, Nov 20, 2002
check out Fri, Nov 22, 2002
guests 1
room Bwi best rate*our best v
round. Simply book best
participating hotel.
1 Queen bed* no smoking,c
Room cost summary
Done
Internet

Orbitz


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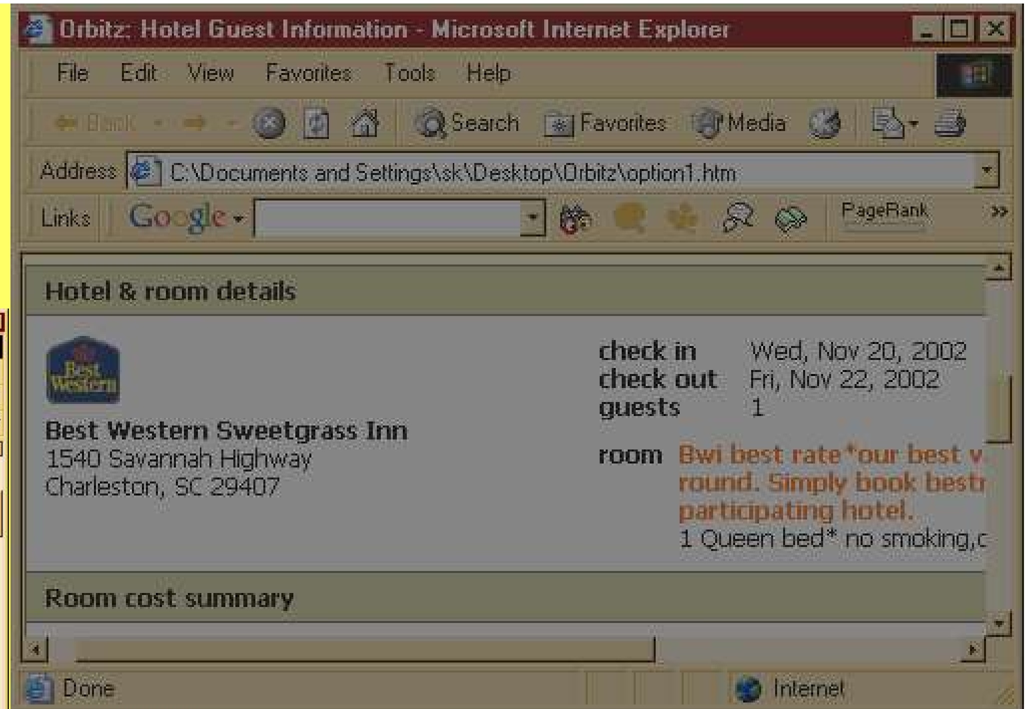
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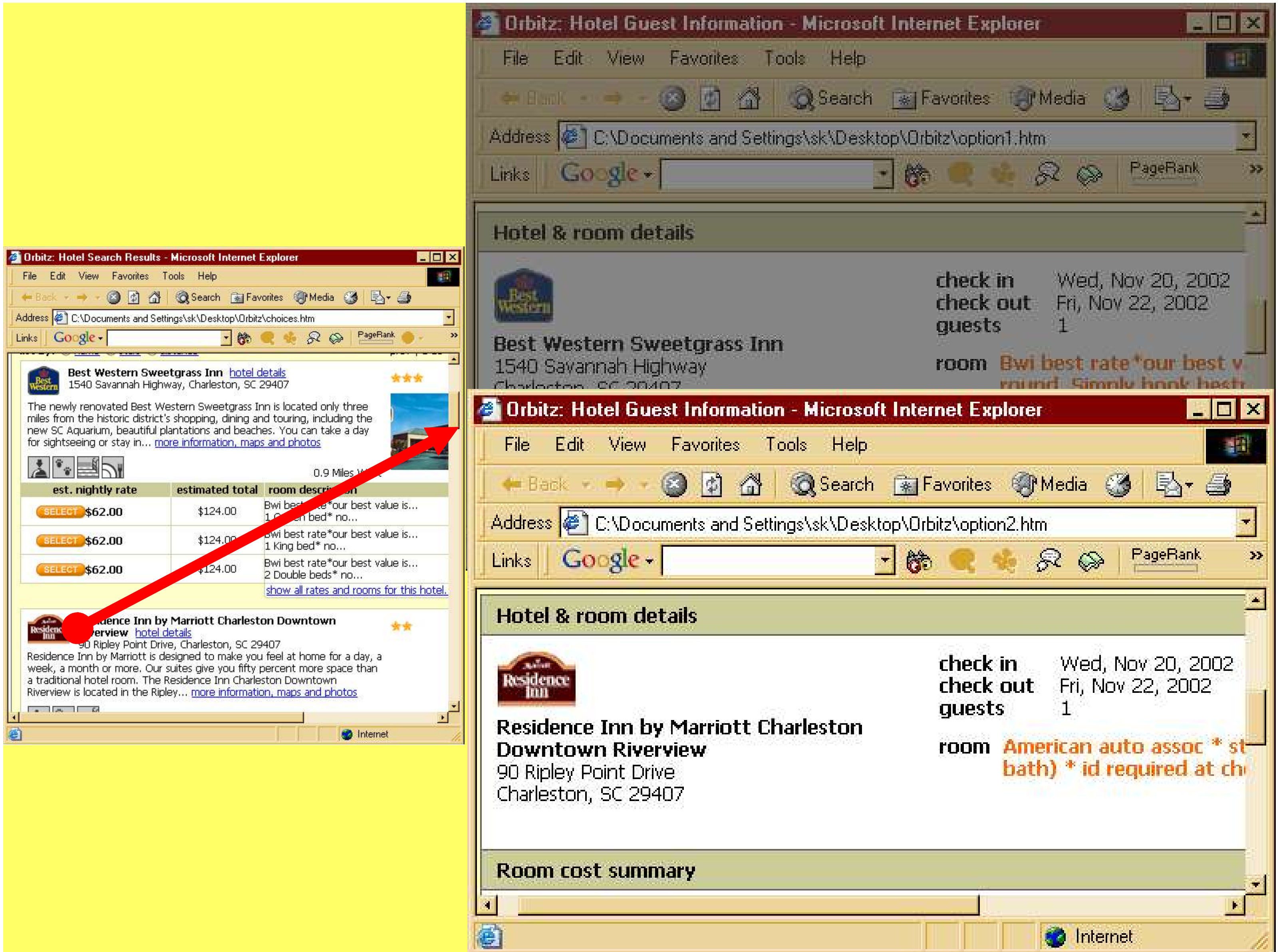

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1540 Savannah Highway
Orbitz: Hotel Guest Information - Microsoft Internet Explorer
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check in Wed, Nov 20, 2002
check out Fri, Nov 22, 2002
guests 1
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Charleston, SC 29407
room American auto assoc
Room cost summary

