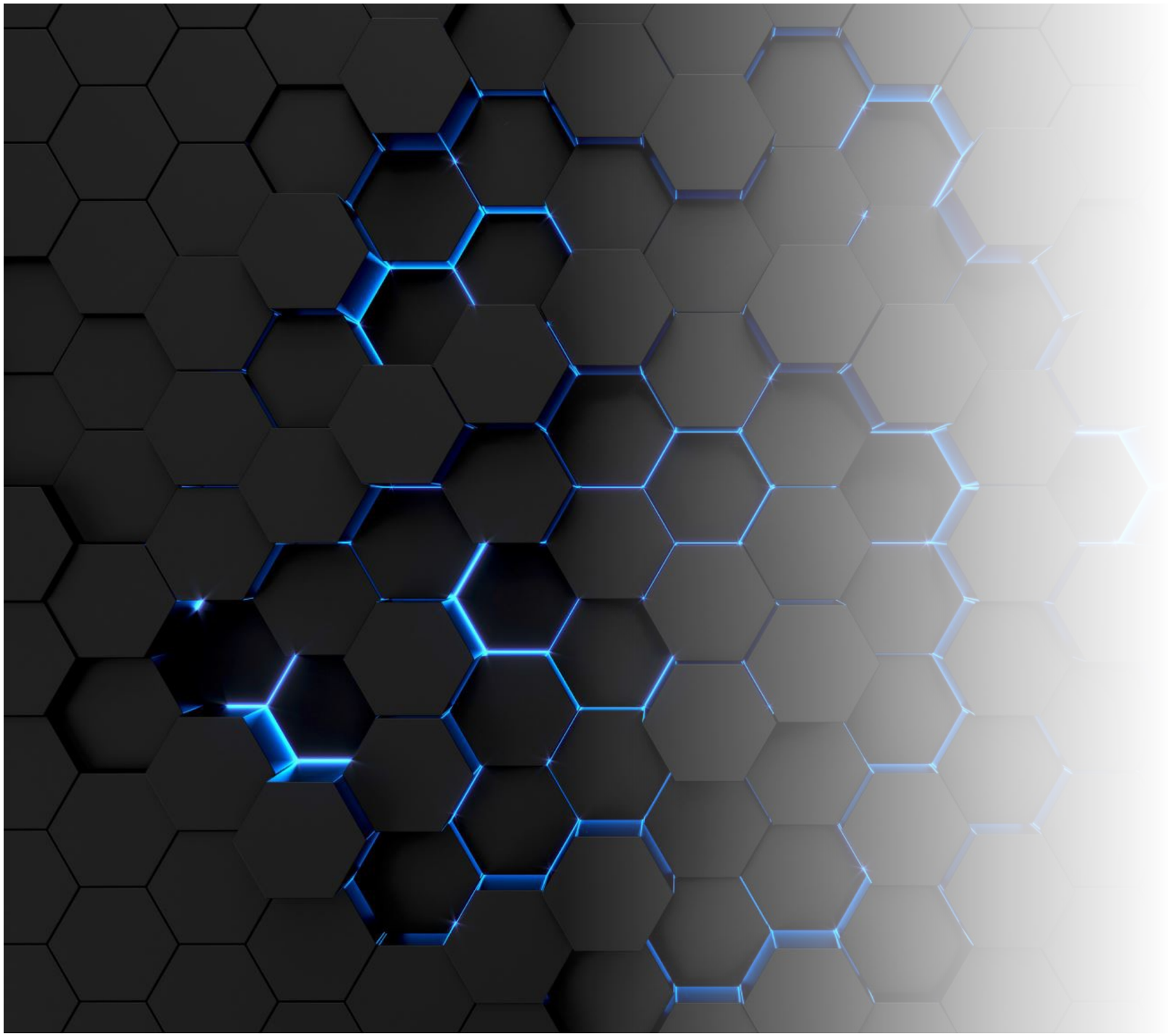

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Traffic Data collection

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Main possibilities and goals of data collection:

- «Transportation science is like geography. Everything is visible, and therefore everything is obvious. Everyone understands that it is necessary to expand roads to get rid of traffic jams in the city. It's as clear as the fact that the earth is flat» ☺

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Main possibilities and goals of data collection:

- The methodology for forming an efficient transport system of a large city is a set of tools that allow us to quantify the functionality of the city's transport system and, on their basis, provide evidence-based justification for the selected initiatives to improve its efficiency (**transport system**).
- To implement these methods, various transport data are needed. The most common are data on the intensity of transport, pedestrian and passenger flow as well as the date related to traffic flow speed.
- The collection of such information is carried out for multiple purposes.

