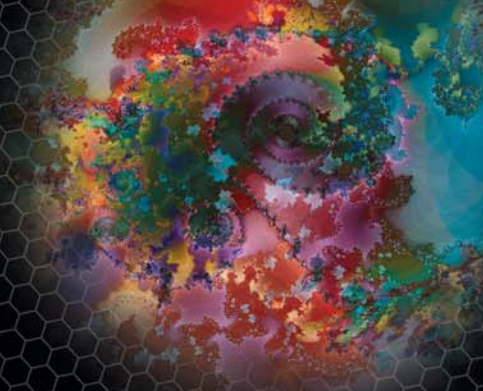
THE EXPERT'S VOICE® IN OPEN SOURCE



Beginning Google Maps Applications with Rails and Ajax

From Novice to Professional

Build awesome Rails-driven mapping applications using the powerful Google Maps API

Andre Lewis, Michael Purvis, Jeffrey Sambells, and Cameron Turner

Apress®

Beginning Google Maps Applications with Rails and Ajax

From Novice to Professional

Andre Lewis, Michael Purvis, Jeffrey Sambells, and Cameron Turner

Apress®

Beginning Google Maps Applications with Rails and Ajax: From Novice to Professional

Copyright © 2007 by Andre Lewis, Michael Purvis, Jeffrey Sambells, and Cameron Turner

All rights reserved. No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage or retrieval system, without the prior written permission of the copyright owner and the publisher.

ISBN-13 (pbk): 978-1-59059-787-3

ISBN-10 (pbk): 1-59059-787-7

Printed and bound in the United States of America 9 8 7 6 5 4 3 2 1

Trademarked names may appear in this book. Rather than use a trademark symbol with every occurrence of a trademarked name, we use the names only in an editorial fashion and to the benefit of the trademark owner, with no intention of infringement of the trademark.

Lead Editor: Jason Gilmore
Technical Reviewer: Sam Aaron
Editorial Board: Steve Anglin, Ewan Buckingham, Gary Cornell, Jason Gilmore, Jonathan Gennick, Jonathan Hassell, James Huddleston, Chris Mills, Matthew Moodie, Dominic Shakeshaft, Jim Sumser, Matt Wade
Project Manager: Sofia Marchant
Copy Edit Manager: Nicole Flores
Copy Editor: Jennifer Whipple
Assistant Production Director: Kari Brooks-Copony
Production Editor: Laura Cheu
Compositor: Kinetic Publishing Services, LLC
Proofreader: April Eddy
Indexer: Beth Palmer
Artist: April Milne
Cover Designer: Kurt Krames
Manufacturing Director: Tom Debolski

Distributed to the book trade worldwide by Springer-Verlag New York, Inc., 233 Spring Street, 6th Floor, New York, NY 10013. Phone 1-800-SPRINGER, fax 201-348-4505, e-mail `orders-ny@springer-sbm.com`, or visit `http://www.springeronline.com`.

For information on translations, please contact Apress directly at 2560 Ninth Street, Suite 219, Berkeley, CA 94710. Phone 510-549-5930, fax 510-549-5939, e-mail `info@apress.com`, or visit `http://www.apress.com`.

The information in this book is distributed on an “as is” basis, without warranty. Although every precaution has been taken in the preparation of this work, neither the author(s) nor Apress shall have any liability to any person or entity with respect to any loss or damage caused or alleged to be caused directly or indirectly by the information contained in this work.

The source code for this book is available to readers at the official web site, `http://googlemapsbook.com`.

