

SUMO GUI DASTURIY TA'MINOTIDA SUN'IY YO'LDOSHDAN OSM DATE XARITASINI SHAKILLANTIRISH TEXNOLOGIYASI

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Annotatsiya: *Sumo GUI dasturiga sun'iy yo'ldosh orqali xaritadan kerakli maydonni tanlab uni elektron OSM data shakliga o'tkazish texnologiyasi bo'yicha barcha qilingan qadamlar ketma-ketligi.*

Kalit so'zlar: *Sumo GUI, OSM file, OSM date, sun'iy yo'ldosh, xarita, elektron, analiz, tahlil, sumo, texnologiya, fan, tirbandlik, tahlil.*

ТЕХНОЛОГИЯ ФОРМИРОВАНИЯ КАРТЫ OSM DATE СО СПУТНИКА В ПРОГРАММНОМ ОБЕСПЕЧЕНИИ SUMO GUI

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Аннотация: *последовательность всех выполненных шагов по технологии преобразования в электронную форму данных OSM путем выбора нужной области со спутниковой карты в программу Sumo GUI.*

Ключевые слова: *Sumo GUI, OSM file, OSM date, спутник, карта, электроника, анализ, анализ, сумо, технология, наука, трафик, Анализ.*

OSM DATE MAPPING TECHNOLOGY FROM SATELLITE IN SUMO GUI SOFTWARE

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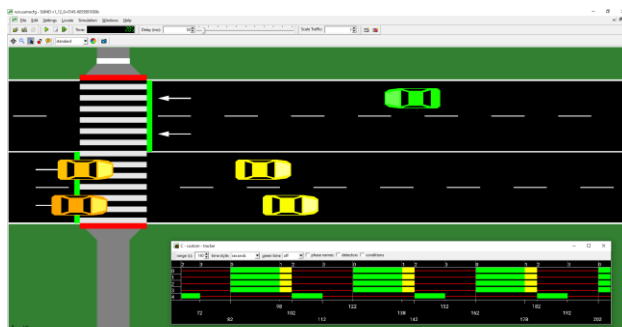
Annotation: *a sequence of all steps taken on the technology of transferring it to the electronic OSM data form by selecting the desired area from the map via satellite to the Sumo GUI application.*

Keywords: *Sumo GUI, OSM file, OSM date, satellite, map, Electronic, Analysis, Analysis, sumo, technology, science, congestion, analysis.*

Sumo GIU dasturiy ta'minotining SUMO GUI (Graphical User Interface), dasturiy ta'minoti, Simulation of Urban MObility (SUMO) dasturini o'rganish, tuzilish va boshqarish uchun grafik interfeysni taklif etadi. SUMO, transport tizimlarini

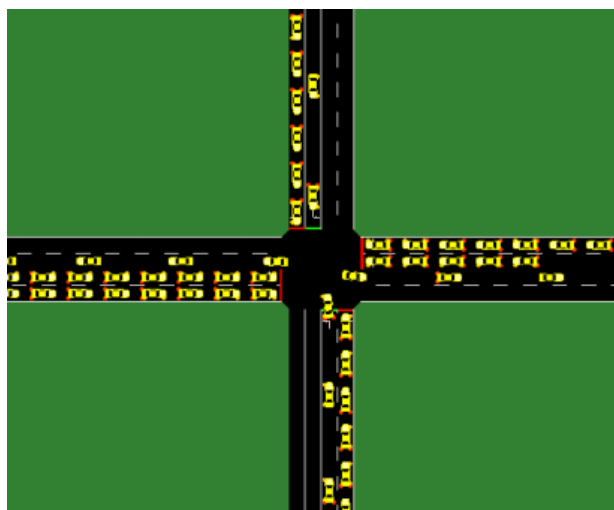
(avtomobillar, avtobuslar, velosipedlar, piyodalar, va h.k.) o'rganish va simulatsiya qilish uchun ishlatiladi. SUMO GUI bu dastur bilan birlashgan bo'lib, SUMO-ni o'rganish va uni boshqarishni osonlashtiradi. SUMO GUI yordamida quyidagi muhim vazifalarni bajarish mumkin.

