Budapest University of Technology and Economics
Faculty of Transportation Engineering and Vehicle Engineering
Department of Transport Technology and Economics

Transport Informatics – BMEKOKKM223

Study books:

Dr. Csiszár Csaba – Csonka Bálint – Földes Dávid: Innovative Passenger Transportation Systems (printed book) 2019.

Dr. Csiszár Csaba – Caesar Bálint – Csonka Bálint – Földes Dávid: Transportation Information Systems I.
Study-aid for practices in computer laboratory 2016

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Homepage of department: http://kukg.bme.hu/en/study/msc/bmekokkm223/ study-aids + announcements (results)

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Timetable, list of students, essence of the subject, antecedents, objectives of the course

Interdependence of the subjects:

BSc courses:

Transportation information systems I. and II. +
information systems of transport subsectors/modes

MSc courses:

Transportation informatics + Intelligent transportation systems (ITS) + optional subjects (e.g. Passenger transportation)

Objective of the courses relating Transportation informatics on the Faculty of Transportation Engineering and Vehicle Engineering [delineation of a „map”]

Topics of final exam (homepage)

Rudiments of system theory, relationship of activities and information, information connection of two elements

System: elements connected to each other and having certain functions, in a well-defined structure. It is established in order to achieve goals or to solve problems.

Elements and connections between elements.

What does it consist of? And how does it work?

Information system: a system which manages the information (sign, data).

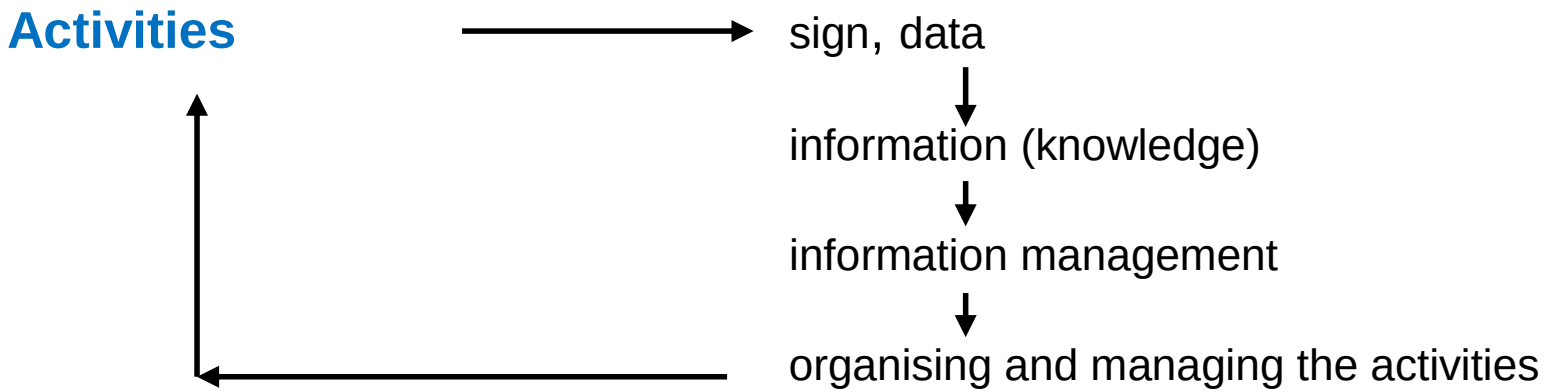
(data collection, -transfer, -storage, -process, data usage, visualization)

Transportation systems

- Technical system of transportation
  - *Power supply system*
  - *Roads and installed objects*
  - *Vehicles and material handling devices*
- Process system of transportation
  - *Movements of cargo and passengers in vehicles; basic process*
- Control and management system
  - *Control of transportation process (direct)*
  - *Management of **organizations** (indirect)*

Based on these:

- **Information system**



DATE: Data are indication of facts (e.g. text, numerical values, etc.), which can be distinguished from each other and handled separately. It is stored in databases or in files.

DATABASE: Database is set of data elements, which are related and stored together without overlapping and redundancy. This data set has a complex, logical structure.

Information is arisen from data by its interpretation. Data elements bear the information. The aim: to retrieve from datasets as much information as possible.

