



AGH UNIVERSITY OF SCIENCE  
AND TECHNOLOGY

## How to calculate real estate accessibility

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## Accessibility of real estate

- Attribute determining the possibility of reaching certain destination
  - driving one's own means of locomotion
  - using public transport



## **Movement with own locomotion means**

- Journey along the road network from real estate directly to some sort of central point, around which concentrates the life of inhabitants
- Two factors
  - “distance” of real estate from a central point
  - quality of the route that this access takes place



## **Getting to the center using public transport**

- First, one needs to reach on foot to the selected station
- Only from there one can leave using means of mass transport



## Data models

- Vector
  - lines (edges) – center lines of streets
  - points (nodes) – street crossings
  - line attributes
    - information about one-way and impassable streets
    - cost of travel along individual segments of the network (length or time)
- Raster
  - pixels
    - pixel value is the impedance that must be overcome to get to the next pixel (only time)



## Used functions

- Service Area - finds the set of all lines (or polygon covering these lines), forming paths beginning at a center point, where total impedance measured from the center point along every individual path will be no larger than a given value
- Cost Distance - for each pixel determines the accumulated cost of reaching the nearest center

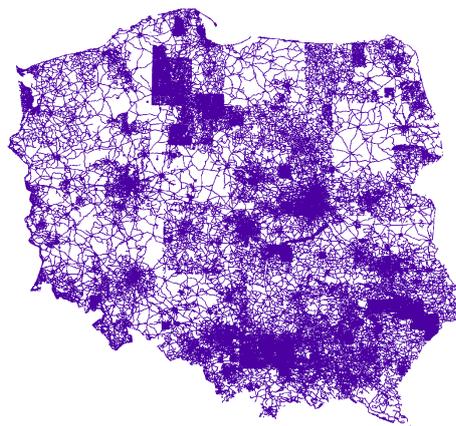


## OpenStreetMap

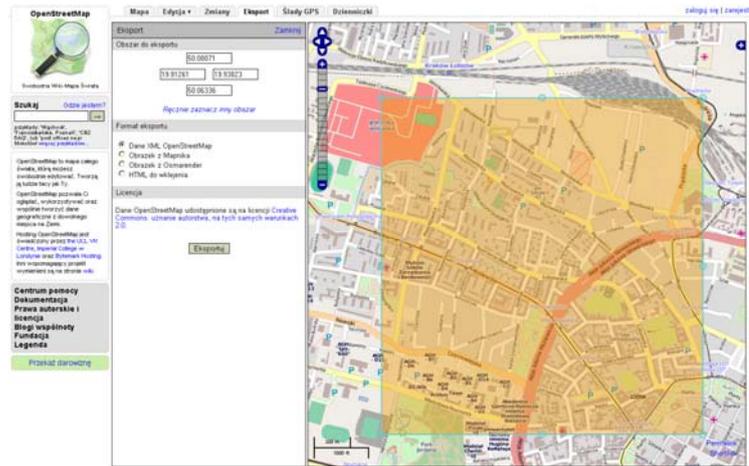
- Community project aimed at creating editable and available without restriction map of the world
- Created based on data from handheld GPS receivers, aerial photographs and other available data sources, as well as sketches made in the field
- Built by volunteers, so no plans are formulated for its systematic development
- Lack of central data quality control



## Polish roads and streets in OpenStreetMap



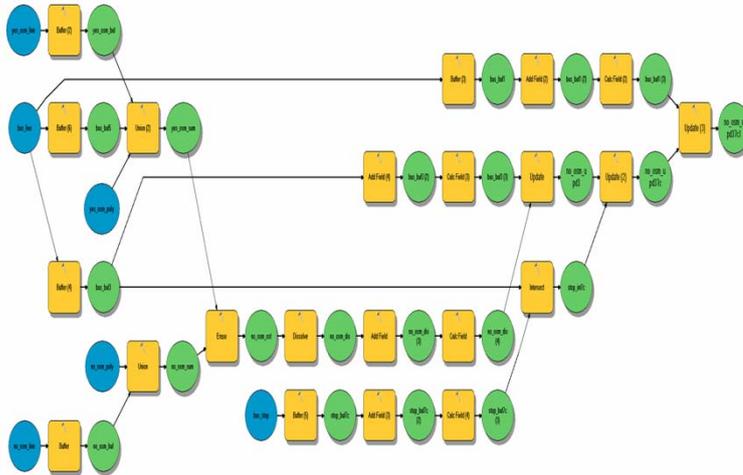
## OpenStreetMap window in web browser



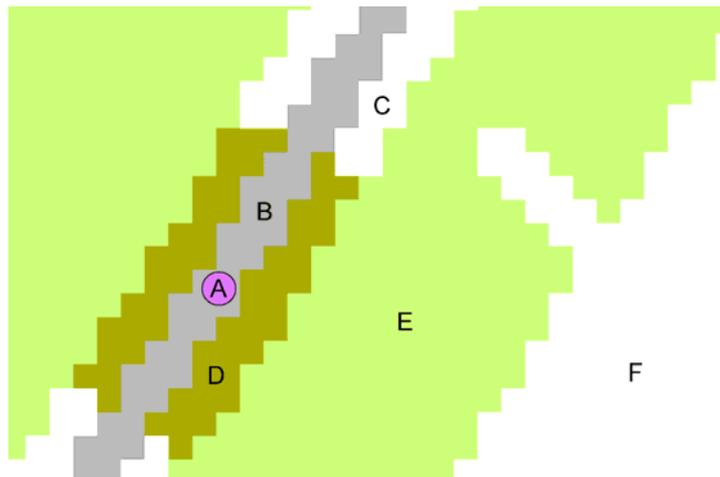
## Data preparation

- For vector data Spatialite DBMS was used
- Both the road network, areas where pedestrian traffic is possible, and wait time at stops were modeled using the raster data

