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A STUDY OF GRAPHY THEORY IN TRAFFIC CONTROL SYSTEM

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Abstract

In this paper the design of a controller crossing is explained by means of various examples. The controller has to minimise the waiting time of the public transportation . First the model of the chosen traffic crossing has been explained.The results are shown at the end. The actual implementation of the control algorithm for the example is shown below. The work presented here is part of a small project. Thel goal of this paper is to provide the traffic engineer for designing to control of traffic lights.

Keywords: Discrete Event **Systems**; **traffic control**; **graph theory,Compatable graph**

Introduction

Traffic congestion has become a serious issue in large cities in terms of social, economic and environmental impact. Smart cities aim to continuously improve the lives of citizens in different aspects transportation, health, education, energy, etc. As cities now become larger, congestion is increased due to rapid urbanization. The smart city is a combination of multiple components of a specific area that is automated to make a digital environment and all smart devices and tools related to a network .

Traffic signaling systems are one of the most important components of our daily routine.

The purpose of traffic control is to assign the right way to drivers and thus to facilitate highway safety and efficiency by ensuring the orderly and predictable movement of all users of the roadway systems, including highways, streets, and bikeways.

The only way to control the traffic flow in such a situation is **to use the current road network more efficiently .**

Graph theory can be applied to **solving systems of traffic lights at crossroads**. By modeling the system of traffic flows into compatible graph, two vertices are represented as the flow connected by an edge if and only if the flow at the crossroads can be moved simultaneously without causing crashes.

Elements of traffic control

There are four basic elements in a computerized traffic control system
(i)**computer**
(ii) communications devices
(iii) traffic signals and associated equipment
(iv)detectors for sensing vehicles.

Traffic flow information is picked up by the detectors from the roadway and transmitted to the computer system for processing.

Properties of traffic

Three fundamental properties of road traffic are
(i) **ambiguity**
(ii) **finiteness**
(iii) **time-space**.

Applications of Graph theory in Traffic control

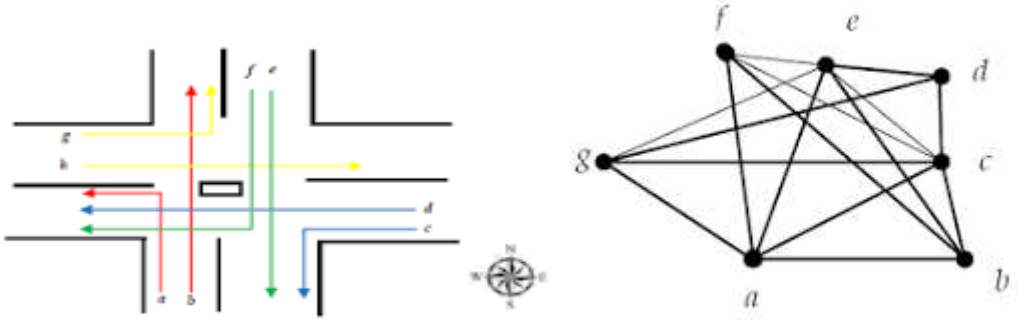
Modern Applications of Graph Theory discusses many cutting-edge applications of graph theory, such as **traffic networks, navigable networks and optimal routing for emergency response, and graph-theoretic approaches to molecular epidemiology**

The statistical theory of traffic flow is presented to **provide estimates of delays and queues at isolated intersections, including the effect of upstream traffic signals**. This leads to the discussion of traffic bunching, dispersion, and coordination at traffic signals.