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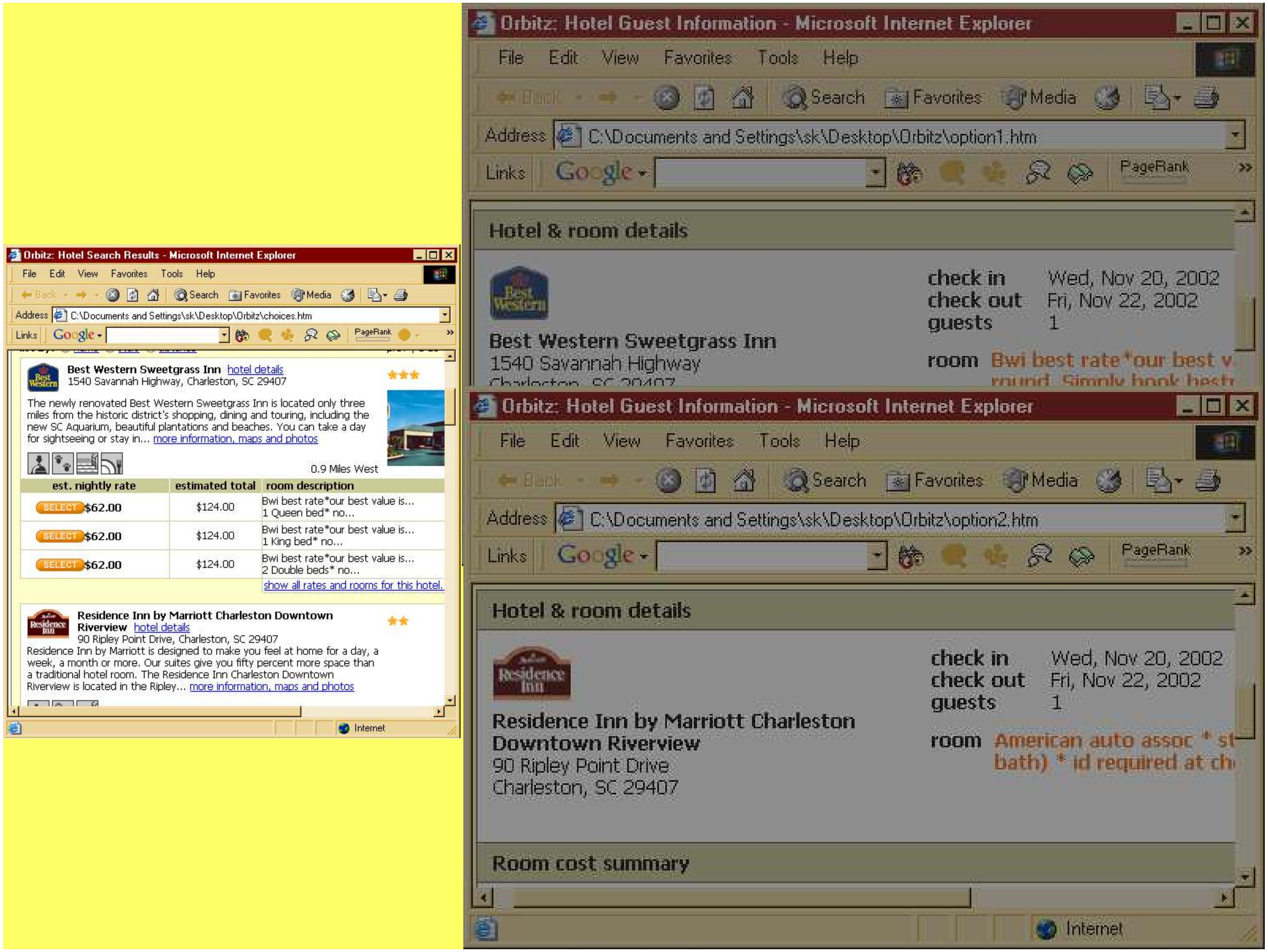

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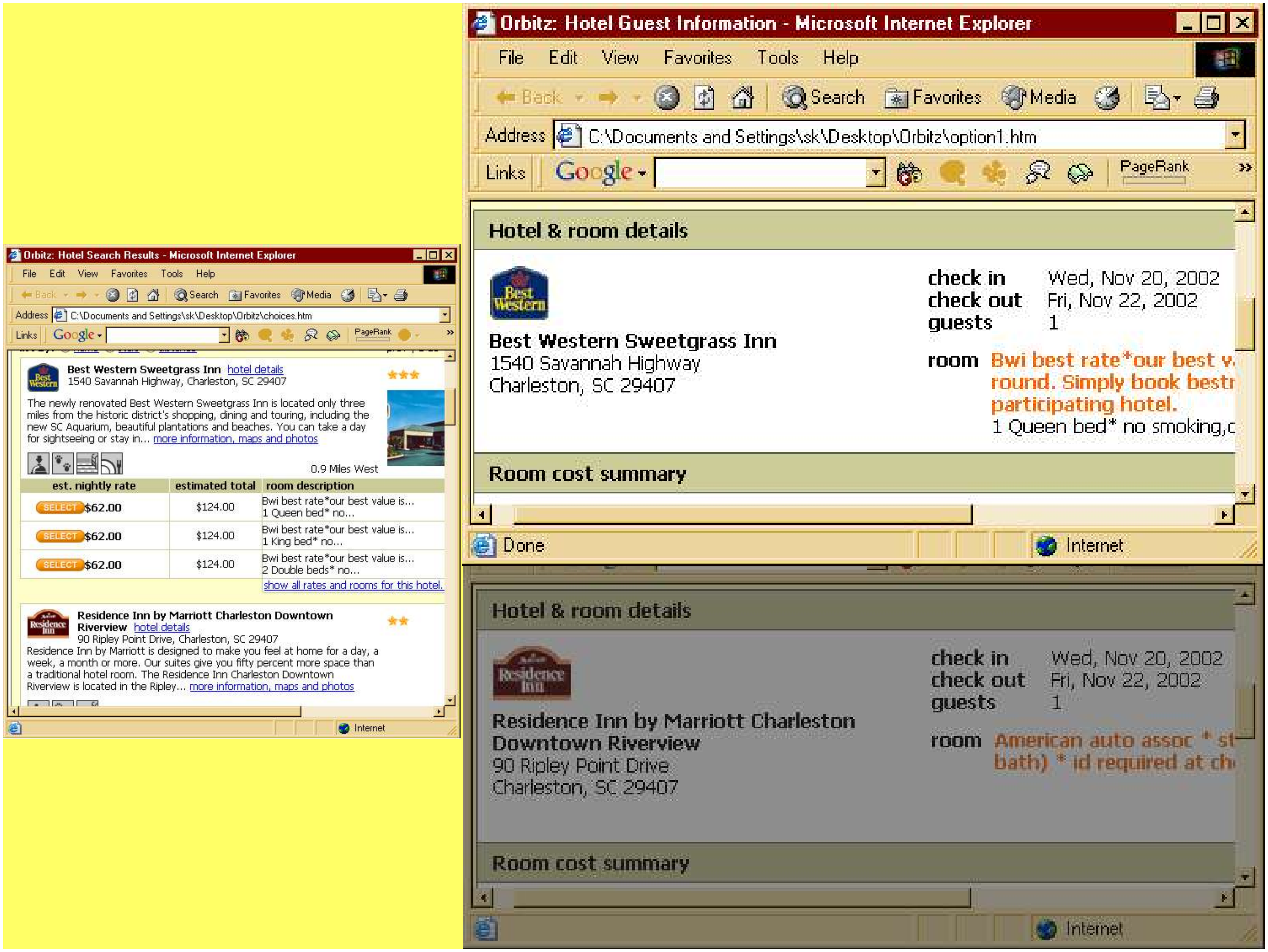

