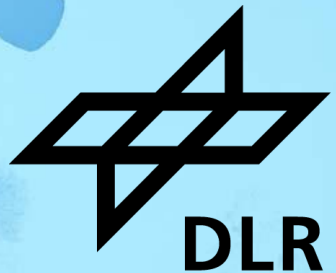


LIBOPENDRIVE-BASED GDAL DRIVER

FOSS4G, 2023-06-30, Prizren

Michael.Scholz@dlr.de



OpenDRIVE – yet another road description format



OpenDRIVE – yet another road description format



OpenDRIVE – structure



- Strong data model hierarchy and element cross-references

```
<road name="Boulevard of Rock" length="66.6"  
  <link  
    <predecessor elementType="junction"  
    <successor elementType="junction" ele  
  </link>
```

```
<signal s="0" t="0" id="1337"  
  country="LV-426" subtype="-1"  
  <laneValidity fromLane="1"  
</signal>
```

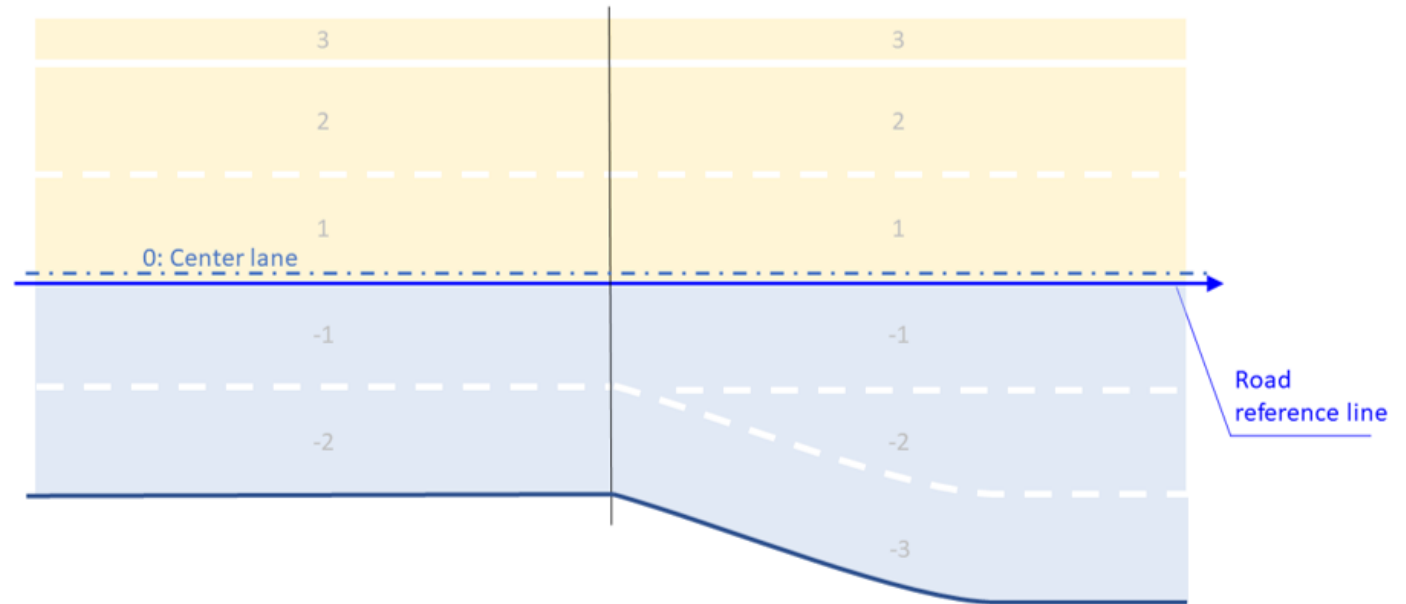
```
<lanes>  
  <laneSection s="0">  
    <left>  
      <lane id="3" type="border"  
        <link  
          <successor id="3"/>  
        </link>
```

```
<junction name="ne Kreuzung halt" id="1234">  
  <connection id="0" incomingRoad="1" connectingRoad="2"  
    <laneLink from="-7" to="-7"/>  
    <laneLink from="-6" to="-6"/>  
    <laneLink from="-5" to="-5"/>  
    <laneLink from="-4" to="-4"/>
```