Avtotarmoq yaratish va boshqarish: SUMO tarmoqning (network) tuzilishi uchun foydalanuvchiga oson va qulay interfeys taqdim etadi. Foydalanuvchilar SUMO GUI orqali yangi transport tarmoqlarini yaratish, o'zgartirish, hamda ularga alohida xususiyatlar (yo'lni yo'qlash, to'xtatish joylari, traffic lightlar, va h.k.) qo'shishlari mumkin.



Rasm- 1. Sumo GUI dasturiy ta'minoti. Tarmoq yaratish jarayoni.

Simulyatsiyani boshqarish: SUMO GUI orqali transport tizimlarini simulatsiya qilish uchun qulay interfeys taqdim etadi. Foydalanuvchilar transport vositalari, sayyoralar, yo'nalishlar, va h.k. kabi parametrlarni sozlashlari va simulatsiya jarayonini boshqarishlari mumkin.



Rasm- 2. Sumo GUI dasturiy ta'minoti. Simulyatsion jarayon.

Natijalarni ko'rsatish: SUMO simulatsiyasi tugaganidan so'ng, foydalanuvchilar SUMO GUI orqali statistika, grafiklar va boshqa vizual ma'lumotlarni ko'rishlari mumkin. Bu natijalar, transport tizimining harakati, qayta-tasvir etish va tahlil qilish uchun foydalanuvchilarga o'zlarining simulatsiya jarayonidagi tuzilishi haqida qo'l ma'lumotlarni olishlari uchun muhimdir.

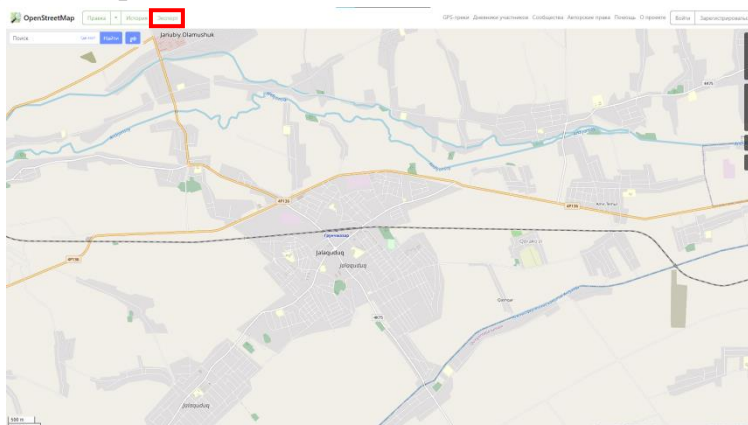


Rasm- 3. Sumo GUI dasturiy ta'minoti.Natijaviy ko'rinish.

Yo'riqnoma va ma'lumotlar manbalariga kirish: SUMO GUI foydalanuvchilarga SUMO haqida qo'1 ma'lumotlarni olishlari uchun yo'riqnoma, ko'rsatkichlar va boshqa ma'lumotlar manbalariga kuzatish uchun qulay yo'nalishlar taqdim etadi.

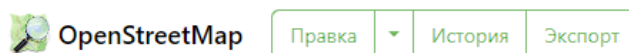
Boshqa dasturiy ta'minotlardan asosiy farqi, SUMO GUI-ning SUMO-ni o'rganish jarayonida boshqa boshqaruvchi maxsus komponentalar va dasturlari o'rnatilishi. Boshqa ta'minotlar SUMO-ni terminal yoki skriptlar orqali boshqarish uchun ishlatiladi, ammo SUMO GUI grafik interfeys orqali boshqarishni osonlashtiradi va o'rganishni qulaylashtiradi.

Eng avval Sumo GUI va python dasturlarini operatsion sitemaga o'rnatib olish talab qilinadi. Bazi komponentalarni Sumo GUI dasturiga bog'lash uchun python dasturlash tilining ba'zi komponentalaridan foydalanish talab qilinganligi uchun bo'ladi. Sumo uchun alohida file (папка) yaratib olish kerak bo'ladi negaki Sumo GUI ishlashi uchun strukturalangan file-lar bir joyda jamlangan bo'lsihi muhim. Shundan so'ng tahlil qilmoqchi bo'lgan manzil maydonini aniqlab, uni [OpenStreetMap](https://www.openstreetmap.org/) web saytiga kirish orqali qidirib topish kerak bo'ladi (Rasm-4).