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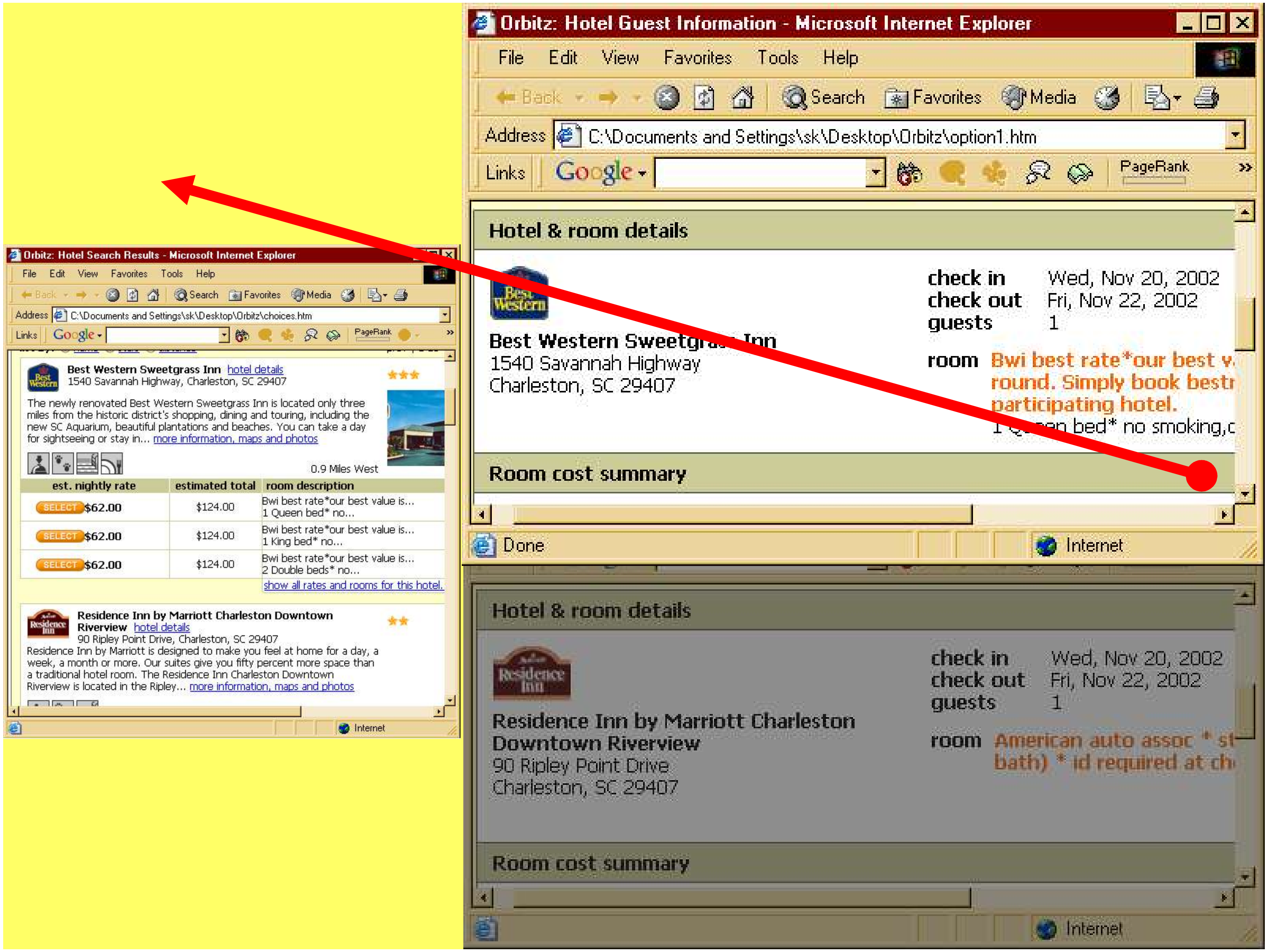
SELECT $62.00
$124.00
Bwi best rate*our best value is... 2 Double beds* no...
show all rates and rooms for this hotel.
Residence Inn by Marriott Charleston Downtown Riverview hotel details
90 Ripley Point Drive, Charleston, SC 29407
Residence Inn by Marriott is designed to make you feel at home for a day, a week, a month or more. Our suites give you fifty percent more space than a traditional hotel room. The Residence Inn Charleston Downtown Riverview is located in the Ripley... more information, maps and photos
Orbitz: Hotel Guest Information - Microsoft Internet Explorer
C:\Documents and Settings\sk\Desktop\Orbitz\option1.htm
Hotel & room details
Best Western Sweetgrass Inn
1540 Savannah Highway
Charleston, SC 29407
check in Wed, Nov 20, 2002
check out Fri, Nov 22, 2002
guests 1
room Bwi best rate*our best v
round. Simply book best
participating hotel.
1 Queen bed* no smoking,c
Room cost summary
Done
Internet
Hotel & room details
Residence Inn by Marriott Charleston Downtown Riverview
90 Ripley Point Drive
Charleston, SC 29407
check in Wed, Nov 20, 2002
check out Fri, Nov 22, 2002
guests 1
room American auto assoc * st
bath) * id required at ch
Room cost summary
Internet

Orbitz


Orbitz: Hotel Guest Information - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address C:\Documents and Settings\sk\Desktop\Orbitz\option1.htm
Hotel & room details
check in Wed, Nov 20, 2002
check out Fri, Nov 22, 2002
guests 1
Best Western Sweetgrass Inn
1540 Savannah Highway
Charleston, SC 29407
room Bwi best rate*our best v
round. Simply book best
participating hotel.
Room cost summary
Done
Internet
Orbitz: Hotel Search Results - Microsoft Internet Explorer
Address C:\Documents and Settings\sk\Desktop\Orbitz\choices.htm
Best Western Sweetgrass Inn hotel details
1540 Savannah Highway, Charleston, SC 29407
The newly renovated Best Western Sweetgrass Inn is located only three miles from the historic district's shopping, dining and touring, including the new SC Aquarium, beautiful plantations and beaches. You can take a day for sightseeing or stay in... more information, maps and photos
0.9 Miles West
est. nightly rate
estimated total
room description
SELECT $62.00
$124.00
Bwi best rate*our best value is... 1 Queen bed* no...
Bwi best rate*our best value is... 1 King bed* no...
Bwi best rate*our best value is... 2 Double beds* no...
show all rates and rooms for this hotel.
Residence Inn by Marriott Charleston Downtown Riverview hotel details
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Residence Inn by Marriott is designed to make you feel at home for a day, a week, a month or more. Our suites give you fifty percent more space than a traditional hotel room. The Residence Inn Charleston Downtown Riverview is located in the Ripley... more information, maps and photos
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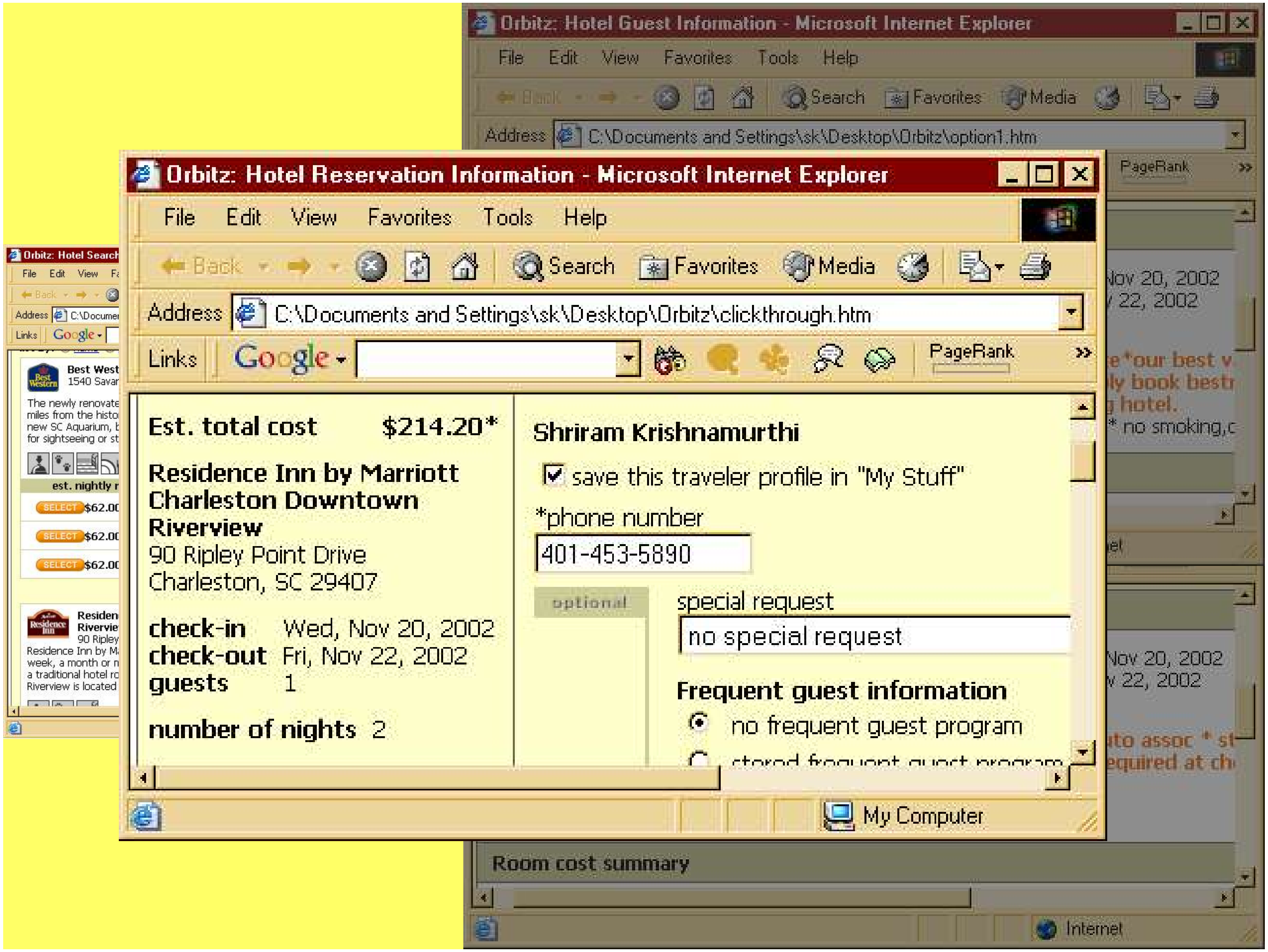
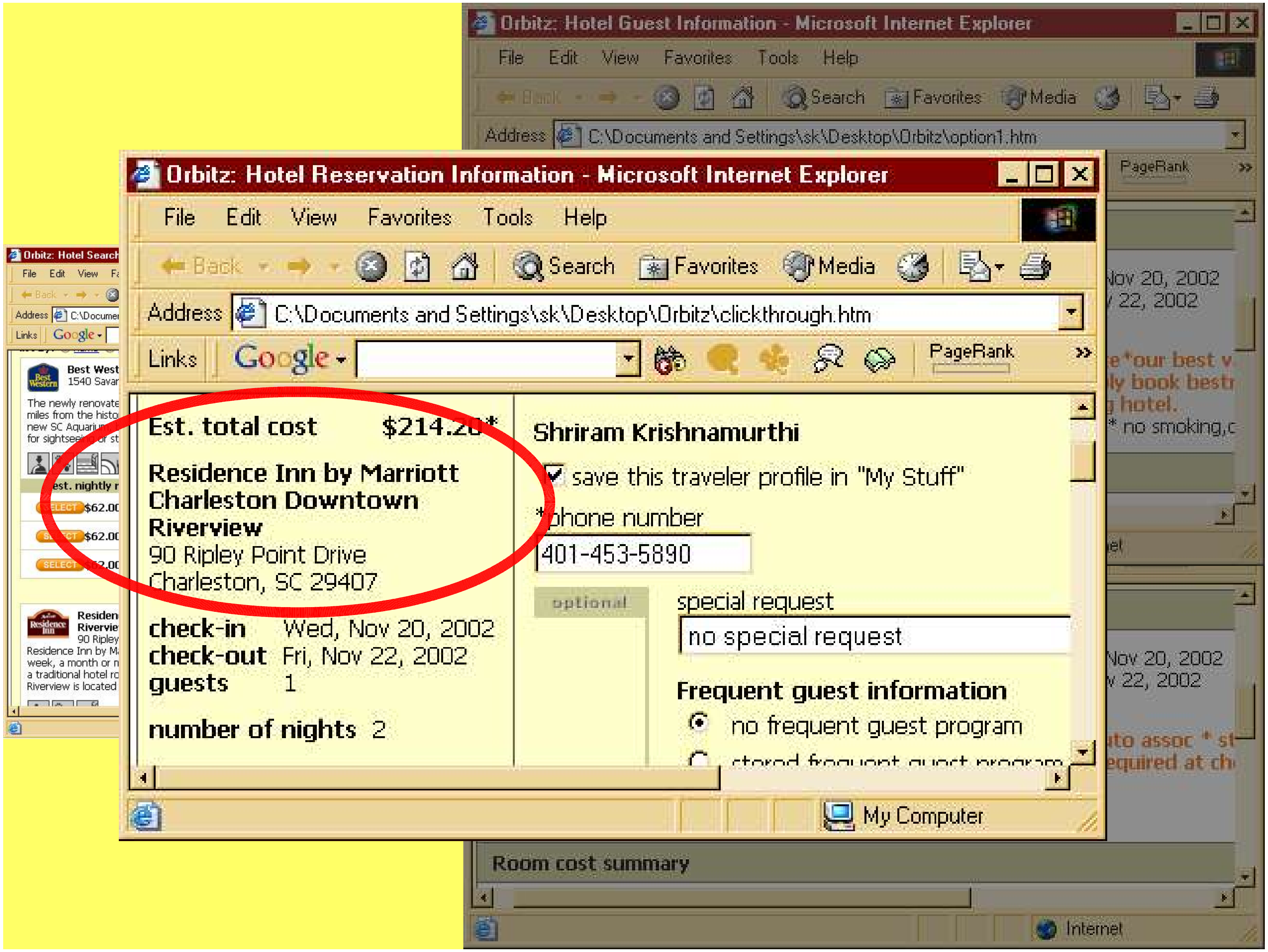
room American auto assoc
bath) * id required at ch
Room cost summary
Internet