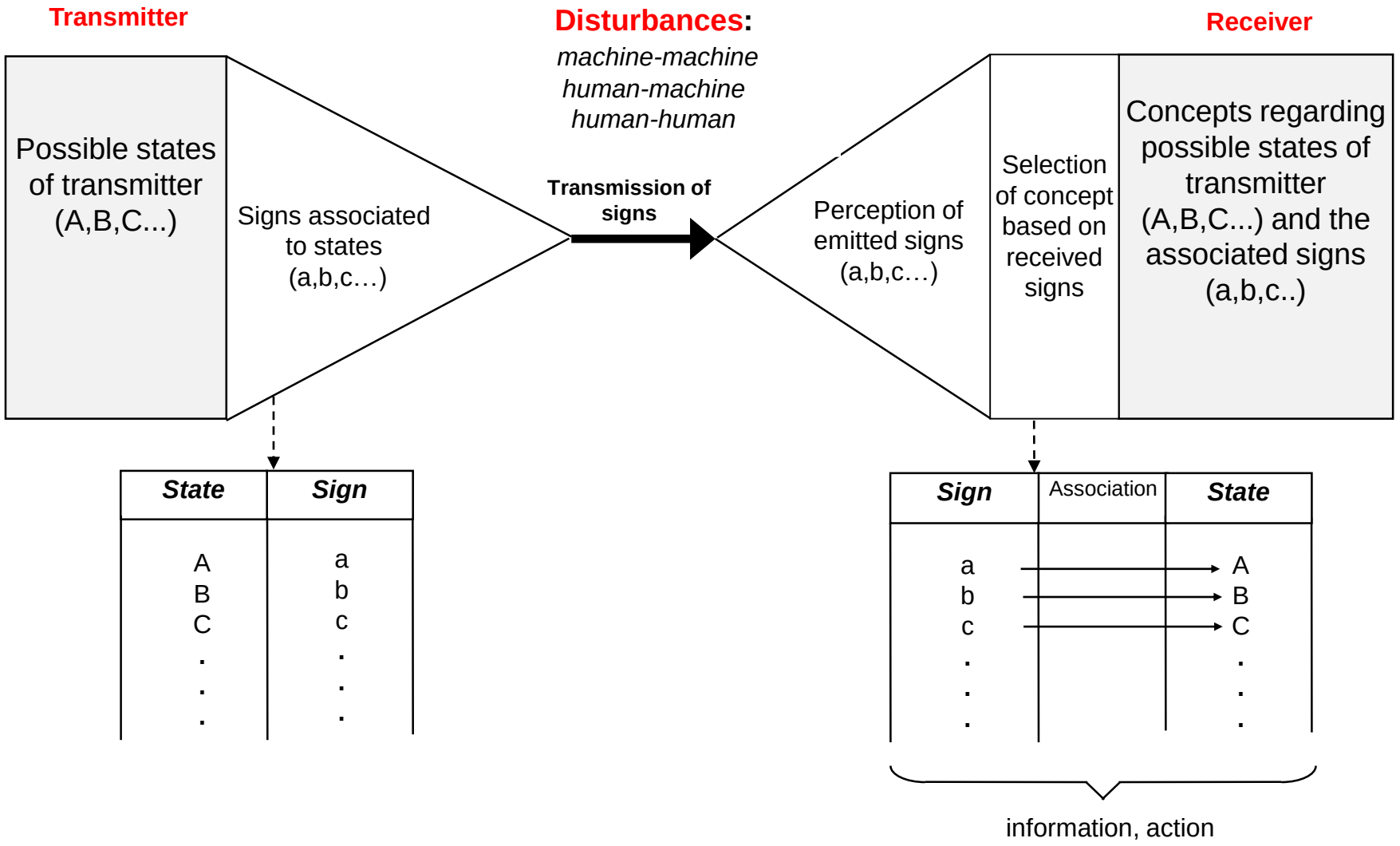
INFORMATION: Information is combination of data elements in a certain context (structure). The information is a reflexion of objective reality in the human consciousness. It is the prerequisite for the abstraction of reality. (Content of information depends on visualization.)