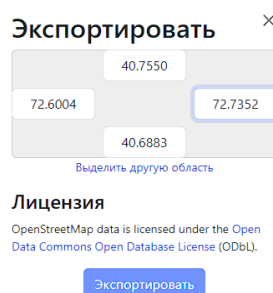
Rasm- 4

Saytning yuqori qismida eksport tugmasi mavjud (Rasm-5).



Rasm- 5

Eksport tugmasini bosishdan keyin ochilgan oyna siz ekranda ko'rib turgan diapazonni tanlab uni eksport qilishingiz mumkin bo'ladi.



Rasm- 6

Agar boshqa diapazonni tanlash kerak bo'lsa, "Boshqa hududni tanlang" tugmasi orqali diapazonni tanlab olish mumkin. Diapazon aniq tanlab olinganidan keyin uni eksport qilish kerak. Tanlangan maydon ma'umotlar bazasi sifatida OdbL tehnologiyasini qo'llab quvvatlaydi va .OSM formatida yuklanadi. Yuklangan xaritani sumo uchun oldindan yaratib qo'yilgan file-ga joylash kerak. Joylash yakunlangandan keyin windows operatsion tizimlarida quyidagi manzilga kirish kerak agar sumo jimlik (default) holatda o'rnatilgan bo'lsa:

C:\Programfiles (x86)\Eclipse\sumo\data\typemap

manzilga kirib Sumo GUI ning ***osmNetconvert.typ.xml*** komponentini oldindan tayyorlab qo'yilgan file ichiga joylash kerak. Joylab olgandan keyin ishchi file-da turgan xolda manzil qismiga ***cmd*** so'zini kiritishdan foydalanib, Chief Managing Director (CMD) oynasini ishga tushurish kerak bo'ladi. So'ng,

netconvert --osm-files map.osm -o test.net.xml -t osmNetconvert.typ.xml --xml-validation never