Orbitz



Orbitz: Hotel Guest Information - Microsoft Internet Explorer
Orbitz: Hotel Reservation Information - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address C:\Documents and Settings\sk\Desktop\Orbitz\clickthrough.htm
Est. total cost $214.20*
Residence Inn by Marriott Charleston Downtown Riverview
90 Ripley Point Drive
Charleston, SC 29407
check-in Wed, Nov 20, 2002
check-out Fri, Nov 22, 2002
guests 1
number of nights 2
Shriram Krishnamurthi
save this traveler profile in "My Stuff"
*phone number
401-453-5890
optional
special request
no special request
Frequent guest information
no frequent guest program
My Computer
Room cost summary
Internet

Orbitz



Orbitz: Hotel Reservation Information - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address C:\Documents and Settings\sk\Desktop\Orbitz\clickthrough.htm
Est. total cost $214.20*
Residence Inn by Marriott Charleston Downtown Riverview
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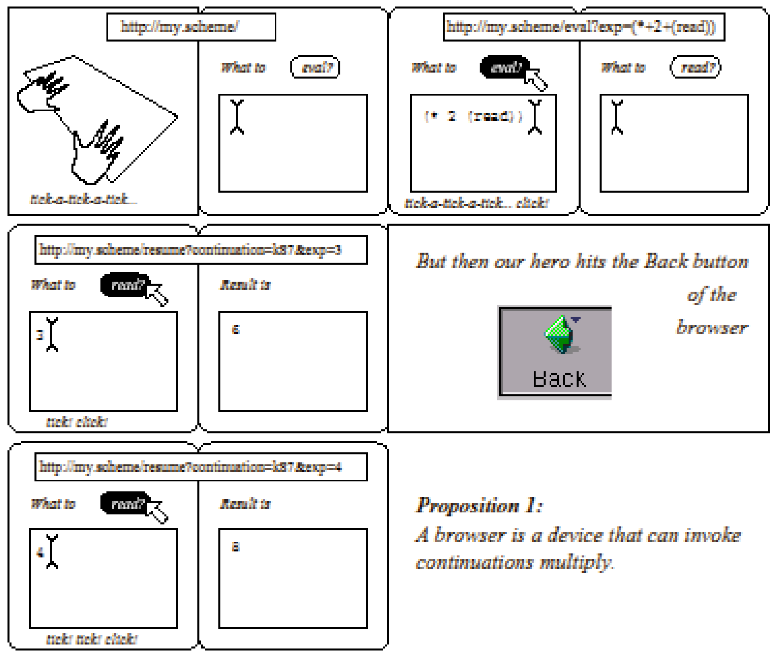
save this traveler profile in "My Stuff"
* phone number
401-453-5890
optional
special request
no special request
Frequent guest information
no frequent guest program
My Computer
Orbitz: Hotel Guest Information - Microsoft Internet Explorer
C:\Documents and Settings\sk\Desktop\Orbitz\option1.htm
Room cost summary
Internet