OpenDRIVE – structure



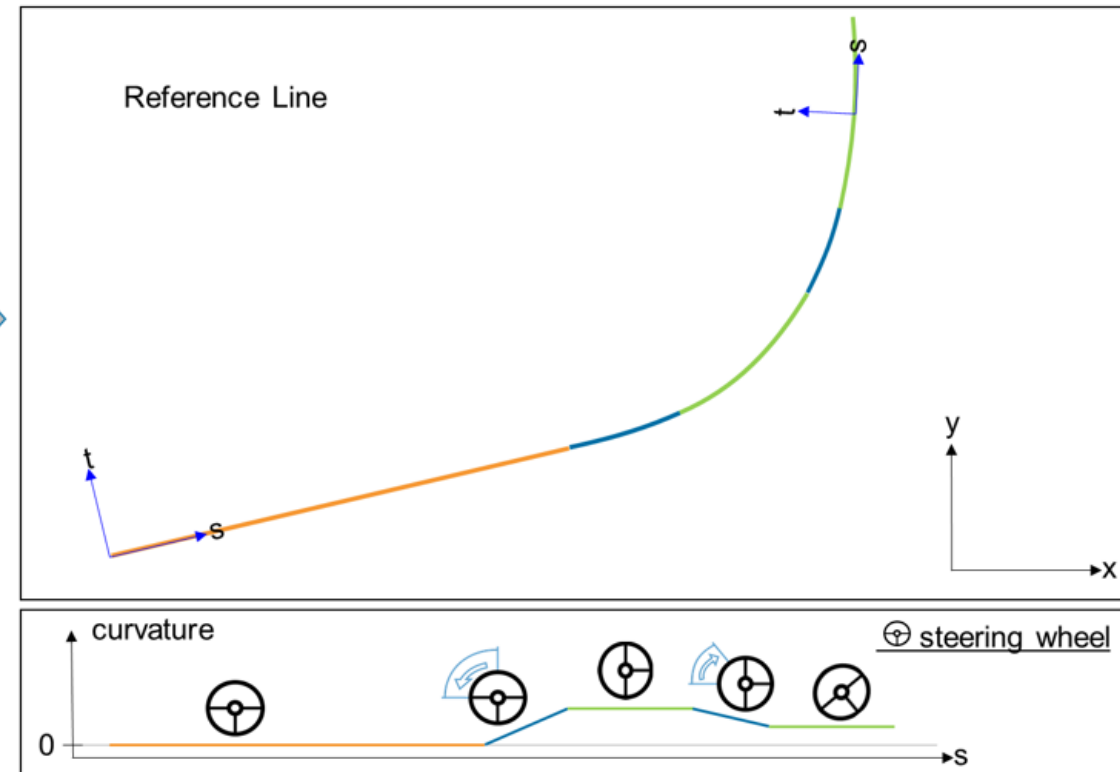
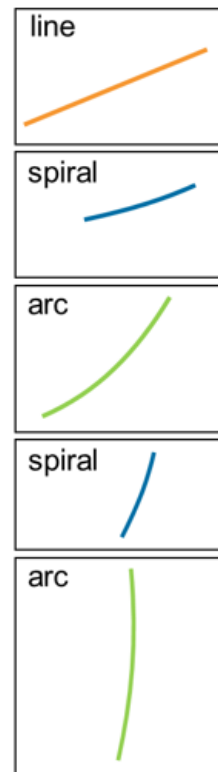
- Strong data model hierarchy and element cross-references
- Detailed lane modelling
- Features refer to an imaginary reference line