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Data collection purposes:

- Most researchers solve local problems in certain sections of the city's road network. Such studies are very important for developing a science-based strategy for the development of urban transport systems in the future, taking into account changes in the transport motivation of people under the influence of various factors, primarily related to changes in their personal needs.

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Data collection purposes:

- *For example, developing project proposals for the organization of traffic and the reconstruction of the road network sections usually begins with the collection of information on the intensity of traffic and pedestrian flows.*

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The goals and objectives of collecting transport data:

The goals and objectives of collecting transport data, including data characterizing the traffic flow, are:

- transport planning and creation of transport models;
- organization of traffic;
- optimization of the transportation process.
- construction of new sections of the network;
- reconstruction (expansion) of network sections;
- closure of individual sections of the network;
- changes in traffic conditions in the network.

Traffic data collection:

- The intensity of traffic on the road network in cities is uneven during the day, so the data that needs to be obtained for each specific object should be carried out at least during the daytime from 07:00 to 20:00.
- In addition, to obtain objective and reliable information about the intensity of traffic and pedestrian flows at the objects under study, it is necessary to collect data simultaneously at several survey points.

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Traffic data collection:

The quality of the information obtained depends on how traffic data is collected. In practice, three main methods of collecting information are used:

1. **Manual method (field observation);**
2. **Semi-automatic (video filming);**
3. **Automatic (sensors, video surveillance systems).**

Other methods:

4. **Mobile positioning,** GIS approaches, BIG Data analysis.
5. Traffic flow speed regime measurements.

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The First way (manual counting):

- **The manual method** of data collection (**field data collection**). With the manual process, direct data collection is carried out by transport accountants. These are specially trained people who stand at intersections during the day and take traffic measurements from various directions.

The First way (manual counting):

1. Safety requirements are met.

   vest with reflective strip

2. Count vehicles in each direction of the intersection.

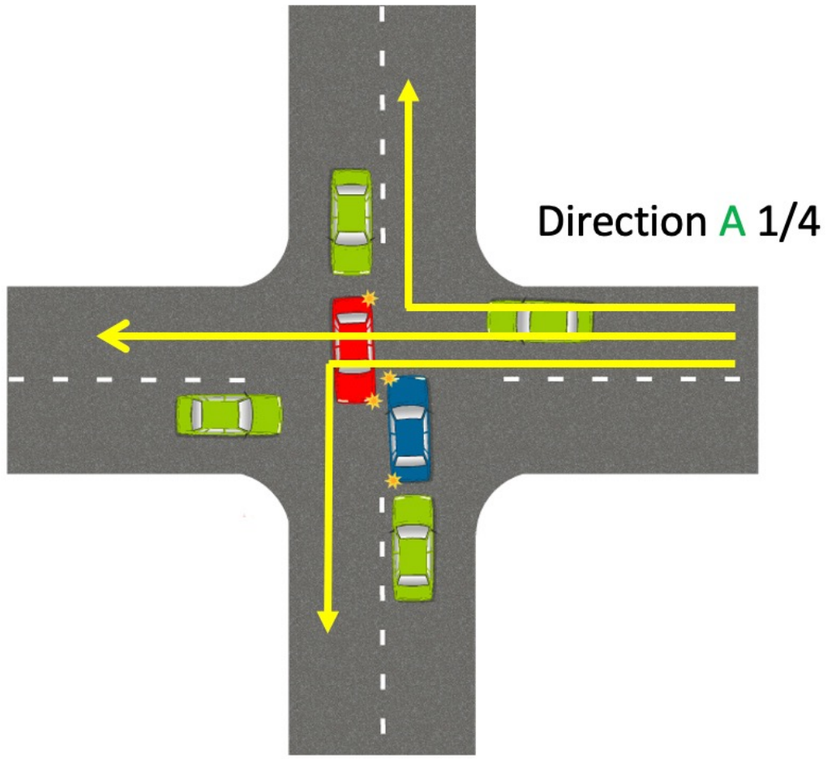
3. All junction directions and manoeuvres

