GWiz

(The GPXWizard)

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Viz

Vizard)

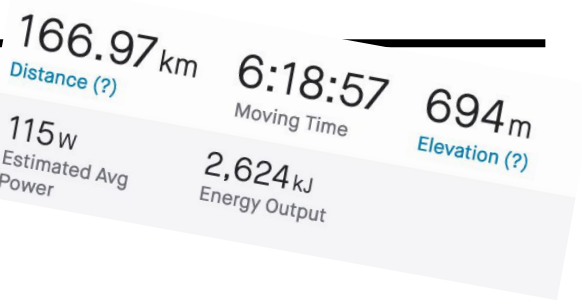
o, Rebecca Yao

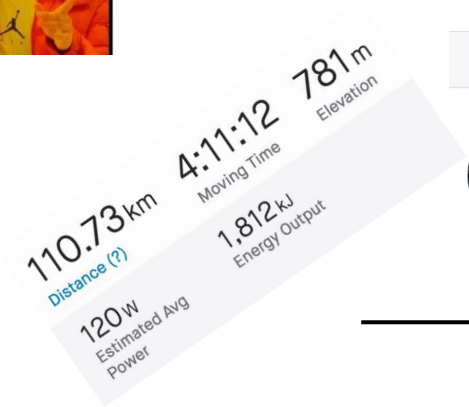
Motivation

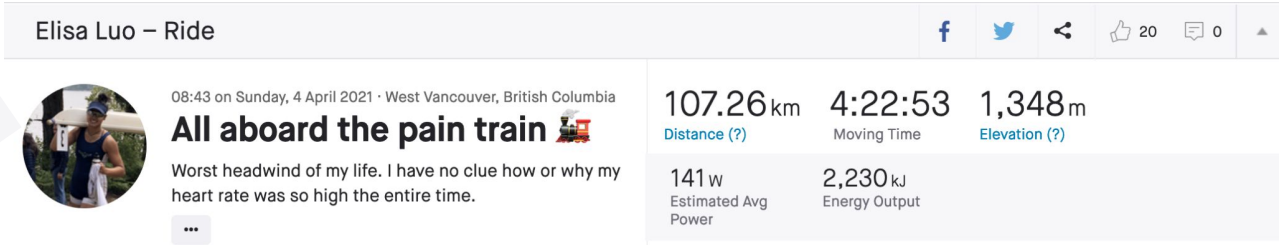
STRAVA

GWiz

- ~~So I can go on excessively long bike rides in the name of "research"~~
- Unleash that inner data junkie 🤓
- Don't let Strava steal your data*



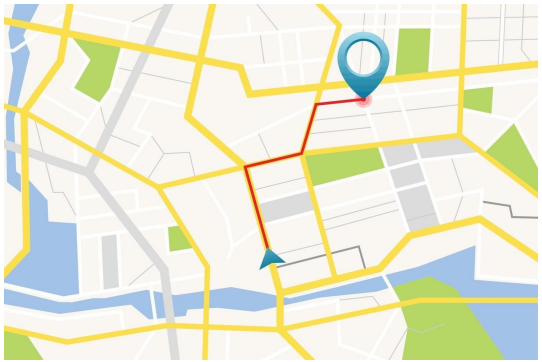




*arguably the compromise of personal privacy is worth the gratification obtained from the social features

High-Level Overview

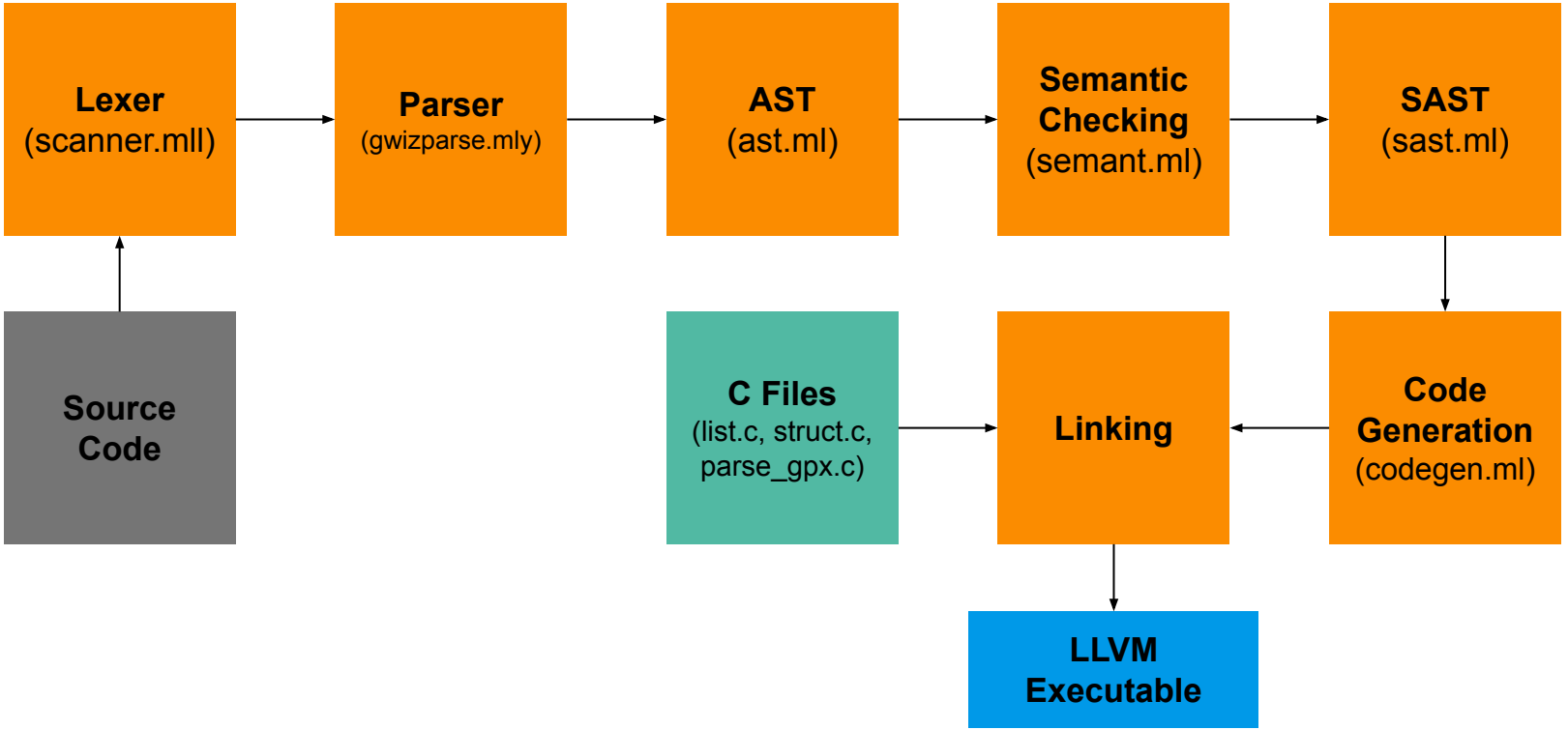
- Imperative
- Statically scoped
- Strongly typed
- Built in struct and list types
- GPX file analysis