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OpenDRIVE – structure

- Strong data model hierarchy and element cross-references
- Detailed lane modelling
- Features refer to an imaginary reference line
- Road topography (2.5D) with continuous geometry definition



Make OpenDRIVE data GIS-able

Discrete anchor points



```
<planView>  
  <geometry s="0.0" x="604944.1037"  
    y="5792860.1272"  
    hdg="3.5148"  
    length="9.7589">  
    <arc curvature="9.0884E-4"/>  
  </geometry>  
  <geometry s="9.7589" x="604935.03"  
    y="5792856.5285"  
    hdg="3.5237"  
    length="12.0">  
    <line/>  
  </geometry>  
</planView>
```

Make OpenDRIVE data GIS-able

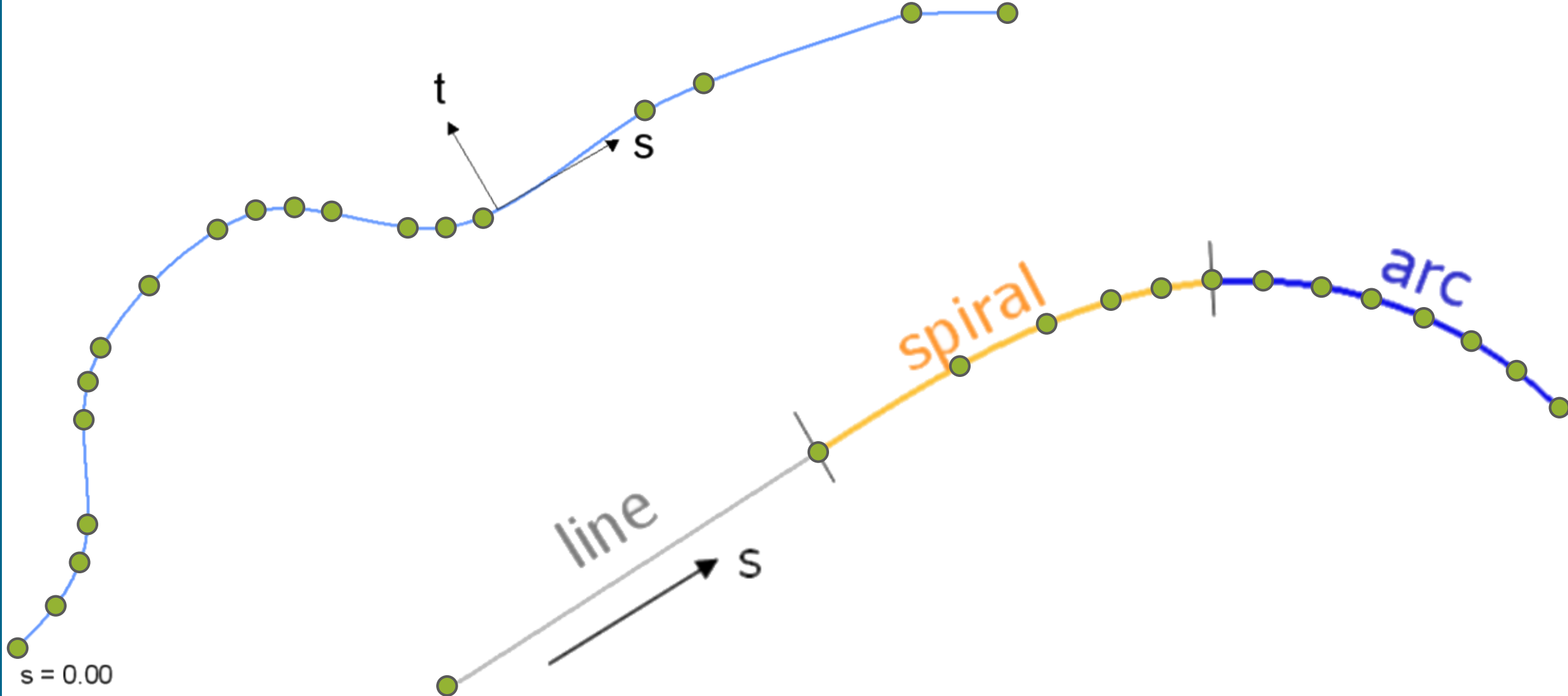
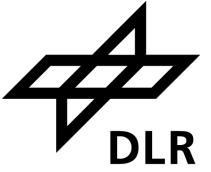
Continuous geometry evolution



```
<planView>  
  <geometry s="0.0" x="604944.1037"  
    y="5792860.1272"  
    hdg="3.5148"  
    length="9.7589">  
    <arc curvature="9.0884E-4"/>  
  </geometry>  
  <geometry s="9.7589" x="604935.03"  
    y="5792856.5285"  
    hdg="3.5237"  
    length="12.0">  
    <line/>  
  </geometry>  
</planView>
```