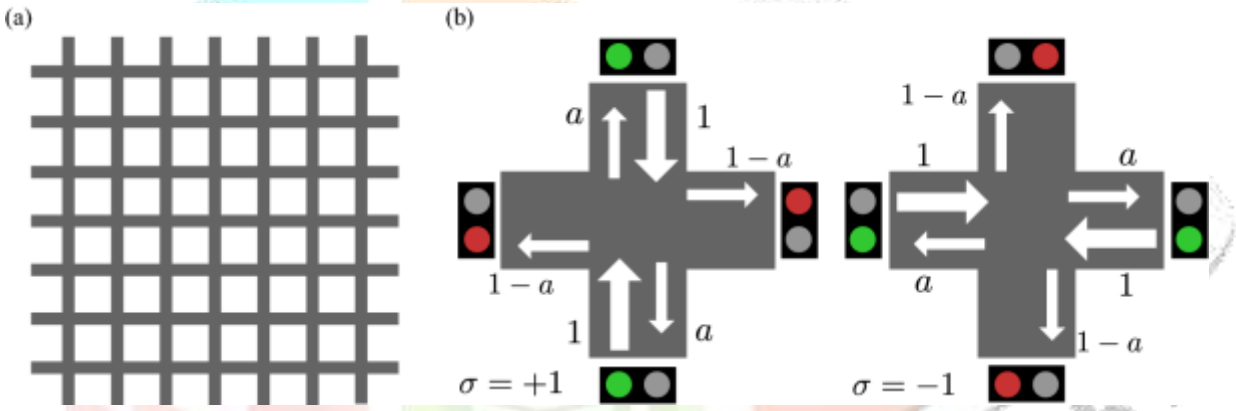
The movement of vehicles or pedestrians through an area or along a route. :
1. the vehicles, pedestrians, ships, or planes moving along a route.
2. the information or signals transmitted over a communications system. 3. the passengers or cargo carried by a transportation system.

Traffic signals are designed to ensure an orderly flow of traffic, provide an opportunity for pedestrians or vehicles to cross an intersection and help reduce the number of conflicts between vehicles entering intersections from different directions.

Control at Crossroad. Graph theory can be applied to solving systems of traffic lights at crossroads. By modeling the system of traffic flows into compatible graph, 2 vertices are represented as the flow connected by an edge if and only if the flow at the crossroads can be moved simultaneously without causing crashes.

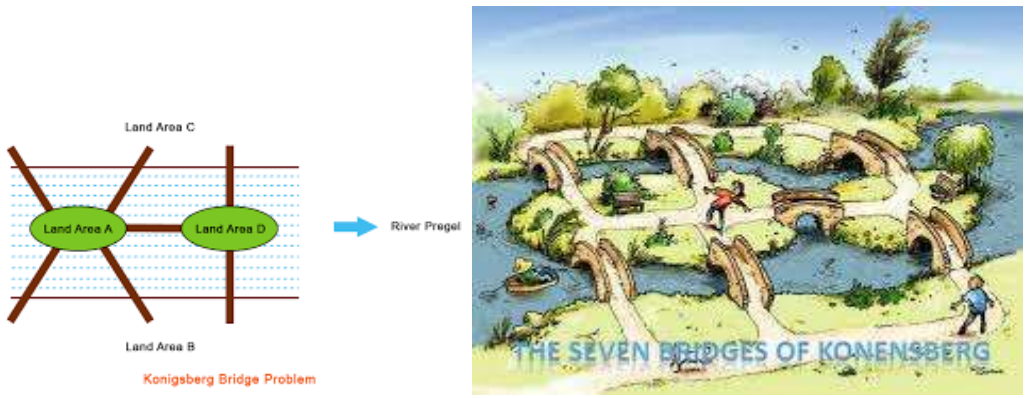


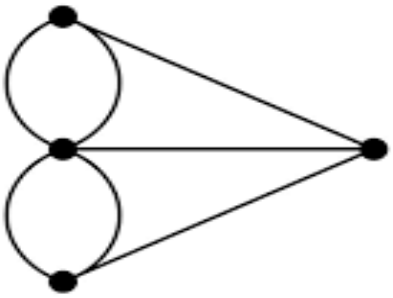
Graph theory **represents the entire traffic signal network that acts as nodes**, and the connectivity of signals is represented as edges to build a network, and through this network, the appropriate routes have been found.



Example

Konigsberg bridge problem can be solved by graph theory





Each vertex is a landmass. Each edge is a bridge.