Contents at a Glance

About the Authors xiv
About the Technical Reviewer xvi

PART 1 Your First Google Maps

CHAPTER 1 Google Maps and Rails 3
CHAPTER 2 Getting Started 13
CHAPTER 3 Interacting with the User and the Server 33
CHAPTER 4 Geocoding Addresses 69

PART 2 Beyond the Basics

CHAPTER 5 Manipulating Third-Party Data 99
CHAPTER 6 Improving the User Interface 123
CHAPTER 7 Optimizing and Scaling for Large Data Sets 147
CHAPTER 8 What's Next for the Google Maps API? 197

PART 3 Advanced Map Features and Methods

CHAPTER 9 Advanced Tips and Tricks 207
CHAPTER 10 Lines, Lengths, and Areas 261
CHAPTER 11 Advanced Geocoding Topics 287

PART 4 Appendixes

APPENDIX A Finding the Data You Want 315
APPENDIX B Google Maps API 323

INDEX 357

Contents

About the Authors xiv
About the Technical Reviewer xvi

PART 1 ■■■ Your First Google Maps

■CHAPTER 1 Google Maps and Rails 3

KML: Your First Map 4
Wayfaring: Your Second Map 5
Adding the First Point 6
Adding the Flight Route 7
Adding the Destination Point 8
Adding a Driving Route 9
Got Rails? 10
What's Next? 11

■CHAPTER 2 Getting Started 13

On JavaScript, Helpers, and Plug-ins 13
Creating Your Rails Application 14
The First Map 14
Keying Up 14
Examining the Sample Map 17
Specifying a New Location 18
Separating Code from Content 20
Cleaning Up 22
Basic User Interaction 23
Using Map Control Widgets 23
Creating Markers 24
Detecting Marker Clicks 26
Opening the Info Window 27

A List of Points 28
Using Arrays and Objects 28
Iterating 30
Summary 32

CHAPTER 3 Interacting with the User and the Server 33

Adding Interactivity 33
Going on a Treasure Hunt 34
Reviewing Application Structure 35
Building on Your Application 36
Creating a New Controller 36
Creating a Marker Model and Migration 36
Creating the Database, Connecting via Rails, and Running the Migration 37
Creating the Map View 38
Creating the Map and Marking Points 38
Listening to User Events 39
Asking for More Information with an Info Window 42
Creating an Info Window on the Map 43
Embedding a Form into the Info Window 44
Avoiding an Ambiguous State 48
Controlling the Info Window Size 50
Implementing Ajax 52
Google's GXmlHttp vs. Prototype's Ajax.Request 52
Using Google's Ajax Object 53
Saving Data with GXmlHttp 53
Parsing the JSON Structure 58
Retrieving Markers from the Server 59
Adding Some Flair 62
Ajax with Prototype 65
Summary 67

CHAPTER 4 Geocoding Addresses 69

Preparing the Address Data 69
Creating the Model 70
Adding a full_address Method 71
Populating the Table 71
Using Geocoding Web Services 73
Requirements for Consuming Geocoding Services 73
The Google Maps API Geocoder 74

The Google JavaScript Geocoder 81
The Yahoo Geocoding API 82
Geocoder.us 87
Geocoder.ca 89
Services for Geocoding Addresses Outside Google's Coverage 91
Persisting Lookups 92
Building a Store Location Map 93
Summary 96

PART 2 Beyond the Basics

CHAPTER 5 Manipulating Third-Party Data 99

Using Downloadable Text Files 99
Downloading the Database 100
Working with Files 103
Correlating and Importing the Data 104
Using Your New Database Schema 107
Screen Scraping 115
Our Scraping Tool: scrAPI 116
Screen Scraping Considerations 121
Summary 121

CHAPTER 6 Improving the User Interface 123

CSS: A Touch of Style 124
Maximizing Your Map 126
Adding Hovering Toolbars 128
Creating Collapsible Side Panels 130
Scripted Style 133
Switching Up the Body Classes 133
Resizing with the Power of JavaScript 135
Populating the Side Panel 138
Getting Side Panel Feedback 140
Data Point Filtering 141
RJS and Draggable Toolbars 144
RJS Templates and Partials 144
Draggable Toolbars 145
Summary 145

CHAPTER 7 Optimizing and Scaling for Large Data Sets 147

Understanding the Limitations 147
Streamlining Server-Client Communications 148
Optimizing Server-Side Processing 150
Server-Side Boundary Method 150
Server-Side Common-Point Method 155
Server-Side Clustering 160
Custom Detail Overlay Method 165
Custom Tile Method 174
Optimizing the Client-Side User Experience 182
Client-Side Boundary Method 183
Client-Side Closest-to-a-Common-Point Method 185
Client-Side Clustering 188
Further Client-Side Optimizations 192
Summary 194