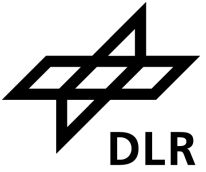

Make OpenDRIVE data GIS-able

Application-based discretisation (sampling)

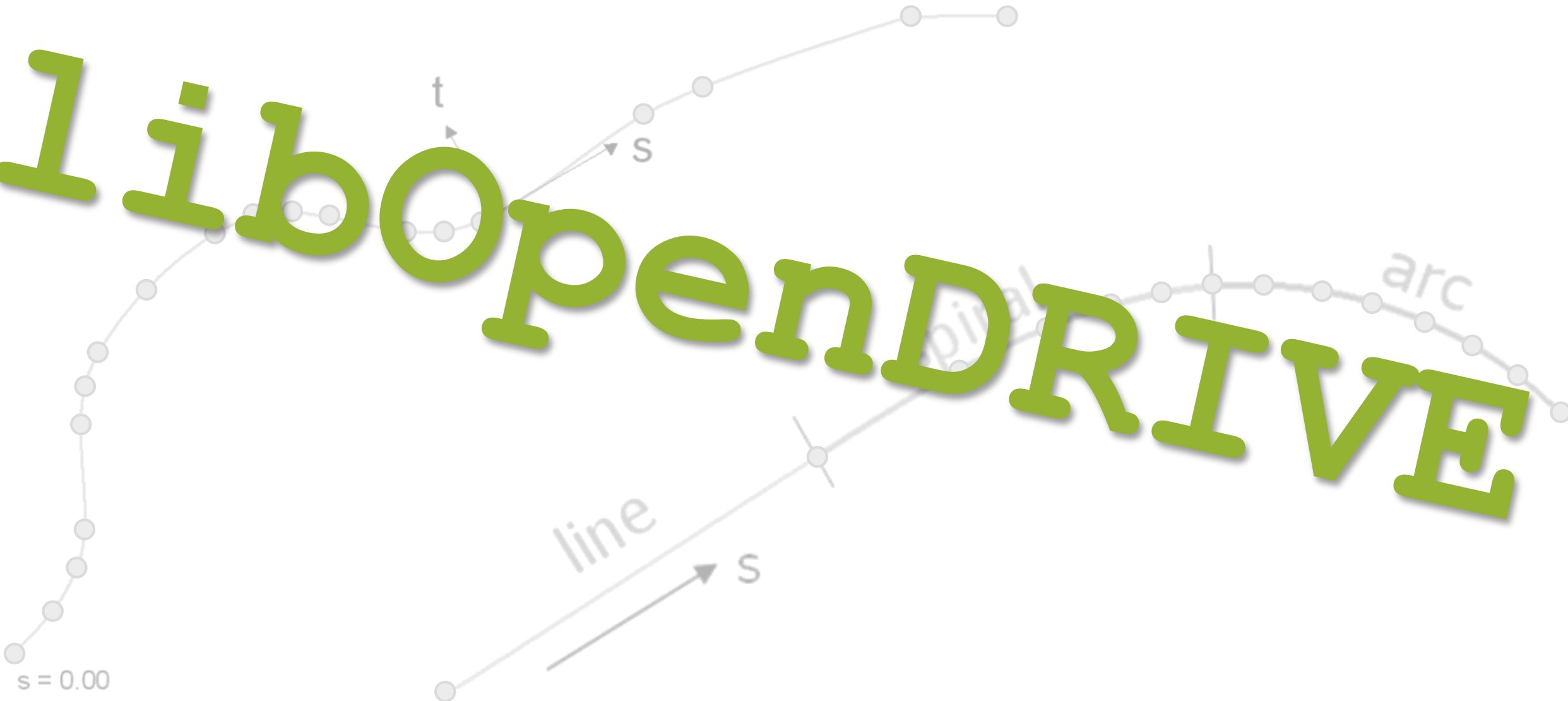


Make OpenDRIVE data GIS-able

Application-based discretisation (sampling)