Example

data - objective - machine information management
information - subjective - human information management

Sign → data → information → knowledge

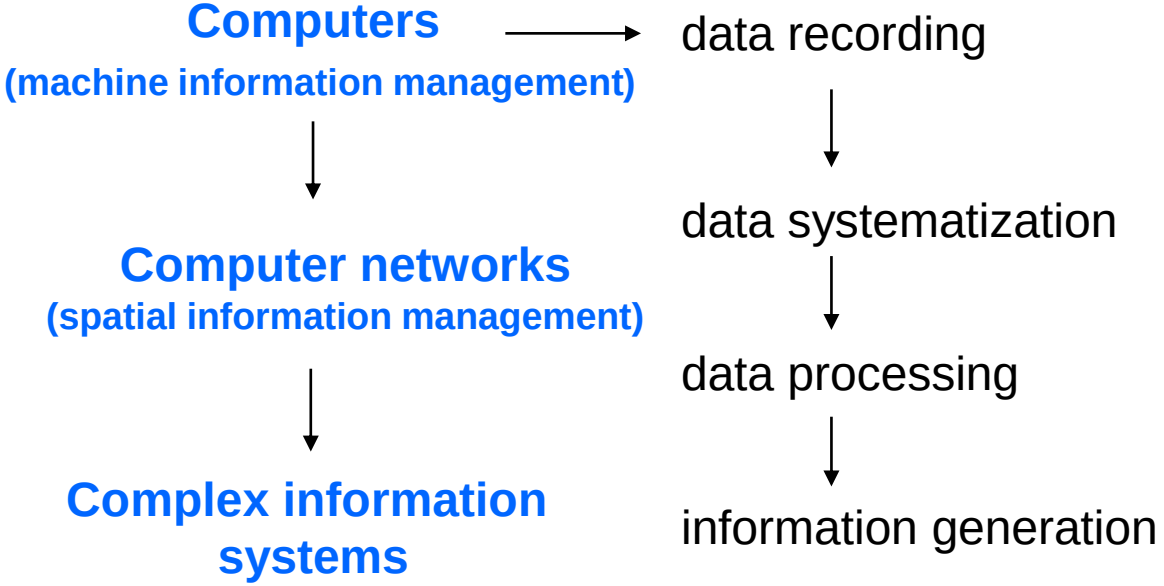
Information connection of two elements



Evolution of informatics

Professions involved in development of complex transport information systems:

- transportation engineer
- system engineer
- computer engineer
- electrical engineer
- economist
- mathematician
- mechanical engineer
- etc.



INFORMATICS: all the knowledge about information management

Data modelling

MODELL: simplified mapping of the complex (dynamic) reality, for specific investigation purposes. The most relevant attributes are taken into consideration in the model, whereas the other features are neglected.

DATA MODEL: mapping of the reality into data elements considering their relations, the circumstances and rules of the utilization - planning of the database structure.

Steps of data modelling:

1. Conceptual model

The field of the reality is selected, that is concerned in the model. Limitations, simplifications: the model and the created application where, for what, by whom will be used. The concepts, their relations and the processes are revealed - the “base system” is recognized.

What are the outputs and inputs of the system?

2. Logic model

I. What are the types of entities (subject, person or concept)?
(one entity type contains the entities with the same attributes)

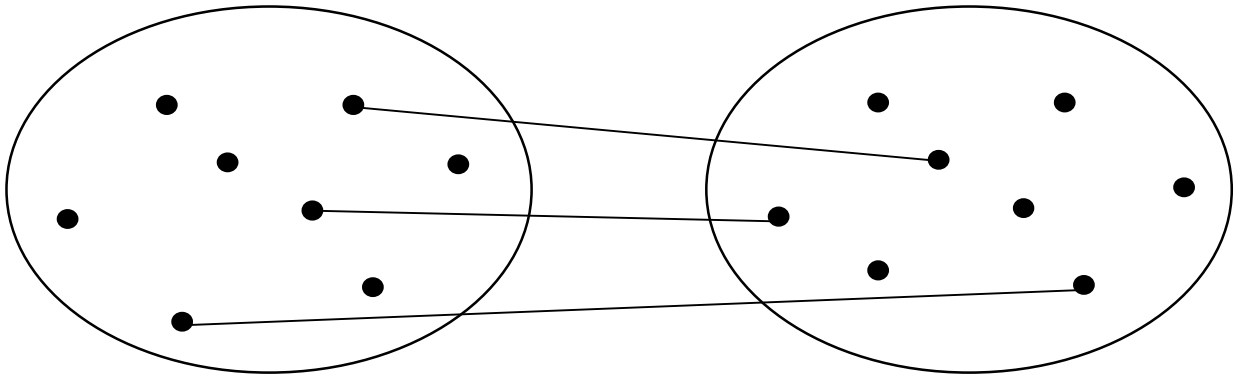
II. Which attributes of the entities are relevant?
(identifying, descriptive attributes)