Continuations

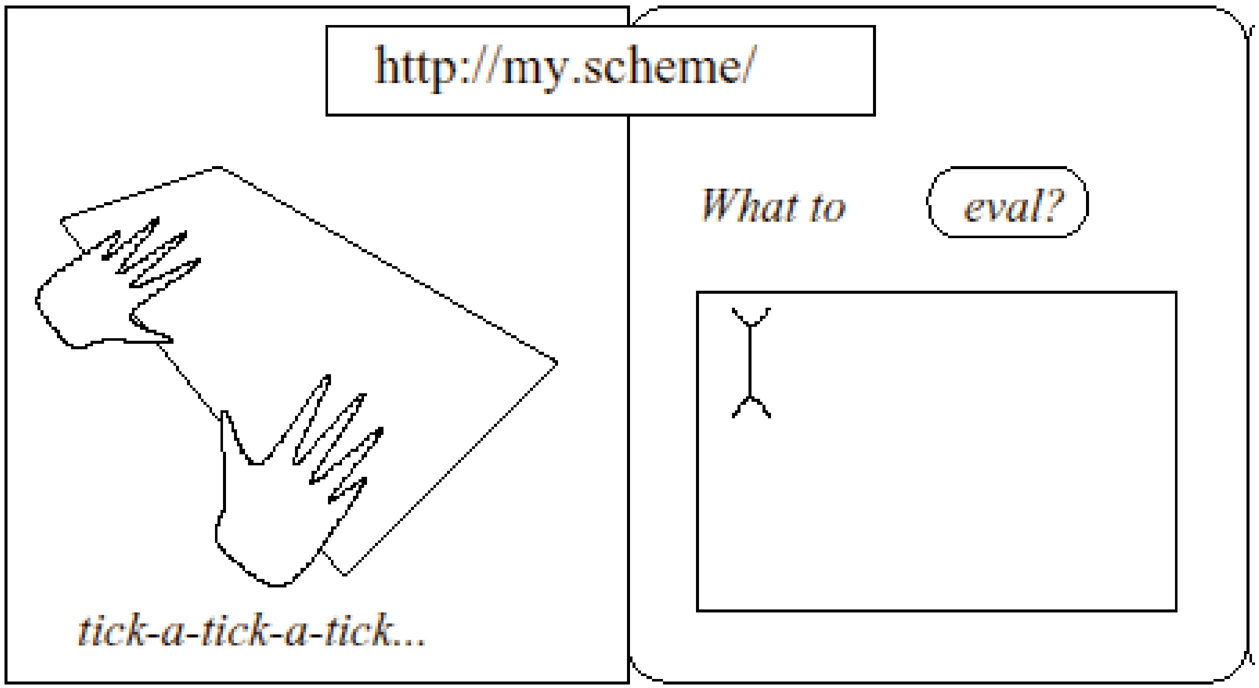
The Influence of Browsers on Evaluators or, Continuations to Program Web Servers

Christian Queinnec
Université Paris 6 — Pierre et Marie Curie
LIP6, 4 place Jussieu, 75252 Paris Cedex — France
Christian.Queinnec@lip6.fr

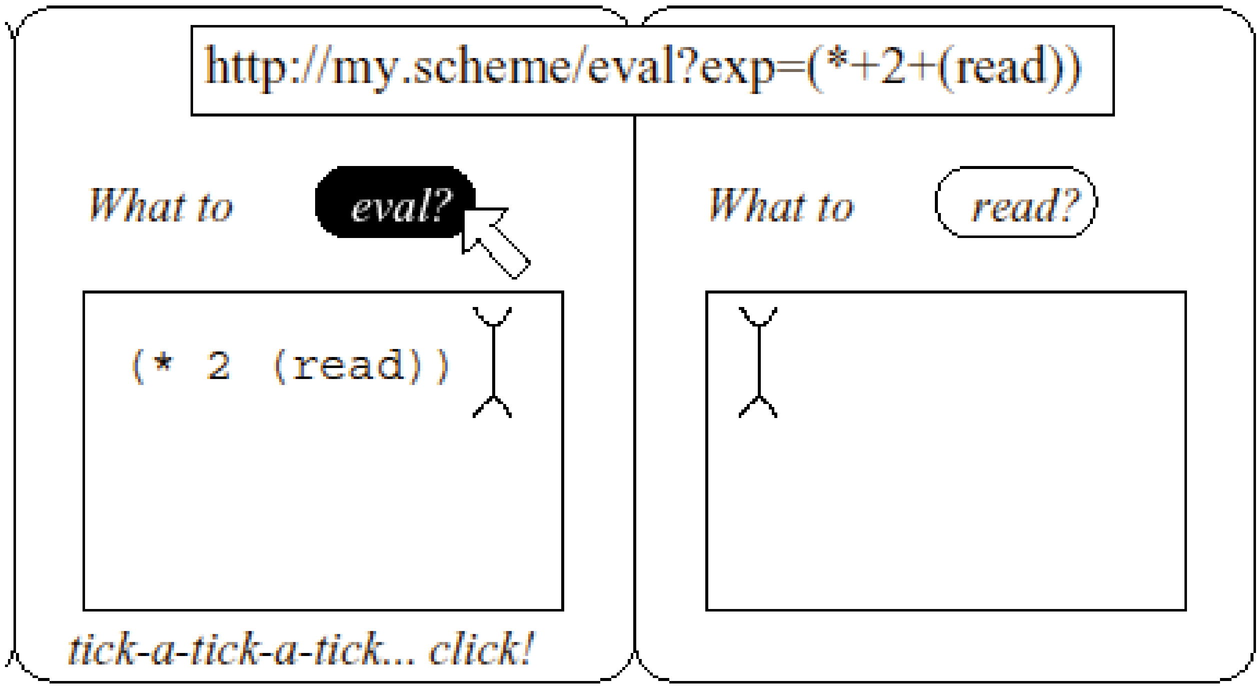


Christian Quenniec (ICFP 2000)