buyrug'ini cmd oynasiga kiritish kerak. ***Success*** so'zi ko'ringan bo'lsa barcha qilingan ishlar to'g'ri bajarilgan bo'ladi. Buyruq to'g'ri bajarilgandan keyin ishchi file-da yangi hujjat hosil bo'ladi ***test.net***. Qo'shimcha poligonlarni import (binolar, suv va boshqalar) qilish uchun quyidagi kodni orqali xml hujjat sifatida saqlash kerak. Birorta bo'sh not file ochib, ichiga kodni joylaymiz, saqlash vaqtida ***typemap.xml*** nomi va xml fayl hujjatlari kengaytmasi orqali saqlanishi kerak.

```
<polygonTypes>
```

```
<polygonType id=«waterway» name=«water» color=«.71,.82,.82»
```

```
layer=«-4»/>
```

```
<polygonType id=«natural» name=«natural» color=«.55,.77,.42»
```

```
layer=«-4»/>
```

```
<polygonType id=«natural.water» name=«water» color=«.71,.82,.82»
```

```
layer=«-4»/>
```

```

        <polygonType id=«natural.wetland»      name=«water»      color=«.71,.82,.82»
layer=«-4»/>
        <polygonType id=«natural.wood»       name=«forest»    color=«.55,.77,.42»
layer=«-4»/>
        <polygonType id=«natural.land»       name=«land»      color=«.98,.87,.46»
layer=«-4»/>
        <polygonType id=«landuse»           name=«landuse»   color=«.76,.76,.51»
layer=«-3»/>
        <polygonType id=«landuse.forest»     name=«forest»    color=«.55,.77,.42»
layer=«-3»/>
        <polygonType id=«landuse.park»       name=«park»      color=«.81,.96,.79»
layer=«-3»/>
        <polygonType id=«landuse.residential» name=«residential» color=«.92,.92,.89»
layer=«-3»/>
        <polygonType id=«landuse.commercial» name=«commercial»
color=«.82,.82,.80» layer=«-3»/>
        <polygonType id=«landuse.industrial» name=«industrial» color=«.82,.82,.80»
layer=«-3»/>
        <polygonType id=«landuse.military»  name=«military»  color=«.60,.60,.36»
layer=«-3»/>
        <polygonType id=«landuse.farm»       name=«farm»      color=«.95,.95,.80»
layer=«-3»/>
        <polygonType id=«landuse.greenfield» name=«farm»      color=«.95,.95,.80»
layer=«-3»/>
        <polygonType id=«landuse.village_green» name=«farm»      color=«.95,.95,.80»
layer=«-3»/>
        <polygonType id=«tourism»           name=«tourism»   color=«.81,.96,.79»
layer=«-2»/>
        <polygonType id=«military»          name=«military»  color=«.60,.60,.36»
layer=«-2»/>
        <polygonType id=«sport»             name=«sport»     color=«.31,.90,.49»
layer=«-2»/>
        <polygonType id=«leisure»          name=«leisure»   color=«.81,.96,.79»
layer=«-2»/>
        <polygonType id=«leisure.park»     name=«tourism»   color=«.81,.96,.79»
layer=«-2»/>
        <polygonType id=«aeroway»          name=«aeroway»   color=«.50,.50,.50»
layer=«-2»/>
        <polygonType id=«aerialway»        name=«aerialway» color=«.20,.20,.20»
layer=«-2»/>
    
```

```

<polygonType id=«shop»          name=«shop»          color=«.93,.78,1.0»
layer=«-1»/>
<polygonType id=«historic»      name=«historic»    color=«.50,1.0,.50»
layer=«-1»/>
<polygonType id=«man_made»      name=«building»    color=«1.0,.90,.90»
layer=«-1»/>
<polygonType id=«building»      name=«building»    color=«1.0,.90,.90»
layer=«-1»/>
<polygonType id=«amenity»       name=«amenity»     color=«.93,.78,.78»
layer=«-1»/>
<polygonType id=«amenity.parking» name=«parking»     color=«.72,.72,.70»
layer=«-1»/>
<polygonType id=«power»         name=«power»       color=«.10,.10,.30»
layer=«-1» discard=«true»/>
<polygonType id=«highway»       name=«highway»     color=«.10,.10,.10»
layer=«-1» discard=«true»/>
<polygonType id=«railway»       name=«railway»     color=«.10,.10,.10»
layer=«-1» discard=«true»/>

<polygonType id=«boundary» name=«boundary» color=«1.0,.33,.33» layer=«0»
fill=«false» discard=«true»/>
<polygonType id=«admin_level» name=«admin_level» color=«1.0,.33,.33»
layer=«0» fill=«false» discard=«true»/>
</polygonTypes>
    
```

Keyin ishchi file-ni ichida **CMD** oynasini ishga tushurish kerak bo'ladi. So'ng ushbu kod yozilishi kerak.

polyconvert --net-file test.net.xml --osm-files map.osm --type-file typemap.xml -o map.poly.xml --xml-validation never

Ish bajarilganligi haqida habarn ko'rinadi.

```

Warning: Ambiguous railway kilometrage direction for way '106623686' (assuming forward)
Warning: Discarding unknown compound 'cycleway.opposite_lane' in type 'cycleway.opposite_lane|highway.residential' (first occurrence for edge '162551440').
Warning: Discarding unusable type 'railway.platform' (first occurrence for edge '218057858').
Warning: Discarding unusable type 'railway.Ortsstellbereich' (first occurrence for edge '356309979').
Warning: No way found for reference '4527130' in relation '3198178'.
Warning: Ignoring restriction relation '3198178' with unknown to-way.
Warning: Found angle of 101.94 degrees at edge '-103157214', segment 0.
Warning: Found sharp turn with radius 6.55 at the start of edge '-104122143'.
Warning: Found sharp turn with radius 8.65 at the start of edge '-104122269'.
Warning: Found angle of 126.76 degrees at edge '-244780591', segment 2.
Warning: Found sharp turn with radius 6.12 at the start of edge '-2490453280'.
Warning: Found sharp turn with radius 5.56 at the start of edge '-251515596#1'.
Warning: Found angle of 101.94 degrees at edge '103157214', segment 1.
Warning: Found sharp turn with radius 5.81 at the start of edge '1435712284'.
Warning: Found angle of 126.76 degrees at edge '244780591', segment 2.
Warning: Found sharp turn with radius 5.56 at the end of edge '251515596#1'.
Warning: The traffic light '269558880' does not control any links; it will not be build.
Warning: Could not build program '0' for traffic light '269558880'.
Warning: The traffic light '263806463' does not control any links; it will not be build.
Warning: Could not build program '0' for traffic light '263806463'.
Warning: Speed of straight connection '-160096660#0->-33425953#2_0' reduced by 6.88 due to turning radius of 3.37 (length=1.43, angle=41.18).
Success.

G:\Tutorial\SUMO>polyconvert --net-file test.net.xml --osm-files map.osm --type-file typemap.xml -o map.poly.xml --xml-validation never
Success.
    
```