III. What kind of relations are among the entities?

(the inner structure is determined by the relations) [relations of entity sets]

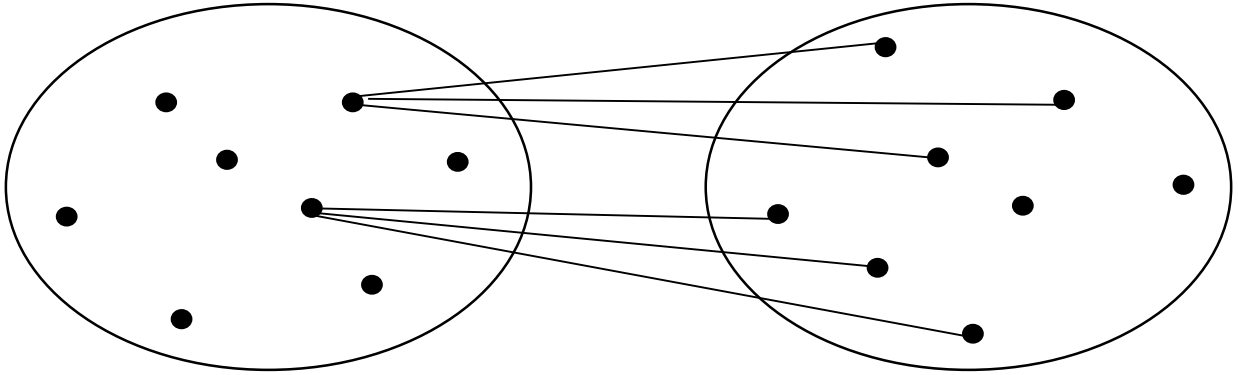
1:1 connection type

- mutual (in both direction) one-to-one correspondence
- each entity has at most one pair in the other cluster
- example: man-woman, marriage



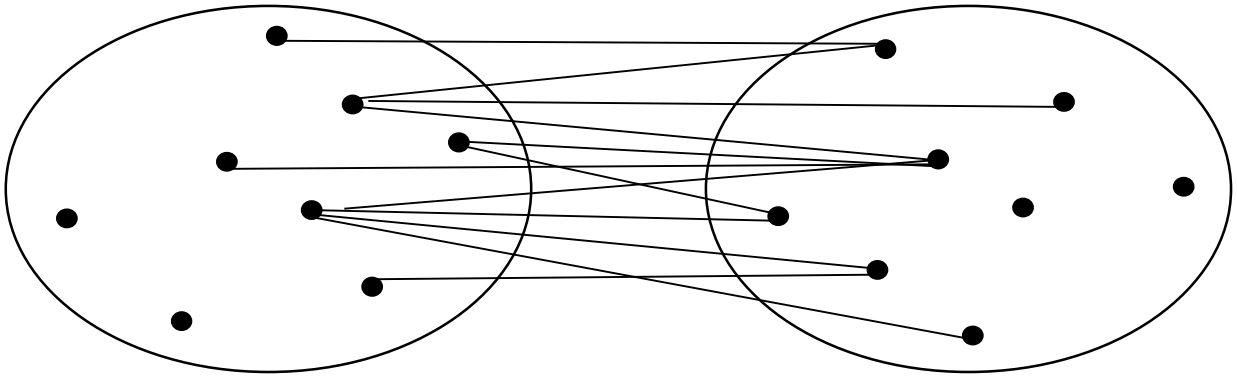
1:N connection type (most commonly used)

