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QUALITY OF TIME SPENT MATTERS!

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INTRODUCTION

Quality of living environments via quality of time spent in user's daily routine.

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Spatial interaction model which assesses quality of space for certain use (activity) and certain user (profile) via analysis of quality of time spent for that activity in a particular space or sequences of spaces.

STANDPOINTS

USER: **Quality of living of any society begins with the quality of living for individuals.**

Any intervention in the environment must serve its user(s) well.

It is necessary to know this user, his habits, expectations and the abilities to achieve well-being and consume the offer of the area he lives in fully.

It is crucial to achieve well-being especially via optimisation of consumption of time, optimisation of services and reduction of costs!

INTRODUCTION

MOTIVE

How to come to real life in certain area, real people, real economic frames and spatial characteristics as close as possible, and set up a time-people-place oriented approach.

CHALLENGE

Searching for the approach which may address quality of living quite directly and describe it with simple everyday measures which are shaping our daily routines and which reflect on actual living situations as much as possible.

CONCEPT

ASSUMPTION

Quality of time spent indicates quality of living environments.

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Less time spent for commuting (e.g. to work, to recreation or other services) and more time to have for any kind of leisure (e.g. theatre, recreation), better quality of life can a person live

Quality of time spent depends on that what a person can afford.

A common denominator for evaluation of quality of living environments is a measure of good/bad time.

CONCEPT

TIME-PEOPLE-PLACE APPROACH

Good time (the best) – Indifferent time – bad time (the worst):

+100% satisfaction (complete satisfaction),
0% indifferent to time spent in certain space
-100% satisfaction (complete dissatisfaction)

Behaviour: schedules and users' characteristics (soc.-econ. data):

daily routine
weekly routine
extraordinary routine

Properties of place (geo-spatial data and information):

Programmes in places and communications between them

CONCEPT

TWO DIFFERENT VALUATION OF THE SAME TIME

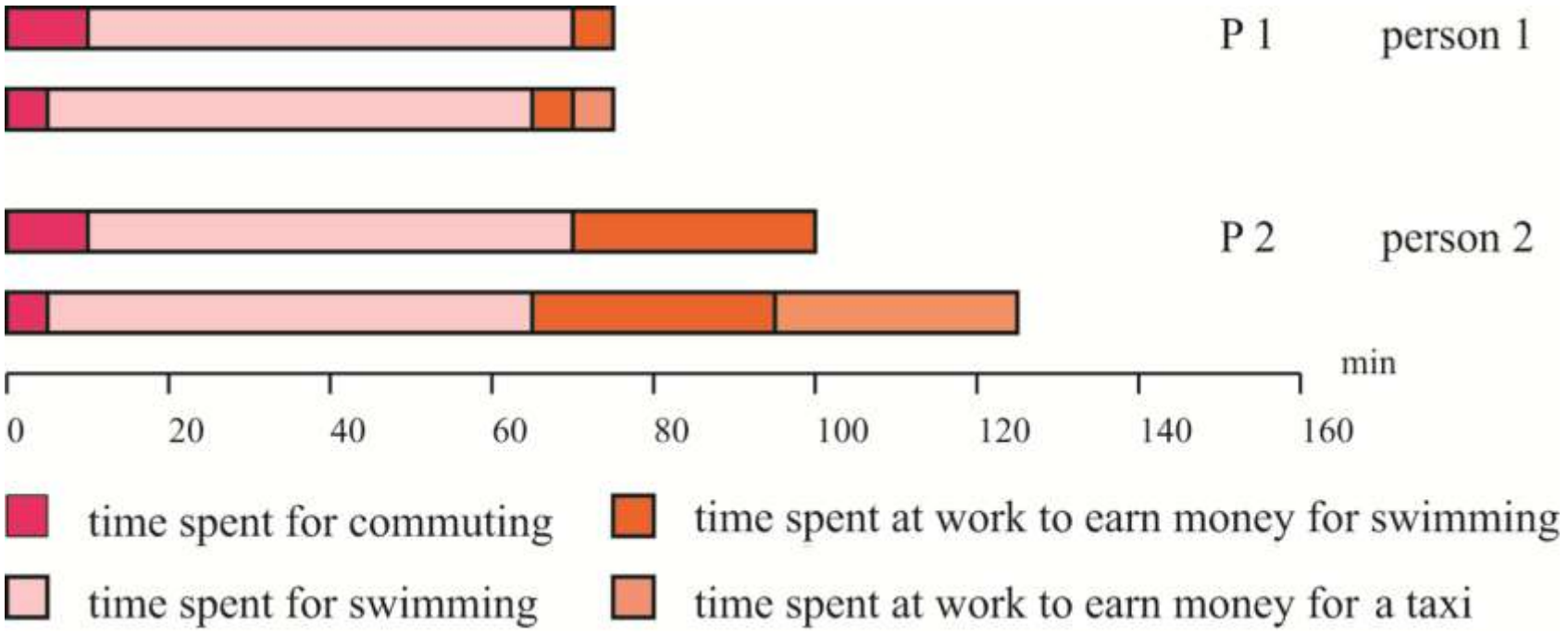
person	*recreation entrance*	*circumstan.*	*solution*	*swimming time*	***value of time spent***	*costs of time spent*	***costs of time spent***
S1	6 EUR	5min late	taxi - on time	60min	**60min of good time**	12 EUR	**65min of bad time**
S2	6 EUR	5min late	walking 15min-late	50min	**65min of good time**	6 EUR	**30min of bad time**