   Left turn, right turn, U-turn, Strait movement

5. Evaluate the composition of the traffic flow.

   For example: a Car 96%, a HGV 4%

6. Observation time morning or evening rush hour.



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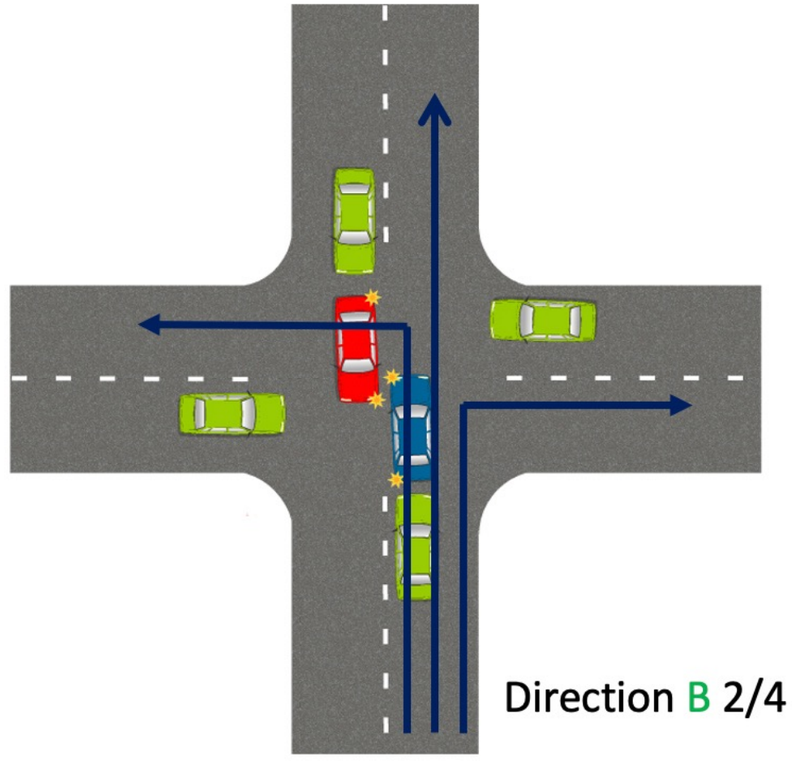

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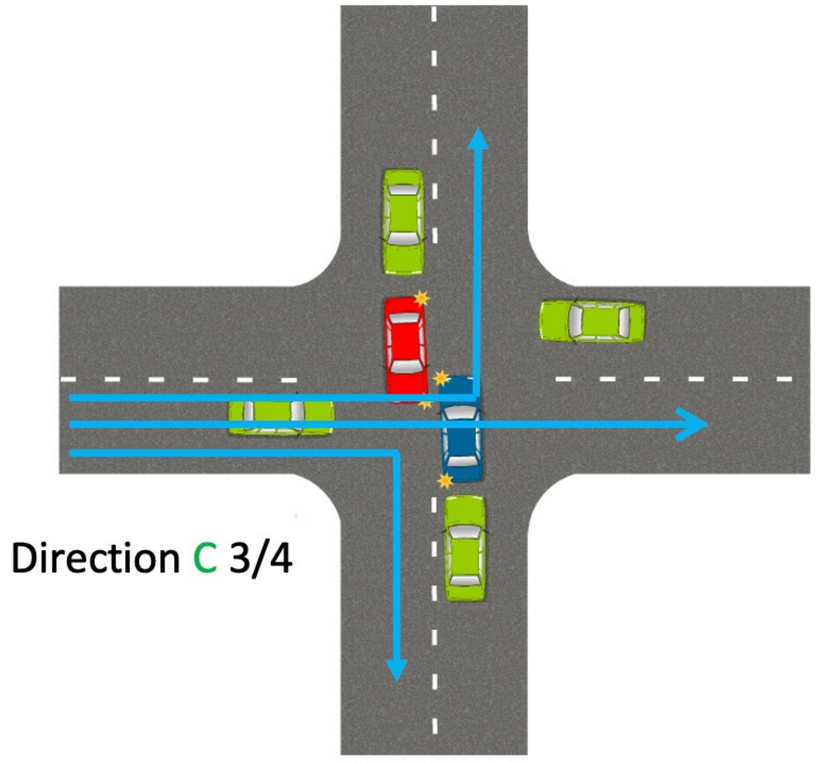

