Budapest University of Technology and Economics
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SENSITIVITY ANALYSIS OF THE ACTIVITY CHAIN OPTIMIZATION PARAMETERS

Tudományos Diákköri Konferencia

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OUTLINE

01 INTRODUCTION

02 METHOD

03 RESULTS

04 CONCLUSION

01 INTRODUCTION

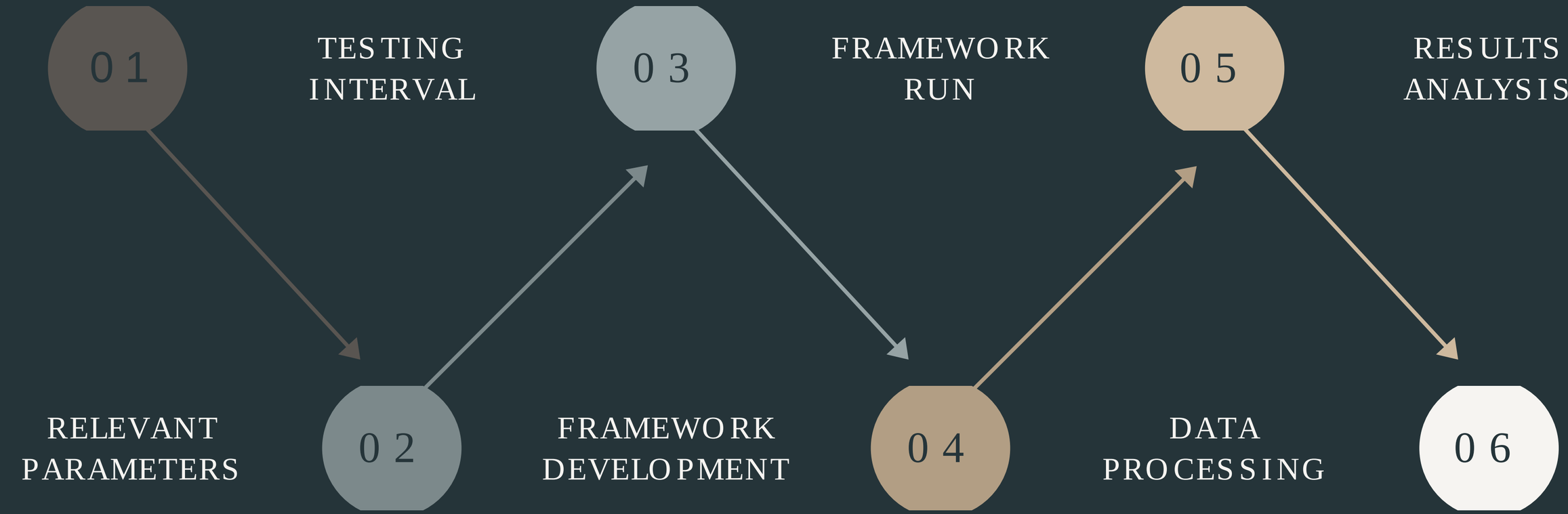
URBAN NETWORK	EFFICIENT USE	ROUTING PROBLEMS	ACTIVITY CHAIN OPTIMIZATION	PARAMETERS
Overload	Better routes	Genetic Algorithms	Time saving	Different behavior

HOW TO UNDERSTAND THE IMPACTS OF PARAMETER CHANGE ON THE OUTPUT OF THE OPTIMIZATION?

The research describes the deployment of a sensitivity analysis on an Activity Chain Optimization (ACO) system that uses GA to solve the TSP and investigate the impacts of the main parameters on the outcomes of the optimization system.

02 METHOD

OFAT
ONE PARAMETER AT A TIME



start time	480	USER PREFERENCES
end time	1170	
transport mode	0	
usable starting battery level	70	
usable finishing battery level	85	
population size	30	GENETIC OPERATORS
generations	20	
crossover probability	0.1	
mutation probability	0.2	
charging stations to keep	5	ACO
alternative locations to keep	5	
fitness weights	0-7	UTILITY FUN