So'ng, birorta bo'sh *not* file ochib, ichiga quyidagi kodni joylaymiz, saqlash vaqtida ***map.sumo.cfg*** nomi va xml fayl hujjatlari kengaytmasi orqali saqlanishi kerak bo'ladi.

```
<?xml version=«1.0» encoding=«UTF-8»?>
```

```
<configuration xmlns:xsi=«http://www.w3.org/2001/XMLSchema-instance»  
xsi:noNamespaceSchemaLocation=«http://sumo.dlr.de/xsd/sumoConfiguration.xsd»>
```

```
<input>
```

```
<net-file value=«test.net.xml»/>
```

```
<route-files value=«trips.trips.xml»/>
```

```
<additional-files value=«map.poly.xml»/> </input>
```

```
<time>
```

```
<begin value=«0»/>
```

```
<end value=«10000»/>
```

```
</time>
```

```
</configuration>
```

Python-ning random komponentini Sumo GUI dasturiy ta'minoti file-dan ishchi file-ga nushalash kerak bo'ladi. Standard holda o'rnatilgan Sumo GUI dasturi tarkibida (file ichida) python-random komponenti quyidagi manzilda joylashgan bo'ladi.

C:\Program Files (x86)\Eclipse\Sumo\tools

Python komponentining nomi: ***randomTrips.py*** ushbu komponentaning nushasi olinadi va ishchi file-ga joylanadi. Ish bajarilgandan so'ng file-ning o'zidan CMD oynasi ishga tushiriladi

python randomTrips.py -n test.net.xml -r map.rou.xml -e 1000 -l -validate
-kodi yoziladi va bajartiriladi.

So'ng barcha yaratilgan file-lardagi xatoliklar to'g'irlanishi kerak. Misol uchun ***map.polly.xml*** (Rasm-5) file-ni kod qismi ichidagi ochilish va yakunlash belgilarining mavjud emasligi bo'ladi. (Qizil yo'naltirgich va to'rtburchak shaklni o'rnida qo'yilishi kerak bo'lgan belgilar) Chap qismga "***<!-->***" o'ng qismiga qo'yilishi kerak bo'lgan belgi "***-->***"

