PHYSARUM-INSPIRED BICYCLE LANE NETWORK DESIGN IN CONGESTED MEGA CITY

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November 2023

Acknowledgement [*Times New Roman, Bold, Centered,16 size, 1.5-line space*]

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First and foremost, I must be grateful to and wish to acknowledge my insightful indebtedness to Dr. XYZ, Professor of the Department of Computer Science and Engineering and the supervisor of the project. His unfathomable knowledge in this field influenced me to carry out this project up to this point. His endless endurance, scholarly guidance, continual encouragement, constant and lively supervision, constructive criticism, and priceless suggestions made it possible to come up to this phase. Without his inspiring, enthusiasm, and encouragement, this work could not have been completed. Last, but by no means least, I thank Allah for the talents and abilities I was given that made it possible to undertake this project…………………………………..

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Authors

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Abstract

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A network can be described as a spatial structure that permits either vehicular movement or the flow of some commodity. The Network Design Problem (NDP) is known as one of the most complex and challenging transportation problems for many years. Transportation networks …………………………...

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Contents

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List of Tables

List of Figures

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1 Introduction

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1.1 Background

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Mobility, a key factor in planning and designing urban transport, is a fundamental part of human beings. For mobility purposes, people can use both motorized and non-motorized vehicles within a city. ……………………

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1.2 Objectives

In the case of an unorganized and unplanned mega city, where the transportation network is congested and unplanned ………………………………………………….

1.3 Scope

The main attraction of this project is to present a modified Physarum inspired technique to construct bicycle lane network design. ………………………………….

1.4 Unfamiliarity of the problem

The main attraction of this project is to present a modified Physarum inspired technique to construct a bicycle lane network design. ………………………………….

1.5 Project planning

The main attraction of this project is to present a modified Physarum inspired technique to construct bicycle lane network design. ………………………………….

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2 Related Works

2.1 Related works

Physarum polycephalum, accurately the 'many-headed' slime mold, is a gigantic multi-nucleated but single-celled protest [1]. Recently, Physarum polycephalum (true slime mold) has arisen …………….

2.2 Discussion of research gap solution

The intelligent behavior of slime mold was first observed by Nakagaki et al. in 2000 [2]. They assume that the flow is laminar and follows the Hagen-Poiseuille equation, the flux through the tube is,

$$Q_{ij} = \frac{\pi r_{ij}^4 (P_i - P_j)}{8\varepsilon L_{ij}} = \frac{D_{ij}(P_i - P_j)}{L_{ij}} , \qquad (2.1)$$

here ε is the viscosity of the fluid, and $D_{ij} = \frac{\pi r_{ij}^4}{8\varepsilon}$ is a measure of the conductivity of the tube. As the length L_{ij} is a constant, the behavior of the network is described by the conductivities of the edges.

Here we summarize various works of network construction using Physarum inspired technique in the following Table 2.1.

Table 2.1: Network construction using Physarum.

Authors & Year	Project Title	Contribution
Tero et al., 2010 [6]	Rules for Biologically Inspired Adaptive Network Design	Tokyo Rail Network construction
Adamatzky et al., 2011 [7]	Rebuilding Iberian motorways with slime mould	Iberian motorway network construction
Adamatzky et al., 2011 [8]	Approximating Mexican highways with slime mould	Mexican Federal highway network construction

3 System Design

There exist lots of challenges in some of mega cities not good enough, cycling lanes ……………………

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For Table -> caption will be above the table]

3.1 Analysis of the system

This research aims at extending a construction pattern for our network to Dhaka, Bangladesh's capital city. The main challenges with Dhaka city are described in followings……………………….

3.2 System architecture

Green City also named as Eco-city or Sustainable city is a city designed with consideration for the social, economic, environmental impact which consists of several elements such as Green Transports. A simple network in shown in Fig. 3.1. It shows that ……………
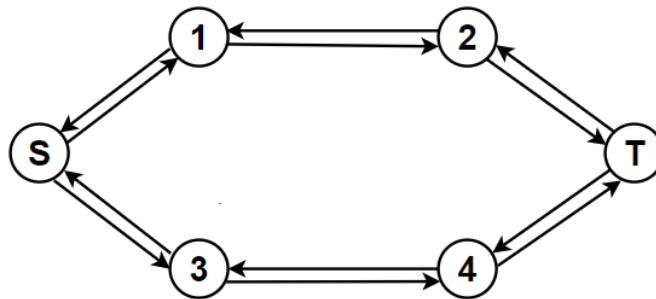

Figure 3.1: Real traffic network.

3.3 Tools used

In more ways than one, driving a bicycle has a positive impact on the environment. They are also less expensive than other forms of ……………………………………

3.3.1 Android Studio

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Bicycles are considered zero-emission vehicles i.e. they do not release any carbon emissions. Bicycles, as vehicles with ……………………………………

3.3.2 Kotlin

Bicycles, as vehicles with ……………………………………

4 Project Implementation

This chapter implements the………………

4.1 System implementation

At first, a selected portion of Dhaka city is considered to construct the network using Physarum inspired technique…………….

4.2 Morality or ethical issues

At first, a selected portion of Dhaka city is considered to construct the network using Physarum inspired technique. And it can also lead to better mental health and energy by bicycling 30 minutes a day [3], [4]………………………….

4.3 Socio-economic impact and sustainability

At first, a selected portion of Dhaka city is considered to construct the network using Physarum inspired technique……………...................................

4.4 Financial analyses and budget

At first, a selected portion of Dhaka city is considered to construct the network using Physarum inspired technique……………………….

5 Conclusion

A modified Physarum-inspired model is presented in this project to address the design of the bicycle lane network………………………………….

5.1 Conclusion and challenges faced

The network design technology inspired by Physarum is believed to have balanced costs, effectiveness, and resilience. Inside Dhaka city, an unorganized and unplanned city, we have developed an electric bicycle ……………………

5.2 Future Study

In the future, parallel computing and the optimal model for the design of the transport network are part of our work. Furthermore, our research includes the implementation of the Physarum ……………………….

Use IEEE formatting style

References [*Bold, Left-align,16 size, 1.5-line space*]

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[1]   C. Oettmeier, K. Brix, and H.-G. Döbereiner, "Physarum polycephalum —a new take on a classic model system," *J. Phys. D. Appl. Phys.*, vol. 50, no. 41, p. 413001, Oct. 2017, doi: 10.1088/1361-6463/aa8699.

[2]   T. Nakagaki, H. Yamada, and Á. Tóth, "Maze-solving by an amoeboid organism," *Nature*, vol. 407, no. 6803, pp. 470–470, Sep. 2000, doi: 10.1038/35035159.

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[7]   A. Adamatzky and R. Alonso-Sanz, "Rebuilding Iberian motorways with slime mould," *Biosystems*, vol. 105, no. 1, pp. 89–100, Jul. 2011, doi: 10.1016/j.biosystems.2011.03.007.

[8]   A. Adamatzky, G. J. Martínez, S. V. Chapa-Vergara, R. Asomoza-Palacio, and C. R. Stephens, "Approximating Mexican highways with slime mould," *Nat. Comput.*, 2011, doi: 10.1007/s11047-011-9255-z.

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N.B. This is the preferable format for Report writing. The subsections written in italic forms (i.e., 1.4, 1.5, 4.2, 4.3, 4.4) are fixed. However, the Supervisor can extend the sections/points of the report (if necessary).