CHAPTER 8 What's Next for the Google Maps API? 197

Driving Directions 197
Integrated Google Services 198
KML Data 200
More Data Layers 200
Beyond the Enterprise 202
Interface Improvements 202
Summary 204

PART 3 Advanced Map Features and Methods

CHAPTER 9 Advanced Tips and Tricks 207

Debugging Maps 207
Interacting with the Map from the API 208
Helping You Find Your Place 209
Force Triggering Events with GEvent 210
Creating Your Own Events 212
Creating Map Objects with GOverlay 212
Choosing the Pane for the Overlay 212
Creating a Quick Tool Tip Overlay 214

Creating Custom Controls 218
Creating the Control Object 219
Creating the Container 220
Positioning the Container 220
Using the Control 221
Adding Tabs to Info Windows 221
Creating a Tabbed Info Window 222
Gathering Info Window Information and Changing Tabs 224
Creating a Custom Info Window 224
Creating the Overlay Object and Containers 230
Drawing a LittleInfoWindow 231
Implementing Your Own Map Type, Tiles, and Projection 235
GMapType: Gluing It Together 236
GProjection: Locating Where Things Are 237
GTileLayer: Viewing Images 244
The Blue Marble Map: Putting It All Together 247
Summary 258

CHAPTER 10 Lines, Lengths, and Areas 261

Starting Flat 261
Lengths and Angles 262
Areas 263
Moving to Spheres 266
The Great Circle 267
Great-Circle Lengths 268
Area on a Spherical Surface 270
Working with Polylines 274
Building the Polylines Demo 275
Expanding the Polylines Demo 281
What About UTM Coordinates? 282
Running Afoul of the Date Line 284
Summary 285

CHAPTER 11 Advanced Geocoding Topics 287

Where Does the Data Come From? 287
Sample Data from Government Sources 288
Sources of Raw GIS Data 291
Geocoding Based on Postal Codes 292

Using the TIGER/Line Data 296
Understanding and Defining the Data 296
Parsing and Importing the Data 300
Building a Geocoding Service 307
Summary 312

PART 4 Appendixes

APPENDIX A Finding the Data You Want 315

Knowing What to Look For: Search Tips 315
Finding the Information 315
Specifying Search Terms 316
Watching for Errors 316
The Cat Came Back: Revisiting the TIGER/Line 316
Airports in TIGER/Line 318
The Government Standard: The GeoNames Data 319
Shake, Rattle, and Roll: The NOAA Goldmine 319
For the Space Aficionado in You 321
Crater Impacts 322
UFO/UAP Sightings 322

APPENDIX B Google Maps API 323

class GMap2 323
GMap2 Constructor 323
GMap2 Methods 324
class GMapOptions 329
GMapOptions Properties 329
enum GMapPane 330
GMapPane Constants 330
class GKeyboardHandler 330
GKeyboardHandler Bindings 330
GKeyboardHandler Constructor 331
interface GOverlay 331
GOverlay Constructor 331
GOverlay Static Method 331
GOverlay Abstract Methods 331
class GInfoWindow 332
GInfoWindow Methods 332
GInfoWindow Event 332

class GInfoWindowTab 333
GInfoWindowTab Constructor 333
class GInfoWindowOptions 333
GInfoWindowOptions Properties 333
class GMarker 333
GMarker Constructor 333
GMarker Methods 334
GMarker Events 335
class GMarkerOptions 335
GMarkerOptions Properties 335
class GPolyline 336
GPolyline Constructor 336
GPolyline Factory Methods 336
GPolyline Methods 336
GPolyline Event 336
class GIcon 337
GIcon Constructor 337
GIcon Constant 337
GIcon Properties 337
class GPoint 338
GPoint Constructor 338
GPoint Properties 338
GPoint Methods 338
class GSize 338
GSize Constructor 338
GSize Properties 339
GSize Methods 339
class GBounds 339
GBounds Constructor 339
GBounds Properties 339
GBounds Methods 339
class GLatLng 340
GLatLng Constructor 340
GLatLng Properties 340
GLatLng Methods 340
class GLatLngBounds 341
GLatLngBounds Constructor 341
GLatLngBounds Methods 341
interface GControl 341
GControl Constructor 342
GControl Methods 342