12 EUR/h

AFFORDANCE – ECONOMIC IMPACT: recreation - go there - work for that

person	*earnings*	*activity (good time)*	*costs*	*commuting 1(bad time)*	*working (bad time)*	*total good time*	*total bad time*
P1	72 EUR/h	60min	6 EUR	10min	5min	**60min**	**15min**
P2	12 EUR/h	60min	6 EUR	10min	30min	**60min**	**40min**

CONCEPT



AFFORDANCE – ECONOMIC IMPACT: recreation - go there - work for that

person	*earnings*	*activity (good time)*	*costs*	*commuting 2(bad time)*	*working (bad time)*	*total good time*	*total bad time*
P1	72 EUR/h	60min	12 EUR	5min	10min	**60min**	**15min**
P2	12 EUR/h	60min	12 EUR	5min	60min	**60min**	**65min**

MODELLING

For quality of living, quality of consumption of time matters.
Quality of living of a person reflects in how well this person can spend and is spending his time.
Various environments enable various quality of living - various quality of consumption of the available time.

TIME BALANCE

shows how comfortable the time is offered to the user by his living environments.

ECONOMIC BALANCE

is a category which represents user's incomes and expenses for necessary and optional activities. It represents a financial frame within which the user is flexible to be able to perform his activity in a certain environment.

TIME-QUALITY BALANCE

classifies time spent regarding the activity and the environment in which the activity is taking place as well or badly spent time. It is the final measure of quality provided with the proposed model.

Balance 1: Time balance

Time spent for each action should be shorter or equal to available time for that action:

$$T_{Rqi} \leq T_{Avi}$$

where

TRqi* = time required for action *i

TAvi* = time available for action *i

Sometimes we do not manage that, so we are late. However, the minimum required condition, jet not always sufficient, is to do everything that is required in the whole available time (e.g. to do all daily routines in 24 hours):

$$\sum_i T_{Rqi} \leq \sum_i T_{Avi} \rightarrow T_{Rq} \leq T_{Av}$$

Time balance analysis shows balance of necessary and optional activities.

The assumption is if the profile is not able to fulfil necessary activities, the neighbourhood is not suitable for such profile. If the profile is not able to fulfil optional activities, optional activities must be re-organised against a new priority list.