libOpenDRIVE



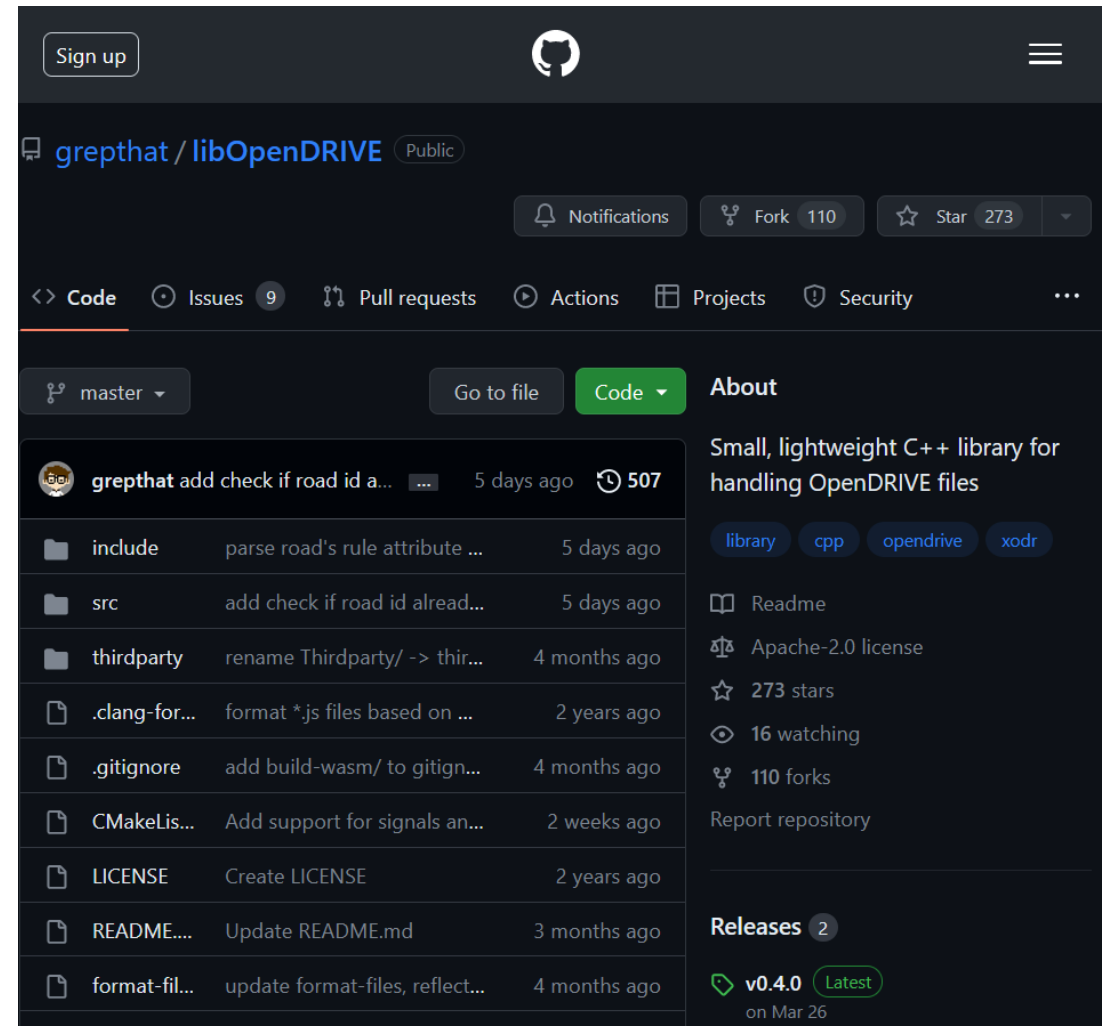
Make OpenDRIVE data GIS-able

With libOpenDRIVE



- [GitHub](#)

- DOI `10.5281/zenodo.7771708`



The screenshot shows the GitHub repository page for `grephat/libOpenDRIVE`. The repository is public and has 110 forks and 273 stars. The main content area displays a list of files and folders, including `include`, `src`, `thirdparty`, `.clang-for...`, `.gitignore`, `CMakeLis...`, `LICENSE`, `README....`, and `format-fil...`. The right sidebar provides an overview of the repository, including a description: "Small, lightweight C++ library for handling OpenDRIVE files". It also lists the license (Apache-2.0), the number of stars (273), and the number of forks (110). The latest release is `v0.4.0`, marked as "Latest", and was released on Mar 26.

Make OpenDRIVE data GIS-able

Translating into OGC Simple Features model of OGR



```
<planView>
  <geometry s="0.0" x="604944.1037"
            y="5792860.1272"
            hdg="3.5148"
            length="9.7589">
    <arc curvature="9.0884E-4"/>
  </geometry>
  <geometry s="9.7589" x="604935.03"
            y="5792856.5285"
            hdg="3.5237"