class GControl . . . 342
GControl Constructors . . . 342
class GControlPosition . . . 342
GControlPosition Constructor . . . 343
enum GControlAnchor . . . 343
GControlAnchor Constants . . . 343
class GMapType . . . 343
GMapType Constructor . . . 343
GMapType Methods . . . 343
GMapType Constants . . . 344
GMapType Event . . . 344
class GMapTypeOptions . . . 344
GMapTypeOptions Properties . . . 345
interface GTileLayer . . . 345
GTileLayer Constructor . . . 345
GTileLayer Methods . . . 345
GTileLayer Event . . . 346
class GCopyrightCollection . . . 346
GCopyrightCollection Constructor . . . 346
GCopyrightCollection Methods . . . 346
GCopyrightCollection Event . . . 346
class GCopyright . . . 346
GCopyright Constructor . . . 346
GCopyright Properties . . . 347
interface GProjection . . . 347
GProjection Methods . . . 347
class GMercatorProjection . . . 348
GMercatorProjection Constructor . . . 348
GMercatorProjection Methods . . . 348
namespace GEvent . . . 348
GEvent Static Methods . . . 348
GEvent Event . . . 349
class GEventListener . . . 349
namespace GXmlHttp . . . 350
GXmlHttp Static Method . . . 350
namespace GXml . . . 350
GXml Static Methods . . . 350
class GXslt . . . 350
GXslt Static Methods . . . 350

namespace GLog 350
GLog Static Methods 351
class GDraggableObject 351
GDraggableObject Static Methods 351
GDraggableObject Constructor 351
GDraggableObject Properties 351
GDraggableObject Methods 351
enum GGeoStatusCode 352
GGeoStatusCode Constants 352
enum GGeoAddressAccuracy 352
class GClientGeocoder 352
GClientGeocoder Constructor 352
GClientGeocoder Methods 353
class GGeocodeCache 353
GGeocodeCache Constructor 353
GGeocodeCache Methods 353
class GFactualGeocodeCache 354
GFactualGeocodeCache Constructor 354
GFactualGeocodeCache Method 354
class GMarkerManager 354
GMarkerManager Constructor 354
GMarkerManager Methods 354
GMarkerManager Events 355
class GMarkerManagerOptions 355
GMarkerManagerOptions Properties 355
Functions 355

INDEX 357

About the Authors

ANDRE LEWIS became interested in Google Maps when he set out to create a simple online list of local Wi-Fi cafes. That effort subsequently grew into an active community-driven site at `http://hotspotr.com`. Since then, he has developed numerous tools and techniques for map-based applications using Ruby on Rails.

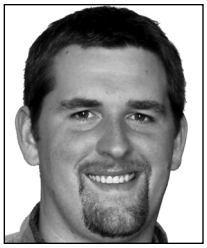
While geographically oriented applications remain a favorite subject, Andre enjoys working with all kinds of technologies. He has architected systems to support millions of daily page views, but he also likes getting the JavaScript and CSS "just right" on a web page. He currently works freelance, consulting on Web 2.0 technologies and developing Ruby on Rails applications. He blogs at `http://earthcode.com` and speaks periodically at Bay Area technology groups.

Andre lives and works in San Francisco. When he's not working with clients or exploring the latest technologies, he likes to mountain bike, camp, and ride his motorcycle.

MICHAEL PURVIS is a mechatronics engineering student at the University of Waterloo, Ontario. Prior to discovering web scripting, he was busy with projects of other kinds, such as making a LEGO Mindstorms kit play the game Connect 4. After the PHP edition of this book was published, he was hired by Google for a four-month internship in the New York City office. He also continues to maintain an active community site for classmates, built from home-brewed extensions to PunBB and MediaWiki.