Balance 2: Economic balance

The basic information addressed is household's incomes and expenses for necessary activities and optional activities. Expenses of a household should not exceed the incomes:

$$\sum_i M_{Rqi} \leq \sum_j M_{Avj} \rightarrow M_{Rq} \leq M_{Av}$$

where

MRqi* = money required for expense *i

MAvi* = money available from the source *j

Incomes are classified as:

- **regular (e.g. salary earned in working time every working day);**
- **other regular (e.g. pension, rent); and**
- **irregular (e.g. property selling).**

Expenses are classified as:

- **residential expenses;**
- **basic basket expenses (e.g. food, clothes);**
- **other necessary expenses (e.g. nursery, school);**
- **other optional expenses and;**
- **travel expenses for commuting at daily routine.**

Balance 3: Time-quality balance

The model extracts the time spent for any activity into the good or the bad portion. The rest of the time, not classified as good or bad, is considered as indifferent portion of time.
Time quality balance is expressed by time-quality coefficient *KTQ*.
The model shows whether a segment of population can live in certain area and how comfortable.

$$K_{TQ} = \frac{T_Q}{T_{Sp}} = \frac{\sum_i T_{Qi}}{\sum_i T_{Spi}} = \frac{\sum_{ij} T_{Spi} \times F_{Qij} \times F_{Wij}}{\sum_i T_{Spi}} \quad \text{where} \quad \sum_j F_{Wij} = 1 \quad \text{and} \quad -1 \le F_{Qij} \le 1$$

where
***KTQ* = time-quality coefficient**
***TQ* = evaluated portion of time (positively signed–good time; negatively signed–bad time)**
TQi* = evaluated portion of time within the time interval *i
***TSp* = time spent**
TSpi* = time spent within the time interval *i
FQij* = quality of the quality component *j* within the time interval *i
FWij* = influence (weight) of the quality component *j* within the time interval *i

Balance 3: Time-quality balance

In the examples in this paper at least two time-quality components are proposed:

AC = activity component
SC = space component
Therefore: $j \in \{AC, SC\} \Rightarrow F_{Wi,SC} = 1 - F_{Wi,AC}$

The activity component evaluates potential or most probable satisfaction with the activity within a given time interval, e.g. desired recreation or relaxation would be assigned +100%, driving a car ±0%, while compulsory hard labour -100%.
The space component evaluates potential or most probable satisfaction with the place where activity is taking place for given activity within a given time interval, e.g. very suitable and stimulative place for certain activity would be assigned +100%, a very inappropriate and destimulative place -100%.

$$K_{TQi} = \frac{T_{Spi} \times \left(F_{QACi} \times F_{WACi} + F_{QSCi} \times F_{WSCi} \right)}{T_{Spi}}$$

$$K_{TQ} = \frac{\sum_i \left(T_{Spi} \times \left(F_{QACi} \times F_{WACi} + F_{QSCi} \times F_{WSCi} \right) \right)}{\sum_i T_{Spi}}$$

The weight of each quality component describes how much each component contributes to potential quality of time, e.g. potential satisfaction with the time spent in the given place.

MODELLING

EXAMPLE 1

		home	home	by bicycle/car	nursery/ school	by bicycle/car	work	by bicycle/car	nursery/ school	by bicycle/car	shop	by bicycle/car	by bicycle/car	gym	by bicycle/car	home	home	
		sleeping	preparation for go to work	going to nursery	dropping of children	going to work	working	going from work, to pick up children	picking up children	going from work, to do shopping	daily shopping and services	going home	going to recreation	recreation	coming from recreation	dinner preparation + dinner	home with a family	
P1b	T_{Sp}	8h 0'	30'	10'	5'	15'	8h 0'	15'	5'	10'	20'	10'	10'	2h 0'	10'	30'	3h 10'	**24h 0'**
	F_{OAC}	100	0	50	0	50	-20	50	0	50	0	50	50	100	50	100	100	
	F_{OSC}	80	80	-20	-10	-10	0	-10	-10	-20	20	-20	20	80	20	80	80	
	F_{WAC}	50	40	40	40	40	50	40	40	40	20	40	40	60	40	50	50	
	F_{WSC}	50	60	60	60	60	50	60	60	60	80	60	60	40	60	50	50	
	K_{TO}	0.90	0.48	0.08	-0.06	0.14	-0.10	0.14	-0.06	0.08	0.16	0.08	0.32	0.92	0.32	0.90	0.90	**0.50**
	T_O	7h 12'	14'	1'	0'	2'	-48'	2'	0'	1'	3'	1'	3'	1h 50'	3'	27'	2h 51'	**12h 2'**
P2b	T_{Sp}	8h 0'	30'	10'	5'	25'	8h 0'	25'	5'	10'	20'	10'	10'	2h 0'	10'	30'	2h 50'	**24h 0'**
	F_{OAC}	100	0	50	0	50	-20	50	0	50	0	50	50	100	50	100	100	
	F_{OSC}	80	80	-20	-10	-10	0	-10	-10	-20	20	-20	20	80	20	80	80	
	F_{WAC}	50	40	60	40	60	50	60	40	60	20	60	40	60	40	50	50	
	F_{WSC}	50	60	40	60	40	50	40	60	40	80	40	60	40	60	50	50	
	K_{TO}	0.90	0.48	0.22	-0.06	0.26	-0.10	0.26	-0.06	0.22	0.16	0.22	0.32	0.92	0.32	0.90	0.90	**0.50**
	T_O	7h 12'	14'	2'	0'	7'	-48'	7'	0'	2'	3'	2'	3'	1h 50'	3'	27'	2h 33'	**11h 57'**