GPX File

```
      <gpxtpx:hr>102</gpxtpx:hr>
     </gpxtpx:TrackPointExtension>
    </extensions>
   </trkpt>
   <trkpt lat="49.3552480" lon="-123.1350690">
    <ele>299.6</ele>
    <time>2021-04-22T15:45:05Z</time>
    <extensions>
     <gpxtpx:TrackPointExtension>
      <gpxtpx:atemp>28</gpxtpx:atemp>
      <gpxtpx:hr>104</gpxtpx:hr>
     </gpxtpx:TrackPointExtension>
    </extensions>
   </trkpt>
   <trkpt lat="49.3552480" lon="-123.1350690">
    <ele>298.0</ele>
    <time>2021-04-22T15:45:09Z</time>
    <extensions>
     <gpxtpx:TrackPointExtension>
      <gpxtpx:atemp>28</gpxtpx:atemp>
      <gpxtpx:hr>106</gpxtpx:hr>
     </gpxtpx:TrackPointExtension>
    </extensions>
```

Compiler Architecture



GWiz's Evolution

Iteration 1

- **Activity Class**
  - Sounded cool but too cumbersome for user to define

Iteration 2

- **Pass GPX file into a gwiz array of structs**
  - Simple to pass pointers to and from C
  - Array of structs' memory didn't match up with C

Current iteration

- **File pointer**
  - Clean and easy to work with on the user end
  - Efficient

Key Language Features

- GPX file interpretation
  - File pointer
  - Built-in functions
  - Math functions
- Generate your own route*
  - Structs (Trackpoint)
  - Linked List

*may be a little cumbersome

Struct = Trackpoint

- Trackpoint is a struct of (double, double, int)
- Used to represent latitude, longitude and time

```
<trkpt lat="49.3552480" lon="-123.1350690">
 <ele>300.6</ele>
 <time>2021-04-22T15:44:59Z</time>
```

```
Trackpoint t;
int time;
double lat;
t=(4.5285, 1.4829, 562);
lat=getLat(t);              //assigns lat to 4.5285
time=getTime(t);            //assigns time to 562
```

Linked List

- Create Linked Lists of Ints and Trackpoints
- Append elements to the end of the list
- Access elements at specified index
- Leak memory

```
Trackpoint[] t;
Trackpoint a;
Trackpoint b;
Trackpoint c;
a=(4.5285, 1.4829, 562);
b=(34.897239, 8.2397, 1234);
t = [a];                          //initialize list
t +<b>;                           //append b to end
c = -<0>;                         //access first element
```

GPX File Parsing

- In C: used libxml2, an XML parser, to select latitude, longitude, and time data for each trackpoint
- Return a pointer to a list of trackpoints

Interpreting a GPX file in GWiz

Sorry, all these functions are in metric because the person who wrote them is Canadian.

- GPX file is represented in GWiz as a file pointer
- Handy built-in functions provide the building blocks for a variety of user-defined functions!
  - GPX functions
    - void stat(file f) /* prints general stats for a quick overview */
    - int totTime(file f)
    - double totDist(file f)
    - double avgSpeed(file f)
  - Math functions
    - intFloor(double d)
    - doubleFloor(double d)
    - squareRoot(double d)

```
file f;

f = parseGPX("nameOfFile.gpx");
```

Code demo

Stackoverflow
Documentation
YouTube Tutorial
GitHub code
Professor's code
My friend's code
My actual code
Prof. Edwards
my working code
What the hell is this?

Future Work

- Use graphs to see if 2 gpx file routes intersect
- Add elevation and heart rate to Trackpoint
- Modify and write to a new gpx file
- Conversion between double and int
  - Less safe, more convenient.
- Automatic garbage collection
  - Won’t run the risk of running out of memory

You
You
Thanks for Listening!
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Ashley Kim