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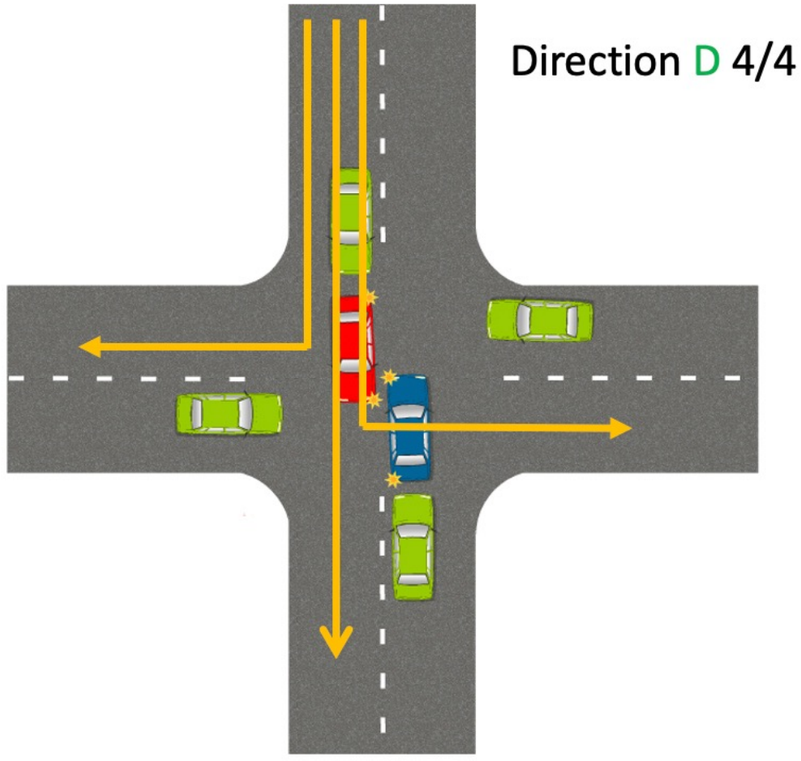


The First way (manual counting):

This method includes the collection of the following indicators:

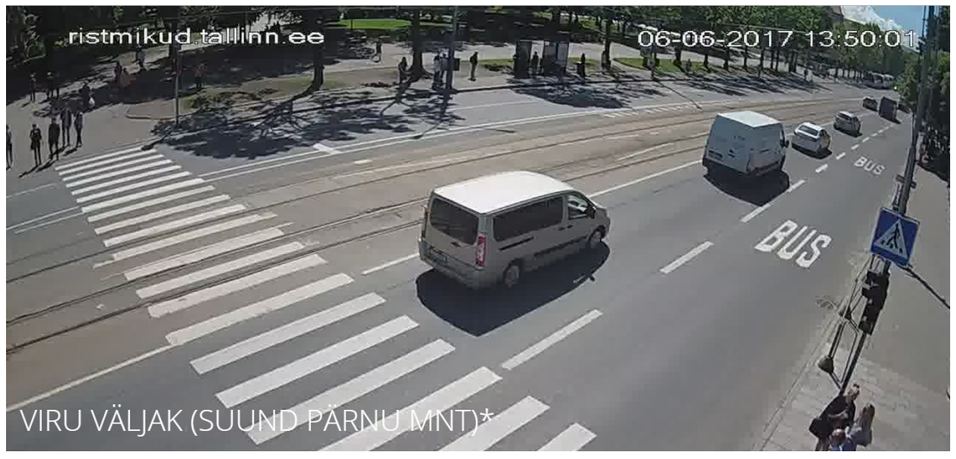
- number of vehicles (units) entering the intersection from each direction, including cars, trucks, public transport (**traffic flow volume, mode distribution**);
- the number of cars moving through the intersection in different directions (**turn rate**);
- the number of pedestrians crossing the carriageway from each direction (**pedestrians flow**).