MODELLING

EXAMPLE 2

		sleeping	preparation for go to work	going to nursery	dropping of children	going to work	working	going from work, to pick up children	picking up children	going from work, to do shopping	daily shopping and services	going home	going to recreation	recreation	coming from recreation	dinner preparation + dinner	home with a family	
		home	home	by bicycle/car	nursery/ school	by bicycle/car	work	by bicycle/car	nursery/ school	by bicycle/car	shop	by bicycle/car	by bicycle/car	gym	by bicycle/car	home	home	
P1b	T_{Sp}	8h 0'	30'	10'	5'	15'	8h 0'	15'	5'	10'	20'	10'	10'	2h 0'	10'	30'	3h 10'	**24h 0'**
	F_{OAC}	100	0	50	0	50	-20	50	0	50	0	50	50	100	50	100	100	
	F_{OSC}	80	80	-20	-10	-10	0	-10	-10	-20	20	-20	20	80	20	80	80	
	F_{WAC}	50	40	40	40	40	50	40	40	40	20	40	40	60	40	50	50	
	F_{WSC}	50	60	60	60	60	50	60	60	60	80	60	60	40	60	50	50	
	K_{TO}	0.90	0.48	0.08	-0.06	0.14	-0.10	0.14	-0.06	0.08	0.16	0.08	0.32	0.92	0.32	0.90	0.90	**0.50**
	T_O	7h 12'	14'	1'	0'	2'	-48'	2'	0'	1'	3'	1'	3'	1h 50'	3'	27'	2h 51'	**12h 2'**
P1c	T_{Sp}	8h 0'	30'	15'	5'	15'	8h 0'	15'	5'	10'	20'	15'	10'	2h 0'	10'	30'	3h 0'	**24h 0'**
	F_{OAC}	100	0	0	0	0	-20	0	0	0	0	0	0	100	0	100	100	
	F_{OSC}	80	80	-50	-10	-10	0	-10	-10	-50	20	-50	-50	80	-50	80	80	
	F_{WAC}	50	40	60	40	60	50	60	40	60	20	60	60	60	60	50	50	
	F_{WSC}	50	60	40	60	40	50	40	60	40	80	40	40	40	40	50	50	
	K_{TO}	0.90	0.48	-0.20	-0.06	-0.04	-0.10	-0.04	-0.06	-0.20	0.16	-0.20	-0.20	0.92	-0.20	0.90	0.90	**0.48**
	T_O	7h 12'	14'	-3'	0'	-1'	-48'	-1'	0'	-2'	3'	-3'	-2'	1h 50'	-2'	27'	2h 42'	**11h 27'**

CONCLUSION

Model suggests time as the universal expression and measure of quality of living.

Key indicators to calculate possibility and comfort of living in the given environment are time balance, economic balance and time-quality balance.

Such data/results are linked to locations and user profiles and are useful for: a. comparison of profiles within different locations of the area, b. judgement about suitability of certain location in the area for various profiles.

Final results: Suitability maps of time-quality zones

The model can be applied for authorities (governance and decision-making) and individuals for a. setting new developments in a place, b. searching for measures for improvements, c. comparison of different locations for one particular use, and d. comparison for various measures in a certain location.

CONCLUSION

Smart cities – people friendly cities
are cities with minimum time waste for their users!

THANK YOU!

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