            length="12.0">
    <line/>
  </geometry>
</planView>
```

```
LineString(
    604944.1037 5792860.1272,
    604752.81 5792819.10, ...)

LineString(
    604935.03 5792856.5285,
    604754.39 5792810.73, ...)
```

Make OpenDRIVE data GIS-able

Translating into OGC Simple Features model of OGR



Simple Features type	OpenDRIVE element
Point	signal, object (e.g. pole)
LineString	planView (road reference line), lane (boundary), roadMark, object (e.g. guardrail)
Polygon	lane, parkingSpace

Make OpenDRIVE data GIS-able

Providing a GDAL driver



```
user@machine:/dev/gdal$ ogrinfo --formats
```

```
Supported Formats:
```

```
PCIDSK -raster,vector- (rw+v): PCIDSK Database File
```

```
CSV -vector- (rw+v): Comma Separated Value (.csv)
```

```
GML -vector- (rw+v): Geography Markup Language (GML)
```

```
KML -vector- (rw+v): Keyhole Markup Language (KML)
```

```
GeoJSON -vector- (rw+v): GeoJSON
```

```
... many more ...
```

```
MBTiles -raster,vector- (rw+v): MBTiles
```

```
OGCAPI -raster,vector- (rov): OGCAPI
```

```
ESRI Shapefile -vector- (rw+v): ESRI Shapefile
```

```
SQLite -vector- (rw+v): SQLite / Spatialite
```