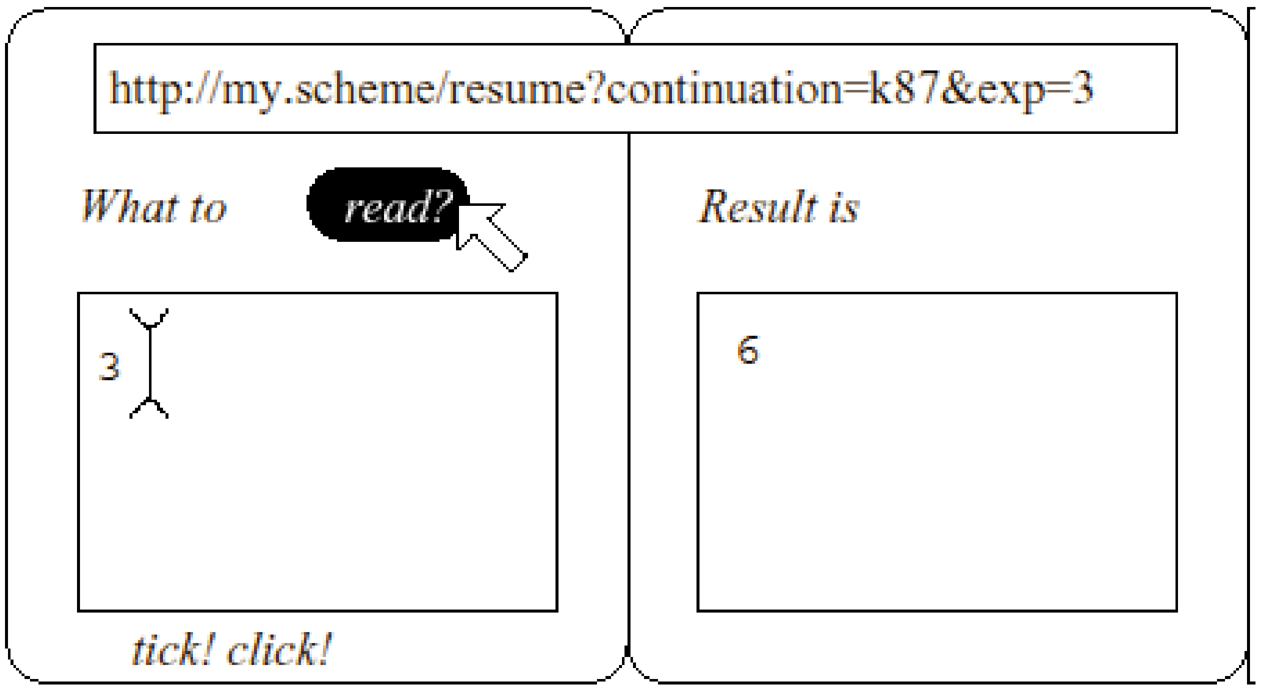
Continuations



Continuations



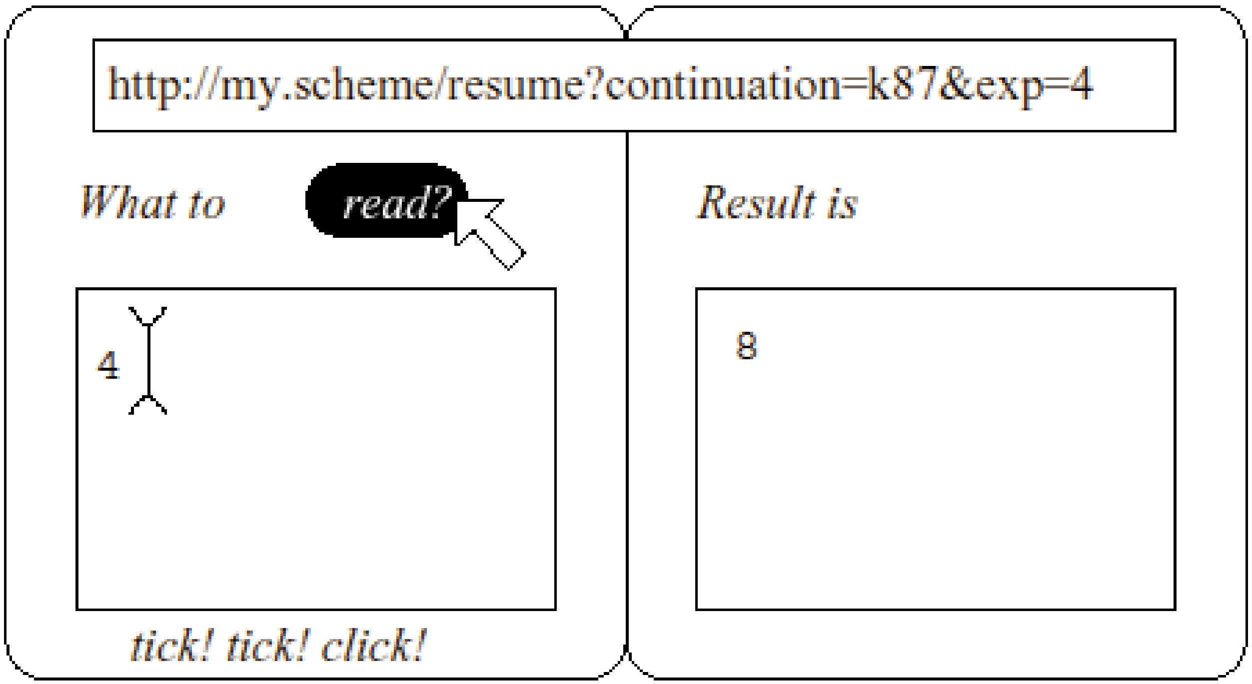
Continuations



Continuations

But then our hero hits the Back button of the browser

Continuations



also used by Paul Graham for Yahoo stores

Links

- What are the right scopes? session scope *vs.* global scope
  key question for web applications!
- “Scalable”
  state stored in client, not in server
- Mechanisms
  hooks to choose implementation technique
  URL parameters *vs.* hidden fields
  cryptographically protect state kept in client
- Other related work
  Mawl (Ramming, Atkins, Ball, Bruns, Cox)
  WASH (Thiemann)

Part IV

Erlang:

Communication via values

Erlang: An area server

```
start() ->
    register(area_server,
        spawn(fun() -> loop(0) end)).
loop(Tot) ->
    receive
        {Pid, {square, X}} ->
            Pid ! X*X,
            loop(Tot + X*X);
        {Pid, {rectangle, [X,Y]}} ->
            Pid ! X*Y,
            loop(Tot + X*Y);
        {Pid, areas} ->
            Pid ! Tot,
            loop(Tot)
    end.
```

Armstrong, Virding, Williams & Wikström

Erlang: Generic server

```
start(Name, Data, Fun) ->
    register(Name,
        spawn(fun() -> loop(Data, Fun) end)).
Rpc(Name, Query) ->
    Tag = ref(),
    Name ! {query, self(), Tag, Query},
    receive
        {Tag, Reply} -> Reply
    end.
loop(Data, Fun) ->
    receive
        {query, Pid, Tag, Query} ->
            {Reply, Data1} = Fun(Query, Data),
            Pid ! {Tag, Reply},
            loop(Data1, Fun)
    end.
```

Erlang: Instantiating the Generic Server

```
start() ->
    start(area_server, 0, handler/2).
handler({square, X}, Tot) ->
            {X*X, Tot + X*X};
handler({rectangle, [X,Y]}, Tot) ->
            {X*Y, Tot + X*Y};
handler(areas, Tot) ->
            {Tot, Tot}.
```

Erlang: Instantiating a Replicated Server

```
start() ->
    start_replicated(area_server, 0, handler/2).
handler({square, X}, Tot) ->
            {X*X, Tot + X*X};
handler({rectangle, [X,Y]}, Tot) ->
            {X*Y, Tot + X*Y};
handler(areas, Tot) ->
            {Tot, Tot}.
```

Links

- Regular expressions for session types

```
session AreaServer =
  (square[Int] | rectangle[Int,Int] | areas[])*
session InitializedAreaServer =
  initialize[],
  (square[Int] | rectangle[Int,Int] | areas[])*
```

- User interface as a process

```
session DOM =
  (root[HTML] | todolist[li[String]*])*
```

- Resumption-passing style

  Server processes hibernate on client

- Other related work

  JoCaml (Fournet & Gonthier)

  Timber (Carlsson, Nordlander & Kieburtz)

Part V

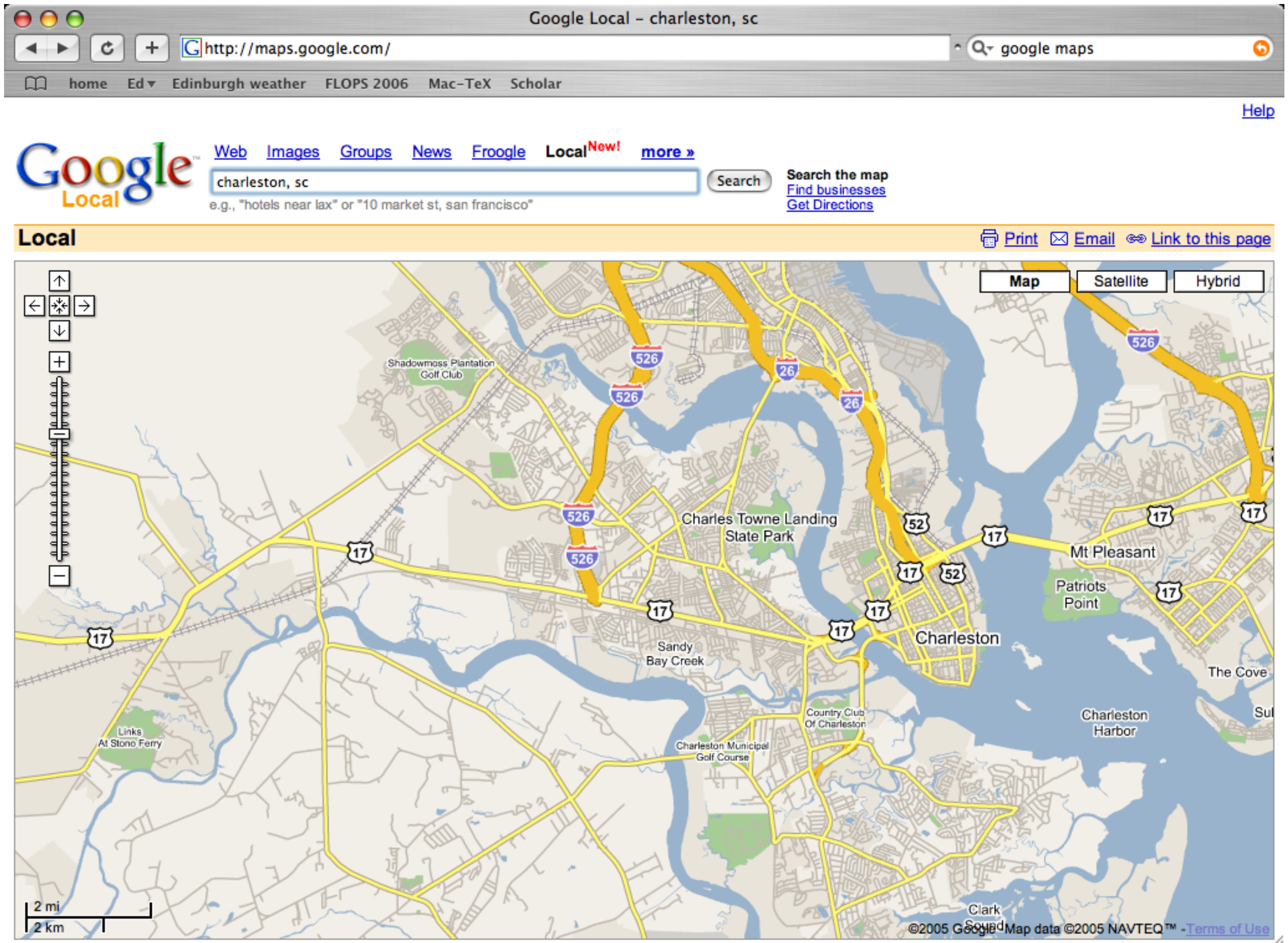
Javascript:
The world’s most-widely deployed functional language