The second way (semi-automatic):

- **Semi-automatic data collection**. The semi-automatic method of collecting information is that data collection is carried out with the help of special video equipment, which allows shooting at the entire surveyed intersection.
- The collected information is processed manually. In this case, the data is entered immediately into the database. There is no stage of entering the collected data into the control chart.

The second way (semi-automatic):

- Data collection for this method is carried out using devices such as CCTV cameras installed on the street network and specially designed mobile stand-alone CCTV cameras.



The second way (semi-automatic):

- Dome CCTV cameras are used to collect information from all directions of movement. Such a camera has a wide viewing angle (up to 130 degrees) and, in addition, can rotate 360 degrees, which allows the operator to assess the traffic at the intersection from all directions.
- The disadvantages of such devices include not focusing on data collection: their location may not always be optimal to achieve this goal.
- In addition, a small number of intersections of the city are equipped with such cameras.

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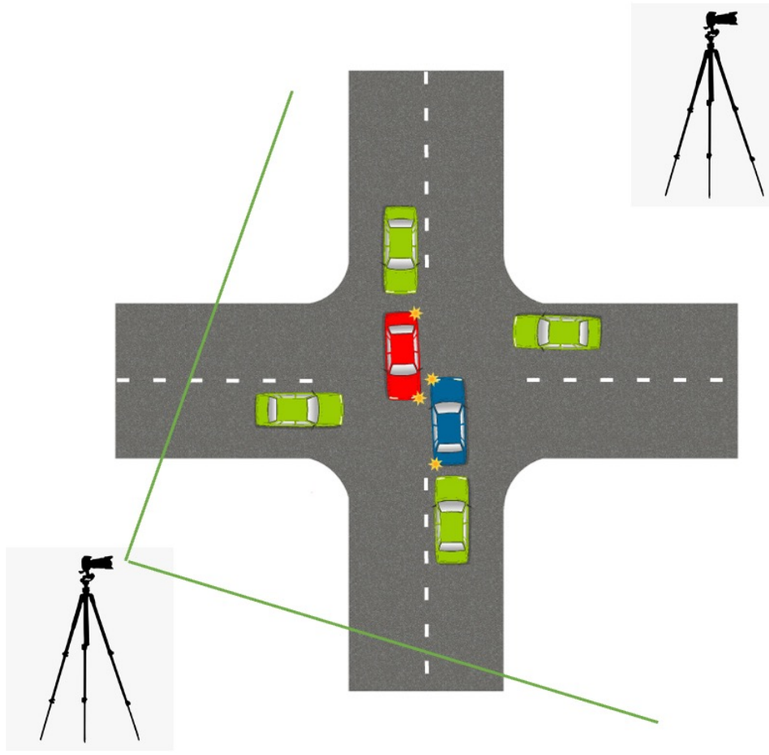
The second way (semi-automatic):

1. Safety requirements are met
   Vest with reflective strip
2. Recording length - 1 hour.
3. All directions of the junction are visible
   Use 2 or more cameras if necessary
4. Countdown from video
   Playback speed 1.25 - 1.50
5. Assess the composition of the traffic flow
   For example: a car 96% a truck 4%
6. Observation time morning or evening rush hour



The second way (semi-automatic):

- The PC operator processes the received video materials using specialized software for transport accounting. Specialized software allows the operator to enter the number of vehicles from the video recording and automatically fill in the survey database.
- This method will enable you to get more reliable information compared to the first. In addition, the data obtained by the second method can be verified based on the saved recording from the video camera.

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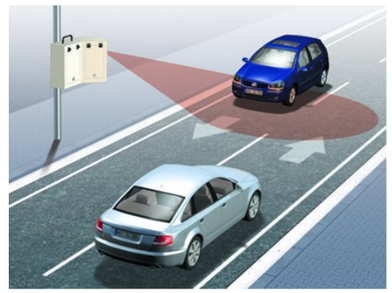
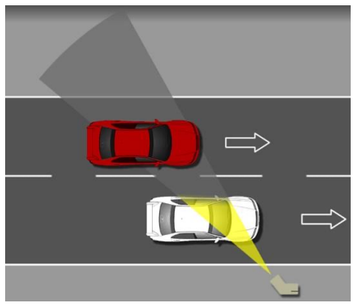
The third way (automatic):