- direction is important
- only in one direction (from many to 1) ← one-to-one correspondence
- entities on many side have at most one pair in the other cluster
- example: painter - painting (with limitations)

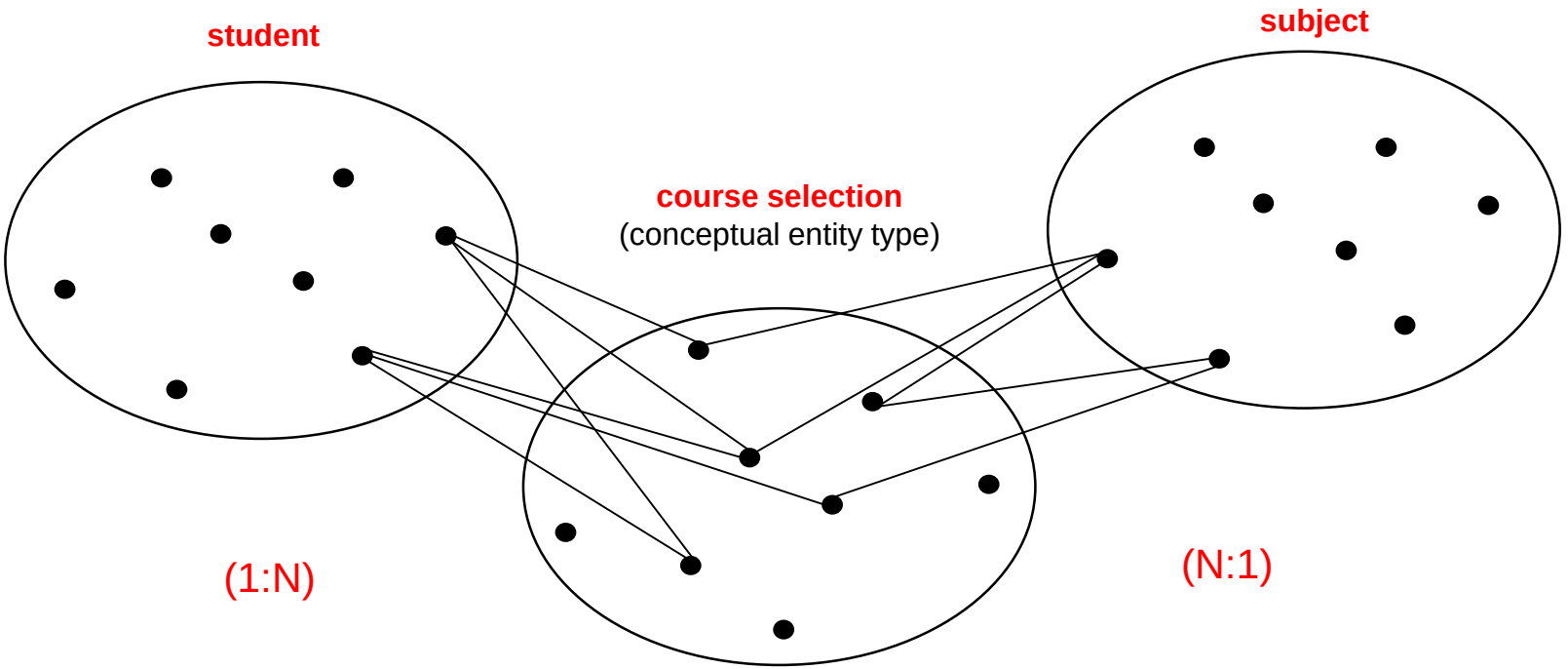


N:M connection type

- there is no one-to-one correspondence
- each entity may have any pair in the other cluster
- example: student - course



Disaggregation of N:M relationship to two symmetric 1:N relationships with connector entity



3. Physical data model

Consideration of the available hardware and software environment (data types and sizes in the database management system, access authority of users).

Planning of processing: : simple operations (seeking, ordering, etc.) multiple operations (grouping, summing-up, preparing statistics, etc.). Processes repeated regularly or periodically.

Physical data independency: the data model is independent from the HW and SW conditions; it can be realized in any “environment”.

It is followed by preparing of the application and programming..