Javascript is a functional language

```
Array.prototype.reduce=function(templateFunction) {
  var l=this.length;
  var s='';
  for (var i=0;i<l;i++) s+=templateFunction(this[i]);
  return s;
}
function wrap(tag) {
  var stag='<'+tag+'>';
  var etag='</'+tag.replace(/s.*/,'')+'>';
  return function(x) {
    return stag+x+etag;
  }
}
document.write(
  '<TABLE><TR>'+
    arr.reduce(wrap('TD class="small"'))+
  '</TR></TABLE>'
);
```

Eich

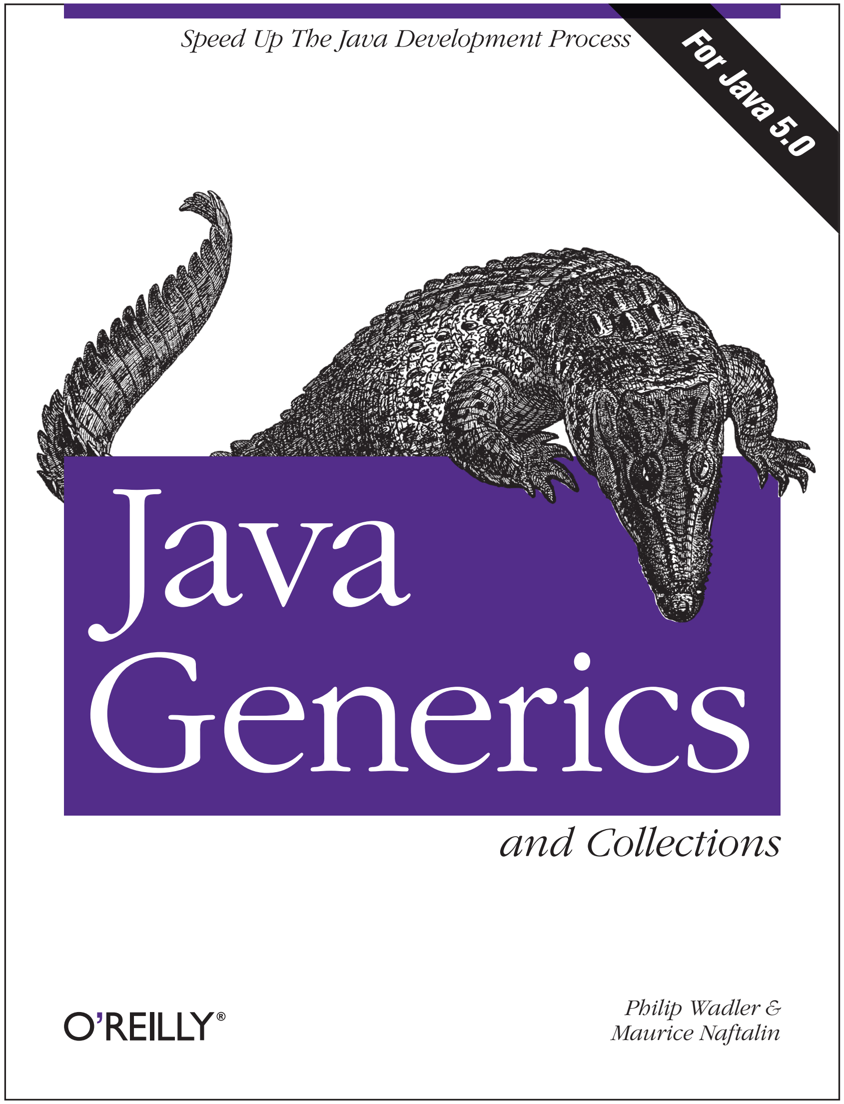
AJAX


Google Local - charleston, sc
http://maps.google.com/
google maps
home
Ed
Edinburgh weather
FLOPS 2006
Mac-TeX
Scholar
Help
Web
Images
Groups
News
Froogle
Local New!
more »
charleston, sc
Search
Search the map
Find businesses
Get Directions
e.g., "hotels near lax" or "10 market st, san francisco"
Local
Print
Email
Link to this page
Map
Satellite
Hybrid
Charles Towne Landing State Park
Mt Pleasant
Patriots Point
Charleston
Sandy Bay Creek
The Cove
Charleston Harbor
2 mi
2 km
©2005 Google - Map data ©2005 NAVTEQ™ - Terms of Use

