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Integrating Digital Tools in Transportation Engineering Education: From Formulas to Simulations

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GOAL OF THE STUDY

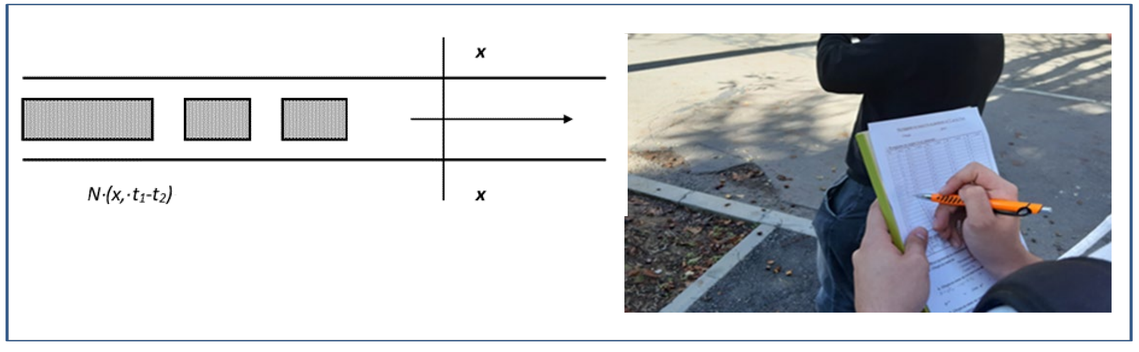
This paper explores the use of specialized simulation software and digital models in the context of higher education, with a focus on traffic engineering.

METHODOLOGY OF THE INVESTIGATION

By utilizing digital twins and simulation platforms such as PTV VISSIM and Data From Sky, students can gain insight into real-time data analysis, infrastructure design, and decision-making processes based on measurable parameters.

MAIN RESULTS FROM THE STUDY

Until recently, the discipline "Organization and Management of Transport" at university level relied primarily on traditional teaching methods. During practical training sessions related to the study of traffic intensity in different areas of the city of Ruse, students used manual observation techniques and filled out pre-printed traffic intensity maps.



a) **b)**

Fig. 1. a) Graphical representation of traffic intensity; b) Recording of physical units for determining traffic intensity

Traffic intensity was measured as the number of vehicles (x) passing through a defined cross-section during a unit of time (t1, t2). The data were recorded in standard units such as: seconds (veh/s), hours (veh/h), days (veh/d), weeks (veh/w), months (veh/m), and years (veh/y), depending on the scope and duration of the observation (Fig. 3). The minimum duration of each observation session was 30 minutes, after which the results were normalized to represent traffic flow per hour.

Fig. 2. Quantitative and qualitative analysis for identifying problem areas in traffic

Modern software tools for traffic flow analysis offer extensive functionalities, enabling step-by-step tracking of the trajectory of each individual vehicle within a given intersection. This allows for detailed behavioral analysis of traffic participants, including their individual routes and interactions (Fig. 2).

CONCLUSIONS

The integration of digital models and so-called “digital twins” into transportation engineering education offers significant advantages for both instructors and students. These technologies enable the simulation and analysis of real-world traffic scenarios in a controlled virtual environment, eliminating the need for direct interaction with physical infrastructure and minimizing the risks and costs associated with traditional training methods.

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