Huddi shu amalni yana ***trips.trips.xml*** file-da ham bajarish kerak.

```

1 <?xml version="1.0" encoding="UTF-8"?>
2
3 <!-- generated on 03/23/20 17:33:07 by Eclipse SUMO polyconvert Version 1.5.0
4 -->
5 <configuration xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="http://sumo.dlr.de/ssd/polyconvert/Configuration.xsd">
6
7   <inputs>
8     <input-file value="test.net.xml"/>
9     <com-files value="map.com"/>
10    <type-file value="typemap.xml"/>
11  </inputs>
12
13  <outputs>
14    <output-file value="map.poly.xml"/>
15  </outputs>
16
17  <processing>
18    <poi-layer-offset value="5"/>
19  </processing>
20
21  <report>
22    <xml-validation value="never"/>
23  </report>
24
25  </configuration>
26
27  <additional
28    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:noNamespaceSchemaLocation="http://sumo.dlr.de/ssd/additional_file.xsd"
29    location netOffset="-410663.53,-5476394.67" convBoundary="-7926.92,-837.85,2011.94,2770.96" origBoundary="7.650365,49.426023,7.787139,49.459333" projParameter="sprojutm +zone=31
30
31  <poly id="100271213" type="building" color="255,230,230" fill="1" layer="-1.00" shape="179,836346,349,356628,185,237771,351,536745,191,202171,354,796745,195,620289,345,620807,184
32  <poly id="100271245" type="building" color="255,230,230" fill="1" layer="-1.00" shape="184,247200,340,188090,195,620289,345,620807,198,032480,340,606746,196,664636,335,166615,184
33  <poly id="100271262" type="building" color="255,230,230" fill="1" layer="-1.00" shape="190,923747,328,660477,190,171264,329,993896,197,332197,330,648277,198,167395,331,930620,201
34  <poly id="100271282" type="building" color="255,230,230" fill="1" layer="-1.00" shape="181,056340,322,515234,190,925747,328,680477,196,038546,318,977770,186,853226,313,401774,181
35  <poly id="100271339" type="building" color="255,230,230" fill="1" layer="-1.00" shape="187,226207,363,048851,191,202171,354,796745,189,237771,351,936745,181,254560,360,209675,187
36  <poly id="100797364" type="building" color="255,230,230" fill="1" layer="-1.00" shape="433,949538,881,173929,427,390283,896,203216,429,236068,896,884181,434,887254,898,07411,438
37  <poly id="100797368" type="building" color="255,230,230" fill="1" layer="-1.00" shape="244,671553,923,728823,240,942890,922,308389,249,61441,936,402332,253,343270,927,233890,244
38  <poly id="100797374" type="building" color="255,230,230" fill="1" layer="-1.00" shape="436,533528,910,442579,434,716795,921,728727,446,093190,922,584739,447,596854,912,563274,436
39  <poly id="100797377" type="building" color="255,230,230" fill="1" layer="-1.00" shape="413,097459,973,228633,411,383107,983,614998,421,283331,987,351489,422,919461,977,040802,413
40  <poly id="100797455" type="building" color="255,230,230" fill="1" layer="-1.00" shape="256,368776,928,229529,253,572444,938,550266,263,209259,941,214635,265,725901,931,168010,256
41  <poly id="100797458" type="building" color="255,230,230" fill="1" layer="-1.00" shape="230,020632,928,798316,219,151949,942,084151,226,635289,948,116309,233,364939,939,982629,231
42  <poly id="100797468" type="building" color="255,230,230" fill="1" layer="-1.00" shape="404,829098,928,073825,403,763212,932,076096,404,887254,898,07411,429,235061,896,884181,404
43  <poly id="100797478" type="building" color="255,230,230" fill="1" layer="-1.00" shape="411,383107,883,614998,409,719107,893,623501,419,604642,896,975481,421,283331,887,351489,411
44  <poly id="100797504" type="building" color="255,230,230" fill="1" layer="-1.00" shape="236,977220,920,574690,230,020632,928,798316,233,026290,932,860936,237,244420,934,648156,239
45  <poly id="100797587" type="building" color="255,230,230" fill="1" layer="-1.00" shape="434,716795,921,728727,433,842765,921,452463,444,829270,922,802276,446,093190,922,584739,444
46  <poly id="100797666" type="building" color="255,230,230" fill="1" layer="-1.00" shape="438,745649,898,746391,436,533528,910,442579,447,596854,912,563274,449,836201,900,972970,438

```

Rasm- 8

Xatoliklar to'g'irlangandan so'ng, Sumo GUI dasturini ishga tushurib, "open file"(Ctrl+o) buyrug'i orqali yaratilgan **map.sumo.cfg** file ni tanlash kerak. Sumo GUI dasturida biz xaritada tanlagan maydon "OSM-data» shaklida ochiladi va analiz, simulatsiya jarayonlarini boshlash uchun tayyor hisoblanadi.

FOYDALANILGAN ADABIYOTLAR RO'YXATI:

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4. «Robotics: Everything You Need to Know About Robotics from Beginner to Expert» - Avtohr: Peter Mckinnon. Chop etilgan yil: 2017. Chop etilgan joy: CreateSpace Independent Publishing Platform.
5. «Introduction to Autonomous Robots: Mechanics, Sensors, Actuators, and Algorithms» - Avtohr: Nikolaus Correll, Bradley Hayes, ve Zachary Dodds. Chop etilgan yil: 2019. Chop etilgan joy: MIT Press.