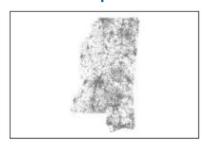# MS_BuildingFootprints_2022

Shapefile

Tags

buildings, Mississippi

Summary

Building footprint polygons of Mississippi structures. This data was generated from BING raster imagery by Microsoft. MARIS downloaded and converted the Mississippi file from JSON format to a WGS84 shapefile using Mapshaper software. Next, MARIS projected the shapefile into MSTM projection. There are 1,507,496 polygons in this layer which is 36,312 more than the 2018 release. Date on update is April,2022. Most of the state is from the 2018 release. Updates were mostly made in Southwest MS and the Coast between 2018 and 2021. Some other buildings were added in metro areas.

Description

MS building footprint polygons - 2022

***** See original source download and supplemental Information for details on data creation by Microsoft.

https://github.com/Microsoft/USBuildingFootprints

Microsoft explanation*: "The gap areas contain image tiles taken with different cameras, which is causing the creation of artificial edges between neighboring tiles. These confuse our detection network which hasn't learned to deal with them. We took a very conservative approach of skipping such tiles. I think we could add additional effort in order to properly deal with this problem."*

Credits

Microsoft, BING, MARIS

Use limitations

Extent

West -91.716971   **East** -88.097683
North 35.009723   **South** 30.192643

Scale Range

Maximum (zoomed in) 1:5,000
Minimum (zoomed out) 1:150,000,000

ArcGIS Metadata ▶

Topics and Keywords ▶

THEMES OR CATEGORIES OF THE RESOURCE location, planningCadastre, society, structure

* CONTENT TYPE Downloadable Data

Hide Topics and Keywords ▲

Citation ▶

* TITLE MS_BuildingFootprints_2022
PUBLICATION DATE 2018-07-10 00:00:00

PRESENTATION FORMATS *** digital map**

Hide Citation ▲

Citation Contacts ▶

RESPONSIBLE PARTY
INDIVIDUAL'S NAME Steve Walker
ORGANIZATION'S NAME MARIS
CONTACT'S POSITION GIS Operations Manager
CONTACT'S ROLE distributor

CONTACT INFORMATION ▶
PHONE
VOICE 601 432-6149

ADDRESS
TYPE physical
CITY Jackson
ADMINISTRATIVE AREA MS
POSTAL CODE 39211
COUNTRY US
E-MAIL ADDRESS swalker@mississippi.edu

Resource Details ▶

DATASET LANGUAGES   ***** English (UNITED STATES)
DATASET CHARACTER SET   utf8 - 8 bit UCS Transfer Format

STATUS   historical archive
SPATIAL REPRESENTATION TYPE   ***** vector

SUPPLEMENTAL INFORMATION

****** MICROSOFT SUPPLEMNTAL INFORMATON ********

Introduction: This dataset originally contained 124,885,597 computer generated building footprints in all 50 US states. This data is freely available for download and use.

License: This data is licensed by Microsoft under the Open Data Commons Open Database License (ODbL)

Approximately 125 million building footprint polygon geometries in all 50 US States in GeoJSON format.

CREATION DETAILS

The building extraction is done in two stages:
    1.Semantic Segmentation – Recognizing building pixels on the aerial image using DNNs
    2.Polygonization – Converting building pixel blobs into polygons

 FIRST STAGE - SEMANTIC SEGMENTATION

   DNN architecture

The network foundation is ResNet34 which can be found here. In order to produce pixel prediction output, we have appended RefineNet upsampling layers described in this paper. The model is fully-convolutional, meaning that the model can be applied on an image of any size (constrained by GPU memory, 4096x4096 in our case).

   Training details

The training set consists of 5 million labeled images. Majority of the satellite images cover diverse residential areas in US. For the sake of good set representation, we have enriched the set with samples from various areas covering mountains, glaciers, forests, deserts, beaches, coasts, etc. Images in the set are of 256x256 pixel size with 1 ft/pixel resolution. The training is done with CNTK toolkit using 32 GPUs.