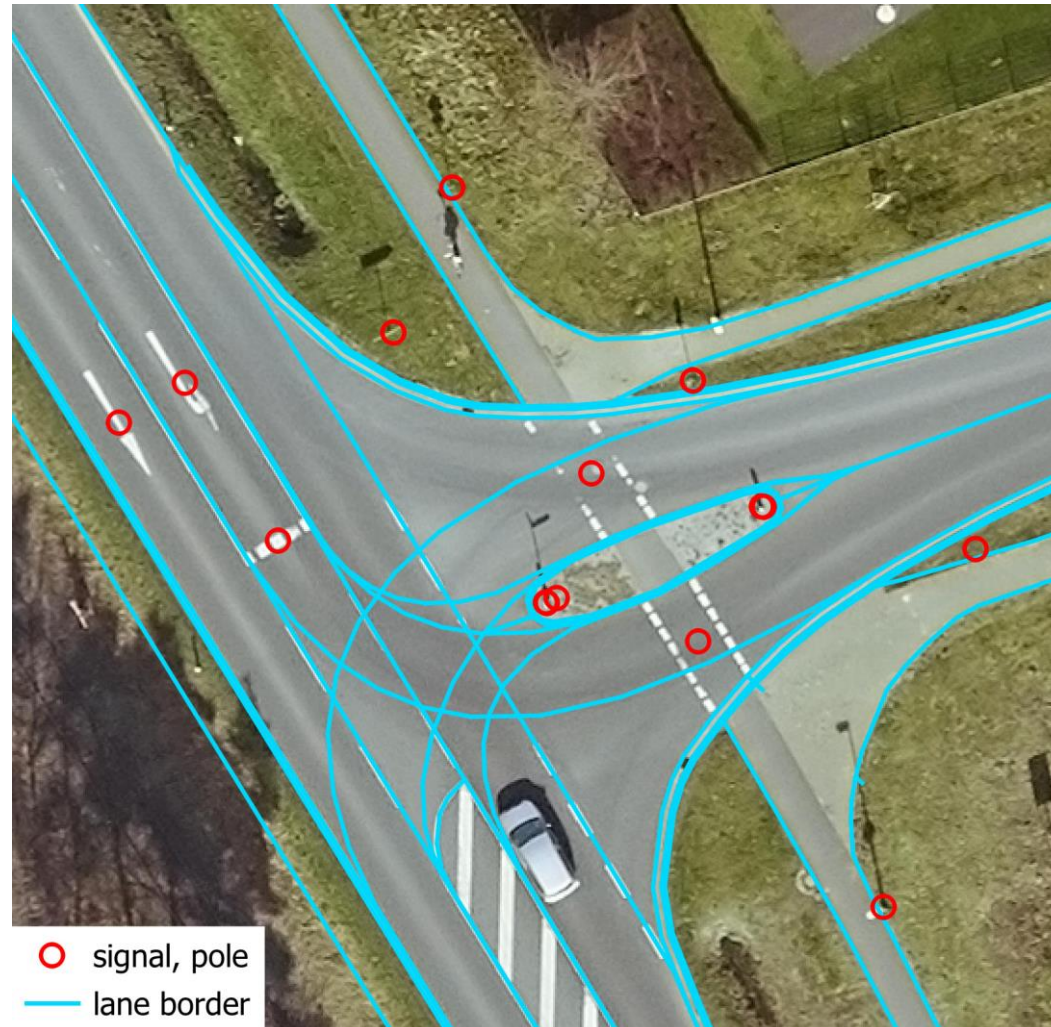
```
TIGER -vector- (rov): U.S. Census TIGER/Line
```

```
XODR -vector- (rov): OpenDRIVE - Open Dynamic Road Information for Vehicle Environment
```

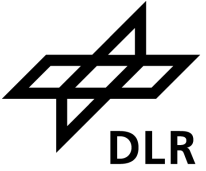
One library to rule them all ...

Make OpenDRIVE data GIS-able

Getting it into QGIS



GDAL with libOpenDRIVE extension



- Currently as branch `libopendrive` at <https://github.com/DLR-TS/gdal>

Let's get it official!

OpenDRIVE – yet another road description format



- Open industry standard as part of „OpenX“, maintained by [ASAM e. V.](#)
- Growing developer community: [Awesome OpenX](#)
- Future GIS integration also via [ADE in OGC CityGML 3.0](#)

Topic: **Providing a libOpenDRIVE-based GDAL driver for conversion of lane-detailed road network datasets commonly used in automotive engineering into GIS tools**

Date: 2023-06-30

Author: Michael Scholz

Institute: Institute of Transportation Systems

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