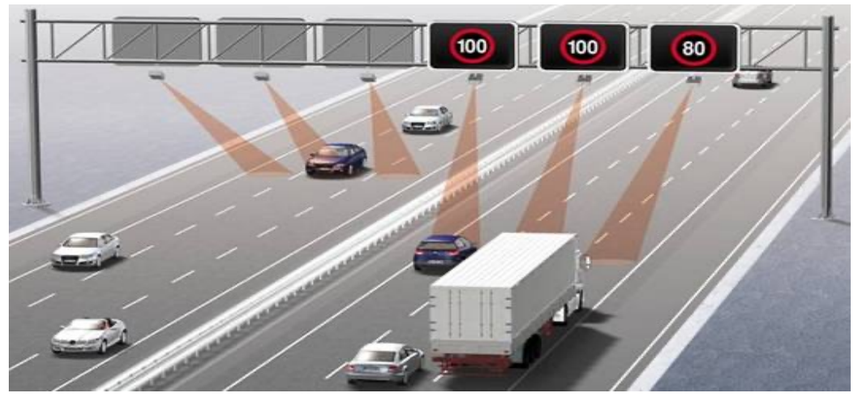
- **Automatic data collection.** The third way to collect data on the intensity of traffic flows is to collect data from traffic metering detectors.
- This method is relevant for sections of the road network, where various transport metering detectors are installed.
- There are many detectors divided into types according to their operation: infrared, volumetric, induction, etc.

The third way (automatic):

- When a vehicle passes through the section of the road network over which the detector is installed, it reacts and sends information to the information processing centre, where the data is processed using specialized software.
- As a result, data collection is **entirely automatic**.







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Advantages and disadvantages of the described methods of collecting traffic data:

Each of the considered methods of collecting information on the intensity of traffic and pedestrian flows has advantages and disadvantages.

We highlight the leading indicators by which the advantages and disadvantages will be evaluated:

- One-time costs;
- Current costs;
- Time spent on collecting/processing information;
- Evaluation of the quality of the collected data.

Advantages and disadvantages of the described methods of collecting traffic data:

A series of scientific studies measured traffic flows at the city's different intersections in three different ways.

The advantages and disadvantages of various data collection methods have been described.

An analysis of the costs required to survey one intersection was carried out:

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Advantages and disadvantages of the described methods of collecting traffic data:

The analysis shows that the 3rd method of collecting information is the most costly since it requires the cost of purchasing sensors that must be installed above each lane.

The following most expensive method is the 2nd method since its use requires only a video surveillance camera and its installation.

And the least expensive way to collect information is natural data collection.

Advantages and disadvantages of the described methods of collecting traffic data:

The most accurate data on the intensity of traffic flows are the data obtained by the second method (semi-automatic, video surveillance).

The considered approach turns out to be a priority when getting data on the intensity of traffic and pedestrian flows.