Part VI

Java: Anothre widely deployed functional language

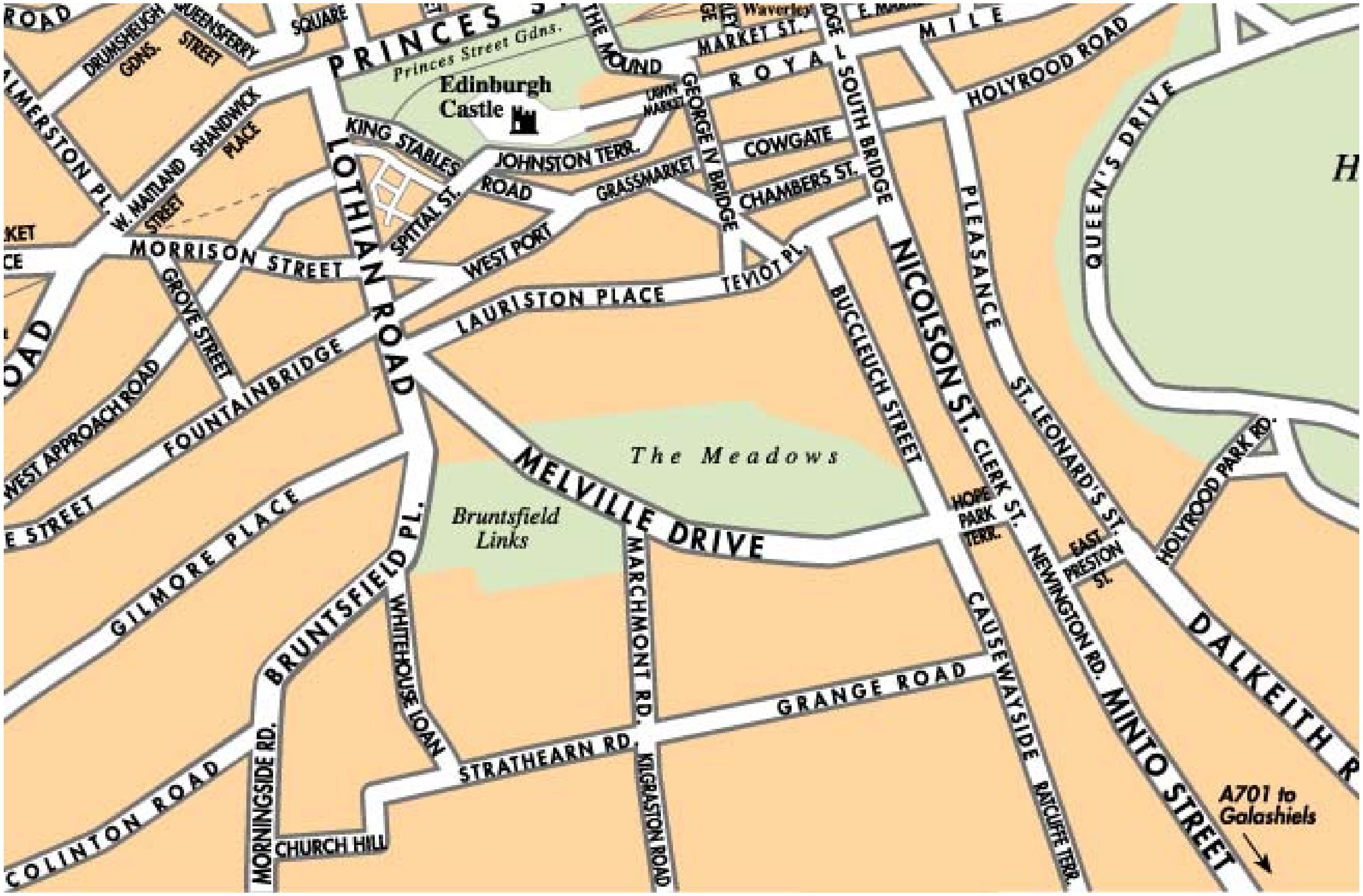
Java generics



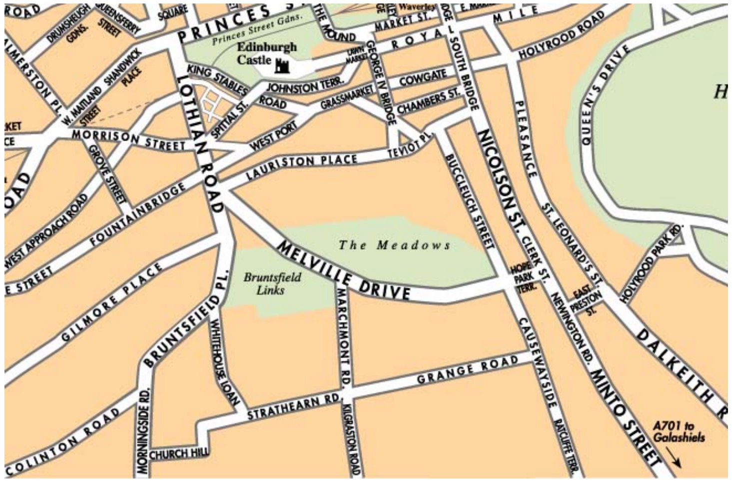
Part VII

Links

Hope and Links



Hope and Links



Links

(Bruntsfield Links)

Wadler et al (2005)

Hope

(Hope Park Square)

Burstall, MacQueen,

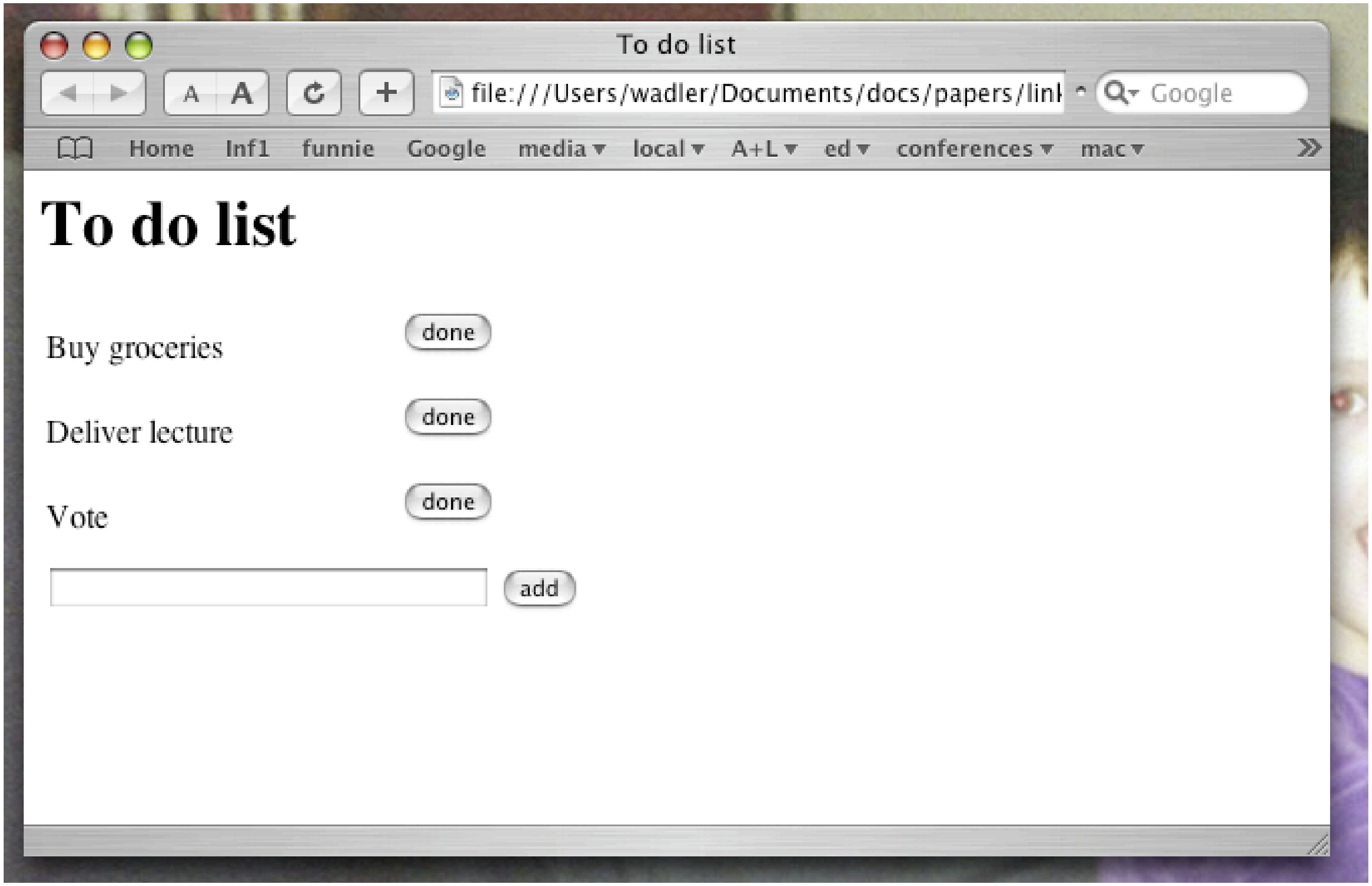
Sannella (1980)

Links meeting, 6 April 2005

Links meeting, 6 April 2005

Part VIII

A Links program state in client


To do list
file:///Users/wadler/Documents/docs/papers/link
Google
Home
Inf1
funnie
Google
media
local
A+L
ed
conferences
mac
To do list
Buy groceries
done
Deliver lecture
done
Vote
done
add

```
main() { todo([]) }
todo(items) {
  <html><body>
    <h1>Items to do</h1>
    <table>{
      for item in items return
        <tr>
          <td>{item}</td>
          <td>
            <form l:action="{todo(items\\[item])}">
              <input type="submit" value="done"/>
            </form>
          </td>
        </tr>
    }</table>
    <form l:action="{todo(items++[new])}">
      <input l:name="{new}" type="text" size="40">
      <input type="submit" value="add"/>
    </form>
  </body></html>
}
```

Part IX

A Links program state in server

```
table TODO of (name : String, item: String)
lookup(n) { [ i | (name:n,item:i) <- TODO ] }
add(n,i) {
  insert into TODO values (name:n, item:i);
  todo(name)
}
remove(n,i) {
  remove from TODO values (name:n, item:i);
  todo(name)
}
main() {
  <html><body>
    <h1>Login</h1>
    <form l:action="todo(name)">
      <input l:name="{name}" type="text" size="40">
      <input type="submit" value="login"/>
    </form>
  </body></html>
}
```

```
todo(name) {
  let items = lookup(name) in
  <html><body>
    <h1>Items to do</h1>
    <table>{
      for item in items return
        <tr>
          <td>{item}</td>
          <td>
            <form l:action="{remove(name,item)}">
              <input type="submit" value="done"/>
            </form>
          </td>
        </tr>
    }</table>
    <form l:action="{add(name,new)}">
      <input l:name="{new}" type="text" size="40">
      <input type="submit" value="add"/>
    </form>
  </body></html>
}
```

Part X

Conclusions

Other ideas

- Multimethods

  Integrate functional and OO styles

- Type classes

  Semantics should determine types, not types determine semantics

- Lists and dictionaries as data structures

  Regular expression matching for lists — down with cons!

- Testing and validity Contracts, Quickcheck

Antinomies (technical)

- Pure or effectful?

  Effects with effect types

- Lazy vs. strict?

  Strict with support for lazy closures

- Type inference vs. subtyping?

  Give up on type inference

- How to import imperative libraries?

  Hide them in a process

Antinomies (social)

- Is it really research?

  Hard for academics to build real systems

- Is it too much research?

  Haskell and SML built on strong concensus

- How do we build a community?

  We can only succeed if we do it together

</Links>