Metrics

These are the intermediate stage metrics we use to track DNN model improvements and they are pixel based. The pixel error on the evaluation set is 1.15%. Pixel recall/precision = 94.5%/94.5%

SECOND STAGE - POLYGONIZATION

Method description

We developed a method that approximates the prediction pixels into polygons making decisions based on the whole prediction feature space. This is very different from standard approaches, e.g. Douglas-Peucker algorithm, which are greedy in nature. The method tries to impose some of a priory building properties, which are, at the moment, manually defined and automatically tuned. Some of these a priori properties are:

1. The building edge must be of at least some length, both relative and absolute, e.g. 3 meters
2. Consecutive edge angles are likely to be 90 degrees
3. Consecutive angles cannot be very sharp, smaller by some auto-tuned threshold, e.g. 30 degrees
4. Building angles likely have very few dominant angles, meaning all building edges are forming angle of (dominant angle $\pm n\pi/2$)

In near future, we will be looking to deduce this automatically from existing building information.

Metrics

Building matching metrics:

METRIC	VALUE
Precision	99.3%
Recall	93.5%

We track various metrics to measure the quality of the output:
1. Intersection over Union – This is the standard metric measuring the overlap quality against the labels
2. Shape distance – With this metric we measure the polygon outline similarity
3. Dominant angle rotation error – This measures the polygon rotation deviation

On our evaluation set contains ~15k building. The metrics on the set are:
•IoU is 0.85, Shape distance is 0.33, Average rotation error is 1.6 degrees
•The metrics are better or similar compared to OSM building metrics against the labels

OTHER INFORMATION

Data Vintage: The vintage of the footprints depends on the vintage of the underlying imagery. Because Bing Imagery is a composite of multiple sources it is difficult to know the exact dates for individual pieces of data.

How good are the data? Our metrics show that in the vast majority of cases the quality is at least as good as data hand digitized buildings in OpenStreetMap. It is not perfect, particularly in dense urban areas but it is still awesome.

What is the coordinate reference system? EPSG: 4326

Will Microsoft be open sourcing the models? Yes. We are working through the internal process to open source the segmentation models and polyonization algorithms.

Will there be more data coming for other geographies? Maybe. This is a work in progress.

Why are the data being released?   Microsoft has a continued interest in supporting a thriving OpenStreetMap ecosystem.

Should we import the data in to OpenStreetMap? Maybe. Never overwrite the hard work of other contributors or blindly import data in to OSM without first checking the local quality. While our metrics show that this data meets or exceeds the quality of hand drawn building footprints, the Data does vary in quality from place to place, between rural and urban, mountains and plains, and so on. Inspect quality locally and discuss an import plan with the community. Always follow the OSM import community guidelines.

State	Number of Buildings	Unzipped MB
Mississippi	1,470,285	438.99

CONTRIBUTING:

This project welcomes contributions and suggestions. Most contributions require you to agree to a Contributor License Agreement (CLA) declaring that you have the right to, and actually do, grant us the rights to use your contribution. For details, visit https://cla.microsoft.com.

When you submit a pull request, a CLA-bot will automatically determine whether you need to provide a CLA and decorate the PR appropriately (e.g., label, comment). Simply follow the instructions provided by the bot. You will only need to do this once across all repos using our CLA.

This project has adopted the Microsoft Open Source Code of Conduct. For more information see the Code of Conduct FAQ or contact opencode@microsoft.com with any additional questions or comments.

LEGAL NOTICES

* PROCESSING ENVIRONMENT   Version 6.2 (Build 9200) ; Esri ArcGIS 10.9.1.28388

CREDITS
     Microsoft, BING, MARIS

ARCGIS ITEM PROPERTIES
  * NAME   MS_BuildingFootprints_2022
  * SIZE   224.220
  * LOCATION   file://\\DESKTOP-
  TP9LNVL\F$\DATA\00_CADASTRAL\Building_Footprints_2022\MS_BuildingFootprints_2022.
  shp
    * ACCESS PROTOCOL   Local Area Network

