Efficient Route Planning
SS 2012

Lecture 5, Wednesday May 23rd, 2012
(Web application, Google Maps API)

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Overview of this lecture

- **Organizational**
  - Feedback and results from Exercise Sheet 4 (Arc Flags)
  - Date of the **exam**

- **A route planner web application**
  - We will build a full-fledged web app together today
  - You will learn about and see applied:

    Google Maps API, HTML, DOM, CSS, JavaScript, jQuery, AJAX, JSON / JSONP, socket communication, ...

  - Our web app will let us specify an arbitrary source and target on the map ... and draw a straight line between them
  - Exercise Sheet 5: Same but with the **shortest path**
    - as computed by one of our fancy algorithms so far

Your Feedback on Ex. Sheet 4 (Arc Flags)

■ **Summary / excerpts**   last checked May 23, 15:45

– Didn't take as much time as the last exercises

– Implementation of arc flags doable in a few hours

– If more time, then due to code refactoring or stupid mistakes

– Both implementation advice and feedback from the tutors was again very useful

– Is it possible to combine A* with Arc Flags?

– Additional bookkeeping (like parent pointers) slows down Dijkstra significantly ... does it really?

– Google Fusion Tables are nice

  ● but unhappy about need to create a Google Account

– Video recording was missing ... no it wasn't!

Your experimental results (Arc Flags)

- **See the table on the Wiki**

  - Comparison Dijkstra / A*-Landmarks / Arc Flags

  - Let's look at the figures for **BaWü**

    settled nodes: 1.2M / 50K / 20K

    query time: 0.5s / 20ms / 10ms

    precomputation time: 0 / 1min / 2min for **one** region

  - That is (only) a factor-2 improvement in query time

    - at the price of a **much** higher precomputation cost

Final exam

- We need to agree on a date

  - Any preferences on your side?

  - It must be in the period August 13 – September 28

  - Suggestion: **Tuesday, August 21, 2:00pm**

Components of a web-based route planner

- **Backend**

  - Your code to solve the shortest path problem

  - Additional code to listen to queries on a given port

  - And to send the result in a form suitable for the frontend

- **Frontend**

  - Code that runs on the client's browser

  - Registers events, like a click on the map somewhere

  - Sends queries to the backend

  - Visualizes results sent from backend

Technologies needed   1/2

- **On the side of the backend**

  - Socket communication

    - Listen for requests on a given port

    - Parse request string

    - Sent back answer string

  - In C++ easy with boost::asio (asio = asynchronous IO)

  - In Java easy with java.net.Socket / java.net.ServerSocket

  - See code examples in the SVN ... under lectures/lecture-5

Technologies needed 2/2

■ **On the frontend side**   (very briefly, see references for details)

– HTML: for a web page that holds the map

– DOM: the elements of the HTML page

– CSS: the layout of the elements of the HTML page

– JavaScript: code loaded and run along with the web page

– jQuery: JavaScript library with lots of useful functions

– Google Maps API: JavaScript library with lots of useful functions to draw maps and manipulate with them …

– AJAX: sending queries from the client to a server and receiving results **a**synchronously

– JSON/JSONP: a string containing JavaScript code

Maps Demo

- We will now write a complete web app together

  - Display a map (as we know it from Google Maps)

  - Place to markers on it (source and target)

  - Make the markers draggable

  - Whenever one of the markers is dragged:

    - sent coordinates of markers to the server

    - receive path between markers from the server

    - draw that line

  - This will contain **all** the technological elements from the last two slides ... which you also need for Ex. Sheet 5

References

- Google Maps JavaScript API V3
  - http://code.google.com/apis/maps/documentation/javascript/
- JavaScript und CSS
  - http://www.w3schools.com/js/default.asp
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- AJAX, JSON, JSONP, …
  - http://en.wikipedia.org/wiki/Ajax_(programming)
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