01

RELEVANT PARAMETERS

02

TESTING INTERVAL

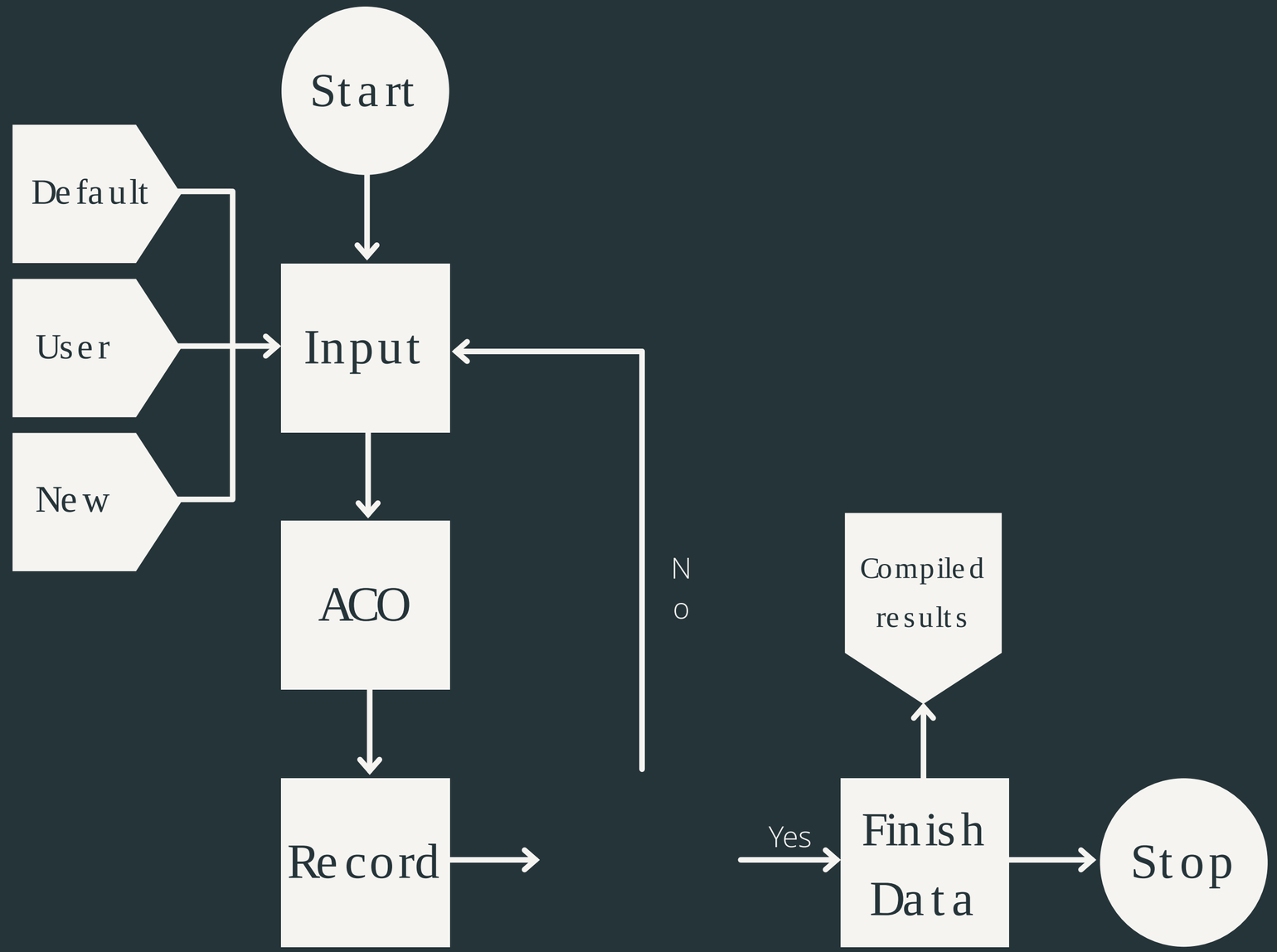
	interval	step size
start time	360 - 600	30
end time	1200 - 1350	30
transport mode	0 - 8	1
usable starting battery level	50 -100	5
usable finishing battery level	50 - 100	5
population size	5 - 45	5
generations	5 - 35	5
crossover probability	0.1 - 0.9	0.1
mutation probability	0.1- 0.9	0.1
charging stations to keep	1 - 7	1
alternative locations to keep	1 - 7	1
fitness weights	0 - 7	1