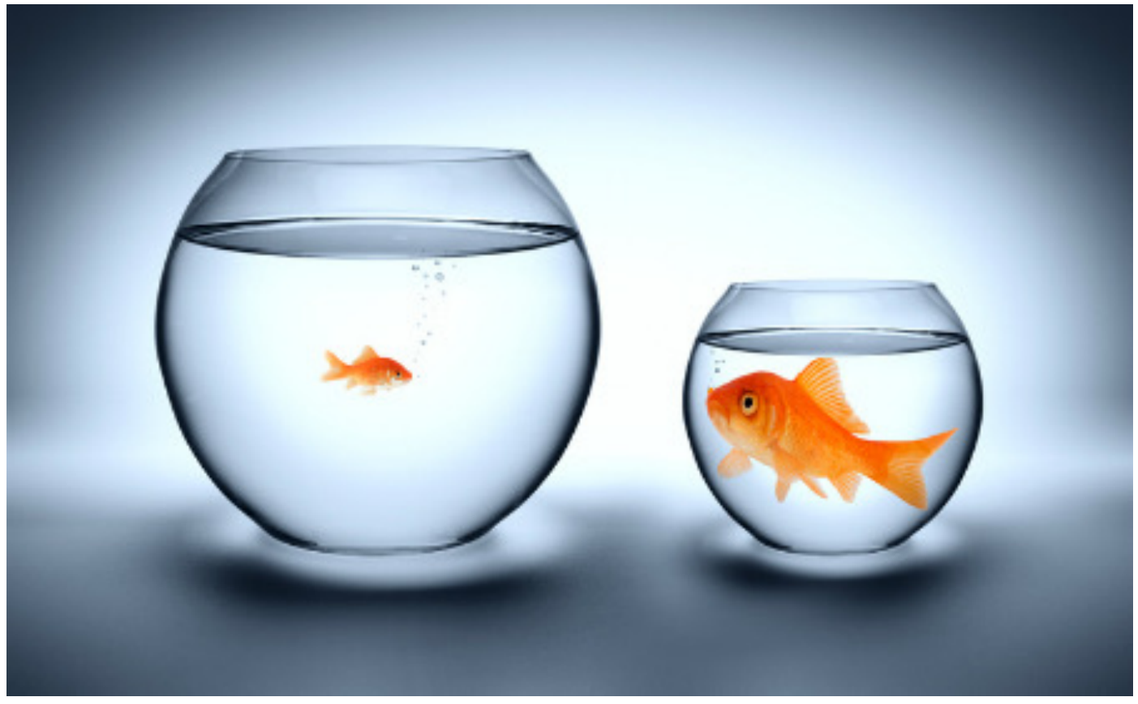
The only possible option for obtaining data within the framework of the second method is a one-time collection of information from stationary cameras and then supplementing it with materials obtained using mobile video cameras.

This procedure takes quite a lot of time and has several restrictions under the law on protecting personal data (more details will be discussed in the next topic of this course).

Advantages and disadvantages of the described methods of collecting traffic data:

Data obtained by observation have an error from **5 to 20%.** Such data can justify traffic management projects and the calibration of transport models.

Data collection using transport accounting sensors showed the unreliability of the data obtained. The errors are more than **20%**. In addition, no foot traffic measurements are taken.



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Advantages and disadvantages of the described methods of collecting traffic data:

A comparative analysis showed that to obtain initial information for single intersections, it is necessary to use a semi-automatic method for collecting data.

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Additional traffic data collection methods:

Mobile positioning data in mobility:

The use of **anonymized** mobile positioning data from mobile network operators, turning billions of location points into meaningful and timely statistical indicators.

This technology provides the best understanding of the spatial aspects of human society. It is used by governments and the private sector in faster, data-driven, and reliable decision-making that brings the world closer to a sustainable existence.

Additional traffic data collection methods:

Technology strives to improve the quality of life of people worldwide through data-driven decisions by providing methods and solutions for extracting trustworthy knowledge from mobile positioning data.

Understanding the mobility of people is crucial for a multitude of domains, whereas measuring it often proves difficult.

Mobile positioning data (MPD) adds the most substantial and dynamic layer of information on the population's location and trips into **mobility, transportation, and spatial planning**.

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Speed measurements:

MPD is the most potent source for getting detailed knowledge on population movements while taking care of the risks for individual data privacy.

It presents a large, statistically valid and representative sample.

The range of mobility solutions is divided into three main categories:

- public transportation planning;
- traffic planning;
- spatial planning.

Traffic Speed measurements:

The second fundamental traffic flow characteristic is speed. There are two ways to measure speed;

- Time-mean-speed (TMS)
- Space-mean-speed (SPS)

- TMS is calculated from the individual speed recorded for vehicles passing a point over a selected period. We calculate SMS by dividing the average travel time by the measured distance. Speed and travel time are fundamental measurements of a traffic performance, and speed is a crucial variable in the design of roadway facilities.
- Engineers also use it in LOS (level of service) determination, accident analysis, economic studies, and traffic engineering studies.
- Today, methods of instrumental speed measurement using laser and optical devices (Doppler radar, camera, laser) are widely used. We will look at some of these methods.

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Traffic Speed measurements:

- **Road cameras:** Cameras record the speed of all passing vehicles. The measuring principle of the measurement system is based on measuring the time difference of light impulses travelling to the object under measurement and back and calculating the speed based on that.
- Cameras can measure the speed of vehicles driving on up to three parallel lanes. Cameras also work at night. The technical solutions of the cameras take into account any lighting conditions, allowing the vehicles' registration plates to be identified in the dark.