Hide Resource Details ▲

Extents ▶

EXTENT
  GEOGRAPHIC EXTENT
    BOUNDING RECTANGLE
      EXTENT TYPE   Extent used for searching
      * WEST LONGITUDE   -91.716971
      * EAST LONGITUDE   -88.097683
      * NORTH LATITUDE   35.009723
      * SOUTH LATITUDE   30.192643
      * EXTENT CONTAINS THE RESOURCE   Yes

EXTENT IN THE ITEM'S COORDINATE SYSTEM
  * WEST LONGITUDE   320442.992253
  * EAST LONGITUDE   650821.915940
  * SOUTH LATITUDE   1045682.967374
  * NORTH LATITUDE   1578327.149904
  * EXTENT CONTAINS THE RESOURCE   Yes

Hide Extents ▲

Resource Maintenance ▶

RESOURCE MAINTENANCE
  UPDATE FREQUENCY   as needed

Hide Resource Maintenance ▲

Resource Constraints ▶

CONSTRAINTS
  LIMITATIONS OF USE

Hide Resource Constraints ▲

Spatial Reference ▶

ARCGIS COORDINATE SYSTEM
  * TYPE   Projected
  * GEOGRAPHIC COORDINATE REFERENCE   GCS_North_American_1983
  * PROJECTION   NAD_1983_Mississippi_TM
  * COORDINATE REFERENCE DETAILS
  PROJECTED COORDINATE SYSTEM
    WELL-KNOWN IDENTIFIER   102609
    X ORIGIN   -5122200
    Y ORIGIN   -12297100
    XY SCALE   450339697.45066422
    Z ORIGIN   -100000
    Z SCALE   10000
    M ORIGIN   -100000
    M SCALE   10000
    XY TOLERANCE   0.001
    Z TOLERANCE   0.001
    M TOLERANCE   0.001
    HIGH PRECISION   true
    LATEST WELL-KNOWN IDENTIFIER   3814
    WELL-KNOWN TEXT
    PROJCS["NAD_1983_Mississippi_TM",GEOGCS["GCS_North_American_1983",DATUM["D
    _North_American_1983",SPHEROID["GRS_1980",6378137.0,298.257222101]],PRIMEM[

"Greenwich",0.0],UNIT["Degree",0.0174532925199433]],PROJECTION["Transverse_Mercator"],PARAMETER["False_Easting",500000.0],PARAMETER["False_Northing",1300000.0],PARAMETER["Central_Meridian",-89.75],PARAMETER["Scale_Factor",0.9998335],PARAMETER["Latitude_Of_Origin",32.5],UNIT["Meter",1.0],AUTHORITY["EPSG",3814]]

REFERENCE SYSTEM IDENTIFIER
  * VALUE   3814
  * CODESPACE   EPSG
  * VERSION   6.17.1(10.0.0)

Hide Spatial Reference ▲

Spatial Data Properties ▶

VECTOR   ▶
  * LEVEL OF TOPOLOGY FOR THIS DATASET   geometry only

GEOMETRIC OBJECTS
  FEATURE CLASS NAME   MS_BuildingFootprints_2022
  * OBJECT TYPE   composite
  * OBJECT COUNT   1507496

  Hide Vector ▲

ARCGIS FEATURE CLASS PROPERTIES   ▶
  FEATURE CLASS NAME   MS_BuildingFootprints_2022
  * FEATURE TYPE   Simple
  * GEOMETRY TYPE   Polygon
  * HAS TOPOLOGY   FALSE
  * FEATURE COUNT   1507496
  * SPATIAL INDEX   TRUE
  * LINEAR REFERENCING   FALSE

  Hide ArcGIS Feature Class Properties ▲

Hide Spatial Data Properties ▲

Distribution ▶

DISTRIBUTION FORMAT
  * NAME   Shapefile

TRANSFER OPTIONS
  UNITS OF DISTRIBUTION   meters
  * TRANSFER SIZE   224.220

Hide Distribution ▲

Fields ▶

DETAILS FOR OBJECT MS_BuildingFootprints_2022 ▶
* TYPE   Feature Class
* ROW COUNT   1507496
DEFINITION
    Building footprint polygons for Mississippi

DEFINITION SOURCE
    MARIS

FIELD FID ▶
* ALIAS   FID
* DATA TYPE   OID
* WIDTH   4
* PRECISION   0
* SCALE   0
* FIELD DESCRIPTION
    Internal feature number.