He has written about CSS for the Position Is Everything web site, and occasionally participates in the css-discuss mailing list. He loves simplicity, but cannot resist the charm of those few problems that do require negative margins and devious float tricks. Discussion of these and other nontechnical topics appears occasionally on his blog at `http://uwmike.com`.

Offline, he enjoys cooking, writing, cycling, and social dancing. He has worked with We-Create Inc. on a number of exciting PHP-based projects and has a strong interest in independent web standards.



JEFFREY SAMBELLS is a graphic designer and self-taught web applications developer best known for his unique ability to merge the visual world of graphics with the mental realm of code. With a bachelor of technology degree in graphic communications management and a minor in multimedia, Jeffrey was originally trained for the traditional paper-and-ink printing industry, but he soon realized the world of pixels and code was where his ideas would prosper. In 1999, he cofounded We-Create Inc., an Internet software company based in Waterloo, Ontario, which began many long nights of challenging and creative innovation. Currently, as director of research and development for We-Create, Jeffrey is responsible for investigating new and emerging Internet technologies and integrating them using web standards–compliant methods. In late 2005, he also became a Zend Certified Engineer.

When not playing at the office, Jeffrey enjoys a variety of hobbies, from photography to woodworking. When the opportunity arises, he also enjoys floating in a canoe on the lakes of Algonquin Provincial Park or going on an adventurous, map-free drive with his wife. Jeffrey also maintains a personal web site at `http://JeffreySambells.com`, where he shares thoughts, ideas, and opinions about web technologies, photography, design, and more. He lives in Ontario, Canada, eh, with his wife, Stephanie, daughter, Addison, and their little dog, Milo.

CAMERON TURNER has been programming computers since his first VIC 20 at age seven. He has been developing interactive web sites since 1994. In 1999, he cofounded We-Create Inc., which specializes in Internet software development. He is now the company's chief technology officer. Cam obtained his honors degree in computer science from the University of Waterloo with specialization in applied cryptography, database design, and computer security.

Since the PHP edition of this book was published, Cam started giving technology-related talks and lectures to companies and associations based in and around Waterloo, Ontario. Topics and interests range from Google Maps (of course) to search engine optimization as well as other topics relating to professional web software development.

Cam lives in Canada's technology capital of Waterloo with his wife, Tanya, son, Owen, and dog, Katie. His hobbies include geocaching, biking, hiking, water skiing, and painting. He maintains a low-volume personal blog at `http://CamTurner.com`, discussing nontechnical topics, thoughts, theories, and family life.

About the Technical Reviewer

SAM AARON is a Ph.D. student at the School of Computing Science at Newcastle University in the U.K. He is currently finishing off his thesis on the subject of interest management. He is both a Ruby and a Rails fanatic, and as such is actively involved in using and raising awareness of these wonderful technologies. He founded and organizes the local Ruby and Rails User Group—ncl.rb, which attracts more than 20 people every month. He is using Rails to build a web-based decision support tool for Newcastle University's transport department and is constantly looking for excuses to include as many of the exciting new Rails advances into his projects as possible.

Sam lives with his beautiful girlfriend, Susanna, on the quayside in Newcastle-upon-Tyne, England. He loves watching the birds fly over the river from his window. He spends his working days hacking away on his PowerBook listening to strange electronic music. When not working, he likes to get out of the city and relax. He loves camping, climbing mountains, and power kiting. When at home he's often found either playing the piano or table football. He doesn't own a car and can't even drive, preferring instead to cycle everywhere—especially long-distance expeditions with good friends.

When Sam finishes his Ph.D., he plans to start a web development, training, and consultancy company focusing on Ruby and Rails. He is currently in talks with Newcastle College with respect to it including Ruby and Rails content within its taught courses. If you're interested in finding out what Sam's up to today, just head along to his blog: `http://sam.aaron.name`.