## Model used for raster preparation

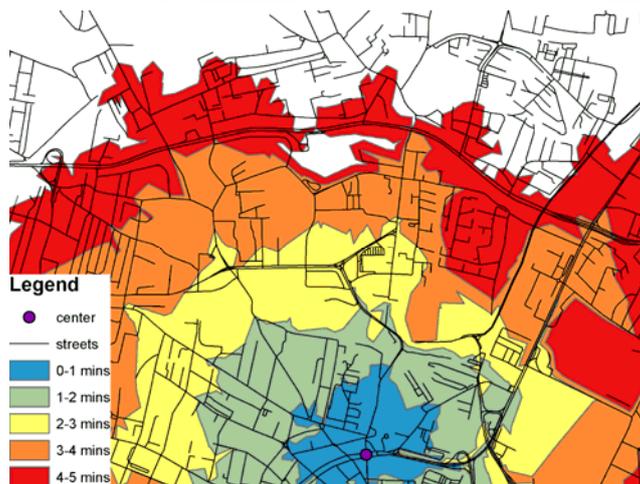


## Enlarged detail

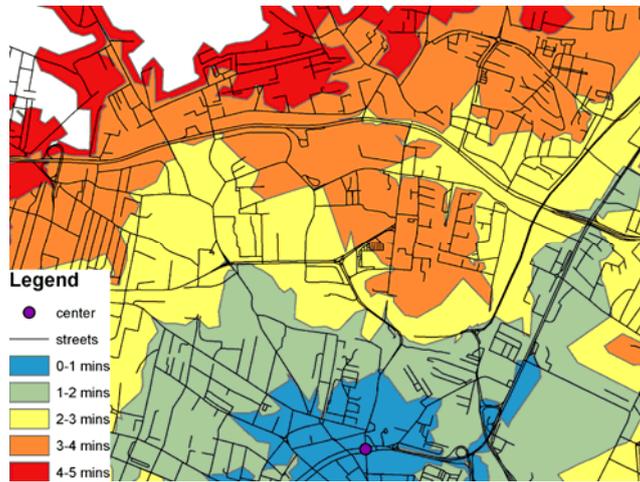


## Results of conducted analysis

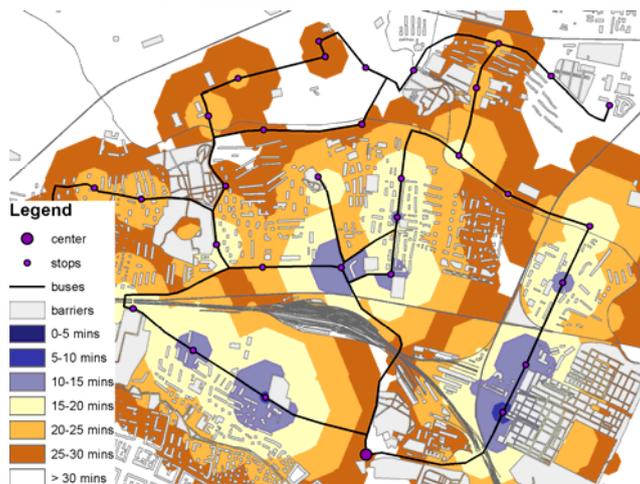
## Service areas (the same speed)



## Service areas (different speeds)



## Result of raster based analysis

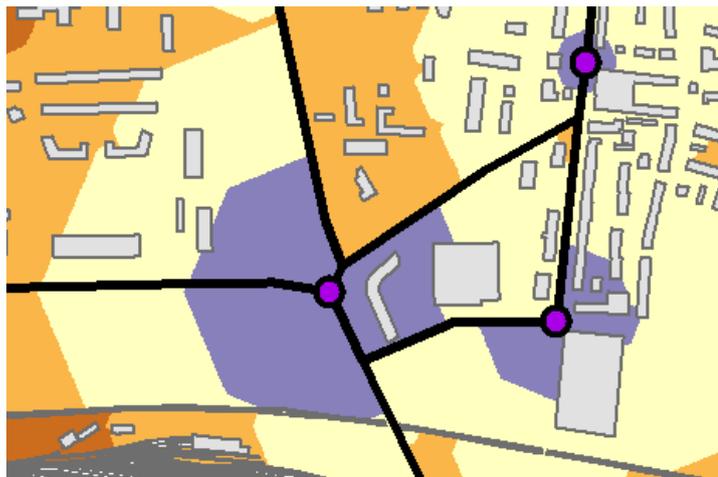




## Enlarged part of the result (1)



## Enlarged part of the result (2)





## Conclusions (1)

- Network analysis performed on the vector data show the importance of proper attribute values describing the movement cost
- Analysis based on raster data provide better opportunities for mapping various aspects of real estate availability
- Resulting raster files, after the appropriate classification of the pixel values, must eventually be converted into a vector
- Detailed analysis of the results obtained from raster analysis showed certain imperfections of Kraków's transport network



## Conclusions (2)

- Stops to be analyzed should be placed at street crossings
- Many potential barriers to pedestrians outside the streets actually does not affect the result of the analysis
- Elongated objects such as railway tracks or rivers, which have relatively few passages, proved to be very important
- The problem of communication lines forming loops was recognized
- OpenStreetMap can be recommended as an appropriate source of spatial data, particularly for network analysis