* DESCRIPTION SOURCE
    Esri

* DESCRIPTION OF VALUES
    Sequential unique whole numbers that are automatically generated.

    Hide Field FID ▲

FIELD Shape ▶
* ALIAS   Shape
* DATA TYPE   Geometry
* WIDTH   0
* PRECISION   0
* SCALE   0
* FIELD DESCRIPTION
    Feature geometry.

* DESCRIPTION SOURCE
    Esri

* DESCRIPTION OF VALUES
    Coordinates defining the features.

    Hide Field Shape ▲

FIELD release ▶

* **ALIAS** release
* **DATA TYPE** SmallInteger
* **WIDTH** 1
* **PRECISION** 1
* **SCALE** 0

Hide Field release ▲

FIELD capture_da ▶
* **ALIAS** capture_da
* **DATA TYPE** String
* **WIDTH** 21
* **PRECISION** 0
* **SCALE** 0

Hide Field capture_da ▲

Hide Details for object MS_BuildingFootprints_2022 ▲

Hide Fields ▲

Metadata Details ▶

* **METADATA LANGUAGE** English (UNITED STATES)

SCOPE OF THE DATA DESCRIBED BY THE METADATA * dataset
SCOPE NAME * dataset

* **LAST UPDATE** 2022-10-07

ARCGIS METADATA PROPERTIES
METADATA FORMAT ArcGIS 1.0
METADATA STYLE ISO 19139 Metadata Implementation Specification
STANDARD OR PROFILE USED TO EDIT METADATA ISO19139

CREATED IN ARCGIS FOR THE ITEM 2022-10-07 07:39:12
LAST MODIFIED IN ARCGIS FOR THE ITEM 2022-10-07 74:82:40

AUTOMATIC UPDATES
HAVE BEEN PERFORMED Yes
LAST UPDATE 2022-10-07 07:47:08

Hide Metadata Details ▲

Metadata Contacts ▶

METADATA CONTACT
INDIVIDUAL'S NAME Steve Walker
ORGANIZATION'S NAME MARIS
CONTACT'S POSITION GIS Operations Manager

CONTACT'S ROLE   originator

CONTACT INFORMATION   ▶
PHONE
VOICE   601 432-6149

ADDRESS
TYPE   physical
CITY   Jackson
ADMINISTRATIVE AREA   MS
POSTAL CODE   39211
COUNTRY   US
E-MAIL ADDRESS   swalker@mississippi.edu

HOURS OF SERVICE
M-f 7-3 CDT

Hide Contact information ▲

Hide Metadata Contacts ▲

Metadata Maintenance ▶

MAINTENANCE
UPDATE FREQUENCY   as needed

Hide Metadata Maintenance ▲

FGDC Metadata (read-only) ▼

DETAILED DESCRIPTION
ENTITY TYPE
ENTITY TYPE LABEL   MS_BuildingFootprints_2022
ENTITY TYPE DEFINITION
Building footprint polygons for Mississippi
ENTITY TYPE DEFINITION SOURCE   MARIS

ATTRIBUTE
ATTRIBUTE LABEL   FID
ATTRIBUTE DEFINITION
Internal feature number.
ATTRIBUTE DEFINITION SOURCE   Esri
ATTRIBUTE DOMAIN VALUES
UNREPRESENTABLE DOMAIN
Sequential unique whole numbers that are automatically generated.

ATTRIBUTE
ATTRIBUTE LABEL   Shape
ATTRIBUTE DEFINITION
Feature geometry.
ATTRIBUTE DEFINITION SOURCE   Esri
ATTRIBUTE DOMAIN VALUES
UNREPRESENTABLE DOMAIN
Coordinates defining the features.

ATTRIBUTE
ATTRIBUTE LABEL   release

ATTRIBUTE
ATTRIBUTE LABEL   capture_da

Hide Entities and Attributes ▲