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Study and Analysis of Networks Flows

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Thesis submitted for the Master's degree
in computer science and engineering
options: Artificial Intelligence
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Louvain-la-Neuve
Academic year 2015-2016

Abstract

Acknowledgment

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Chapter 1

The Maximum Flow Problem

Chapter 2

Existing Algorithms

2.1 Augmenting path algorithms

2.1.1 Introduction

The idea behind the augmenting path algorithms is as follows : As long as there is a path from the source to the sink, we send flow along this path. And so on until there is no more path from the source to the sink.

An available path from the source to the sink is called *augmenting path* and to find it, we use the *residual graph*. A *residual graph* is a double oriented graph with the available capacities. For instance here is a graph with its *residual graph*:

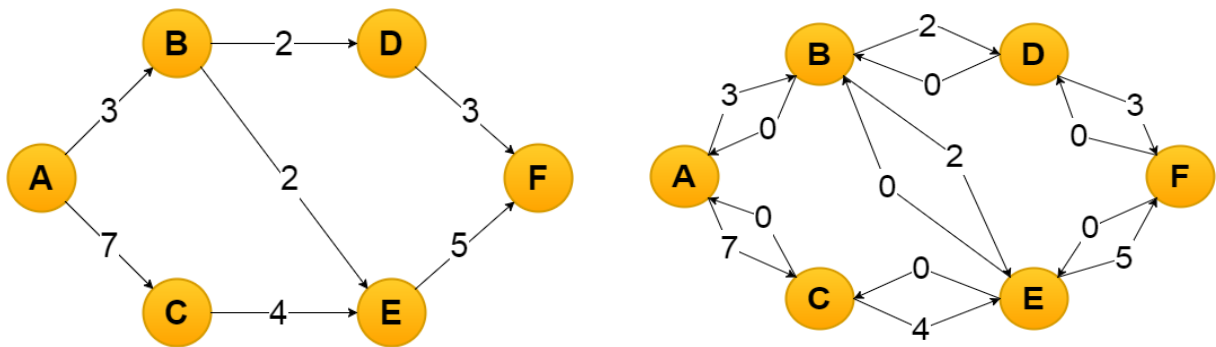


Figure 2.1: Graph with its residual graph

When an *augmenting path* is found, we send a flow equivalent to the minimum capacity of the edges of this path. We update the *residual graph* by decreasing capacities in forward edges and by increasing capacities in backward edges. Then we look for a new augmenting path.

Here is the *residual graph* after sending 4 units of flow through the *augmenting path* A-C-E-F :

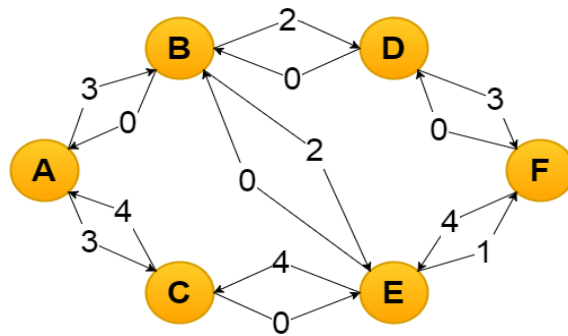


Figure 2.2: Residual graph

The pseudo-code of the augmenting path algorithm is given here :

```

Look for an augmenting path;
while There is an augmenting path do
    Send flow through this path;
    Update the residual graph;
    Look for an new augmenting path;
end

```

2.1.2 Ford-Fulkerson vs Edmonds-Karp

Je cause de la différence entre FF et EK

2.1.3 Complexities

Petite intro pour dire que c'est polynomial

Ford-Fulkerson

Edmonds-Karp

Il faut démontrer que la complexité grand O est pas possible?

2.2 Pre-flow algorithms

Chapter 3

Data Structures

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Improvements of Existing Algorithms

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