03

FRAMEWORK DEVELOPMENT

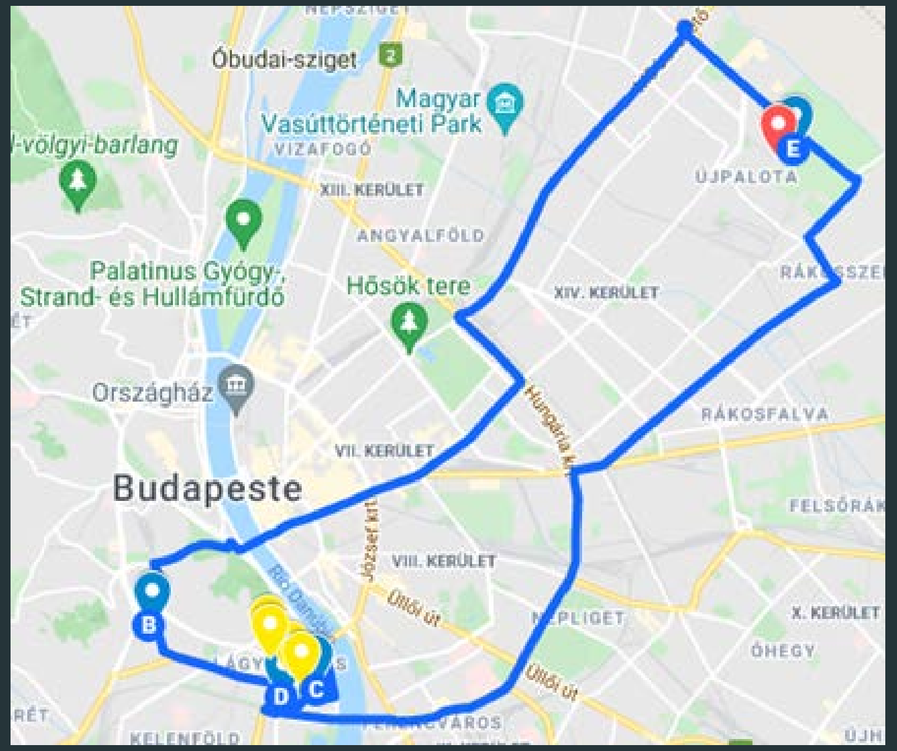
04

FRAMEWORK RUN

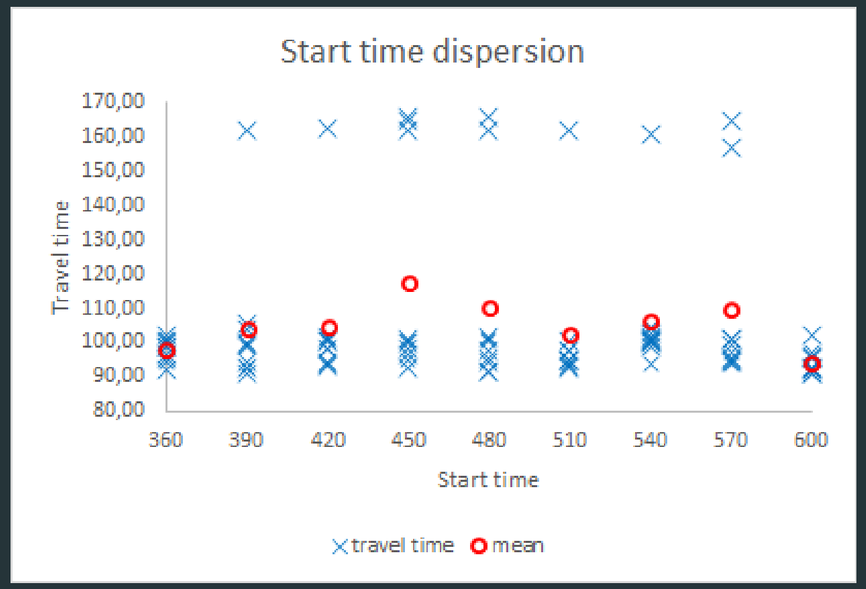


General remarks

The outlier



Spatially flexible acitivity



05 DATA PROCESSING

06 RESULTS ANALYSIS

User preferences

start time
end time

- No major variation
- Low standard deviation
- End time 1350 exception

transport mode

- CAR: Low deviation
- WALK: High impact from route change - low speed
- EV: Recharge detour - TT higher than CAR
- BIKE: WALK similar, but a lower impact from a route change - high speed
- PUBLIC TRANSPORT: high range and deviation - unexpected travel time.

battery lelvel start - finish

- No attendance of battery level constraints

05

DATA PROCESSING

06

RESULTS ANALYSIS

Genetic operators

population size

- The consistency of the results increases with the increase of the population size

generations

- No tendency observed
- A low number of generations - good results

crossover probability

- Higher probabilities increase diversity
- Better results above 0.5

mutation probability

- Higher and lower probabilities - better results
- Higher probabilities may disfigure heredity

05

DATA PROCESSING

06

RESULTS ANALYSIS

ACO parameters

number of charging stations to keep

- Car-wise behavior - needs more investigation

number of alternative locations to keep

- Slightly decrease of deviation with the increase of alternative locations

05

DATA PROCESSING

06

RESULTS ANALYSIS

Utility function

parameter	no outliers	best performance
fitness weight 1	6, 7	6
fitness weight 2	2, 3, 5, 6	3
fitness weight 3	0, 5, 7	7
fitness weight 4	7	7
fitness weight 5	0, 2, 3, 4, 5	0
fitness weight 6	0, 3, 5, 6	3
fitness weight 7	2, 5, 6, 7	7
fitness weight 8	2, 3, 4, 6, 7	3
fitness weight 9	2, 4	4
fitness weight 10	0, 5, 6	5
fitness weight 11	2, 3, 4, 5, 6	5
fitness weight 12	2, 6	6
fitness weight 13	1, 5	5
fitness weight 14	2	2
fitness weight 15	1, 3, 7	1
fitness weight 16	0, 1, 4, 5, 6, 7	4

05

DATA

PROCESSING

06

RESULTS

ANALYSIS

04 CONCLUSION

Behavior

All the results provided insights into the behavior of the due to the input parameter change

Complementation of analysis

The OFAT analysis should be complemented by a global method

Genetic operators

Analogous behavior to other researches

Further investigation

- Real activity chains
- Outlier results
- Transport modes peculiarities
- Fitness weights performance
- Electric vehicles
- Increase number of iterations
- Small step sizes

THANK YOU FOR THE ATTENTION

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