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Traffic Speed measurements:

- **Mobile Laser Speed measurement equipment.**
- Mobile Laser Speed and digital imaging devices combine all the benefits of first-rate laser metering with the advantages provided by high-resolution digital imaging. The result is a mobile measuring system with a high degree of versatility.

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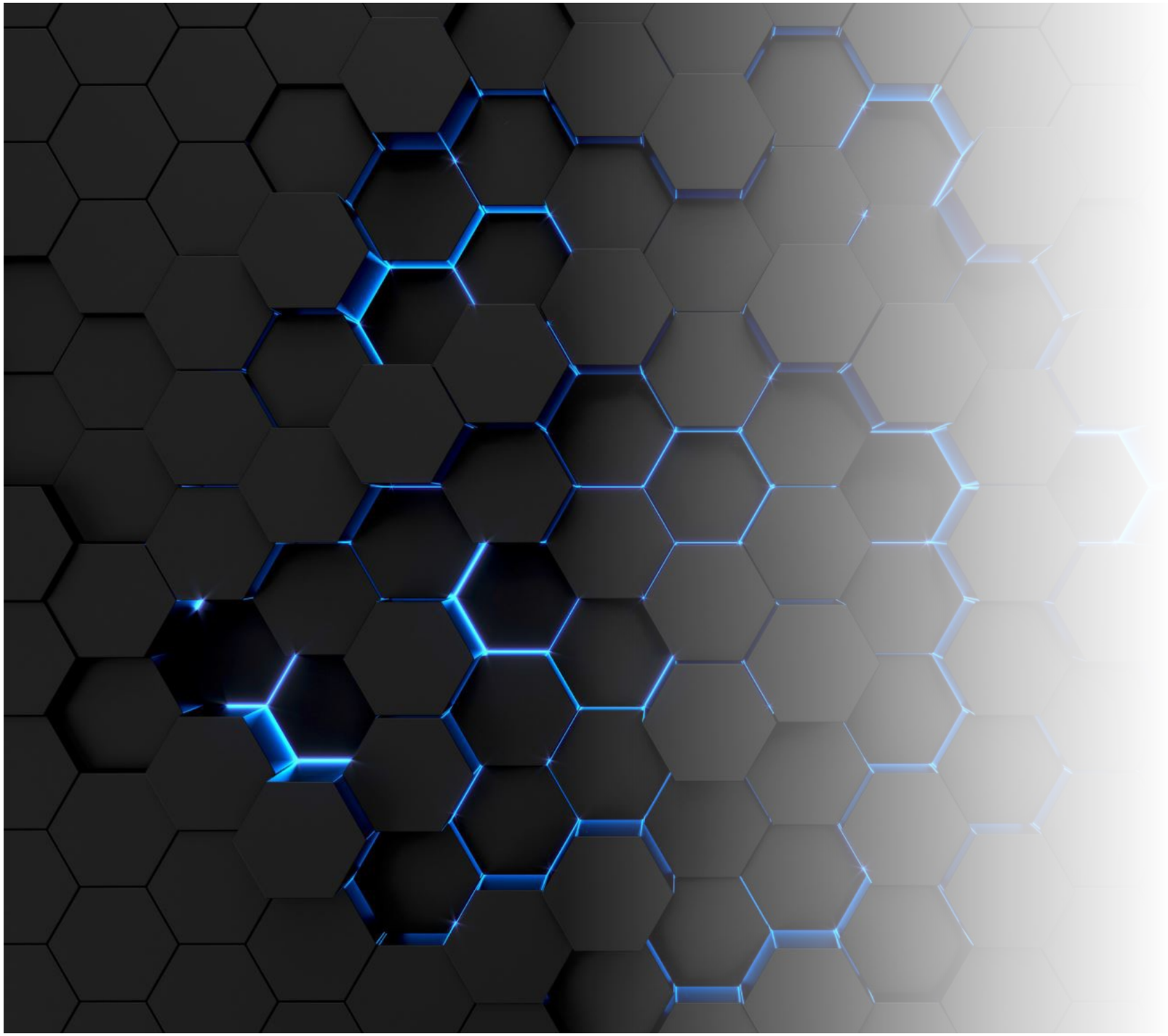

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