Algorithm used in traffic control system

The traffic light control system using the **fuzzy logic algorithm based on the Mamdani method** gives the value of the length of time the green light is on depending on the number of arrivals of a path in the first cycle and second cycle of lights.

A traffic model is a mathematical model of real-world traffic, usually, but not restricted to, road traffic. Traffic modeling draws heavily on theoretical foundations like network theory and certain theories from physics like the kinematic wave model.

Compatability graph: definition

In graph theory, a comparability graph is an undirected graph that connects pairs of elements that are comparable to each other in a partial order. Comparability graphs have also been called transitively orientable graphs, partially orderable graphs, containment graphs, and divisor graphs.

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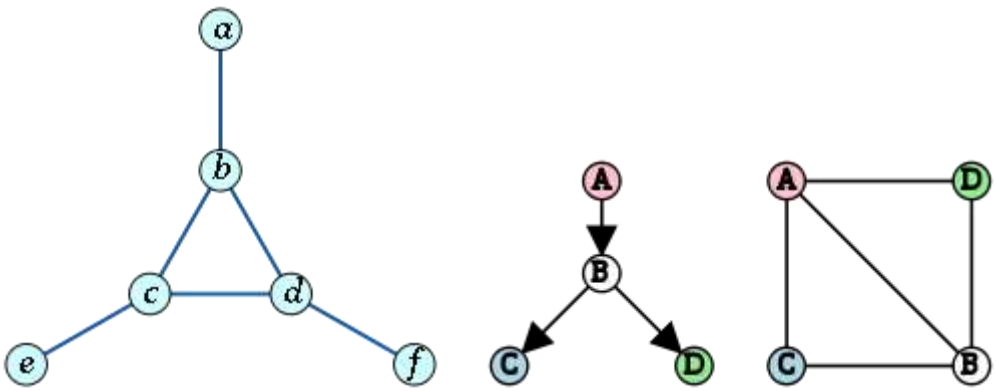

Best solution for traffic

1. Multimodal streets. Streets don't have to be for cars only.
2. Congestion pricing and limited traffic zones. We've written articles about this before.
3. Eliminate street parking.
4. Add transit options.
5. Reclaim public places.

One of the easiest ways to improve traffic congestion is to **remove the issue of congestion arising from too many people trying to travel at once on any given road**. When a civil engineer s design offers alternative routes to the same destination, this can help reduce the number of vehicles in high-traffic areas.

IoT systems can optimize traffic flow and improve safety by **dynamically adjusting control mechanisms such as traffic lights, expressway on-ramp meters, efficient public transport lanes, highway message boards, and also speed limits**.

CONCLUSIONS

Based on the discussion that has been described in this paper, the following conclusions can be taken. Graph theory can be applied to the problem of traffic system settings at a crossroads in the following way

Modeling system traffic flow at crossroads into the compatible graph .Dividing the set vertices of the compatible graph into several sections complete graph such that many parts as possible or the number of dots in each graph section complete as much as possible.

The calculation of the optimal cycle states traffic light cycle at different times at crossroads and when the green light in all directions. But in fact, the traffic light settings are very complicated and no single, which involves a variety of factors, and cannot adopt a suitable model to solve all problems.

REFERENCES

1. Budayasa, I. K.., Teori Graf dan Aplikasinya (Graph Theory and Its Applications) Surabaya : University Press of Universitas Negeri Surabaya, 2007.

2. Dinas Perhubungan Kota Surabaya., Laporan Survey Kinerja Lalu Lintas Tahun 2015 Tahap 2 (Survey Report of Traffic Light) Surabaya : Pemerintah Kota Surabaya, 2015.

3. Hosseini, S.M, & Orooji, H., Phasing of Traffic Light at Road Junction. Applied Mathematical Science, Vol.3. No.30, pp.1487-1492, 2009.

4. Wang, Qiang; Wang, Liang; Wei, Guangcun.. Research on Traffic Light Adjusment Based on Compatibility Graf of Traffic Flow. University of Science and Technology, Qingdao China, 2011.

5. UU no 22 tahun 2009 tentang lalu lintas dan angkutan jalan (Law in Traffic and Roads).