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A short proof of Dean's article for the arboricity of a graph

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ABSTRACT: Dean (**12**) is shown that, for an arbitrary graph with in edges γ (G) $\leq\left[\sqrt{\frac{m}{2}}\right]$. Now in this article we show that a short proof of Dean's article for the arboricity of a graph is give.

***Keywords*: arboricity.**

INTRODUCTION

There are several different ways to characterize the embedability of a graph G. The outer thickness of a graph denoted by θ_0 (G), is the minimum number of outer planar sub graph into which graph can be decomposed. the complexity status of outer planar is open. but since thickness and maximal outer planar sub graph are NP-complete . Outerplanar graphs are a widely studied graph class with application in graph Drawing and with intersecting theoretical properties.
The arboricity γ (G) of a graph G is the minimum number of forests whose union of G.

1.Characterization of outer planar graphs

Def(2.1).

if a graph G=(V,E') is a outer plane of G=(V,E) Such that every graph G=(V,E) obtains from G"=(V,E") by adding on edge from E\E' is outer planar , then G'=(V,E') is called a minimal outer planar sub graph of G.(Mops)

Def (2.2).

let G'= (V, E') be a maximal outer planar sub graph of G"= (V, E") of G with |E"|>|E'|, them G' is a maximum outer planer sub graph.

***Def (2.3)*.**

A graph h is said to be homeomorphic from G if either if≅G or it is isomorphic to a subdivision of G.

Theorem (2.1).

(7) A graph is outer planer if and if it has sub graph homeomorphic to k_4 or $K_{2,3}$.

Theorem (2.2)

a graph is outer planar if And only if G +K_1 is planar.

Theorem (2.3).

(6) Let G'= (V, E") be a maximum outer planar sub graph of a graph G=(V,E) then |E| ≤2|V|-3.

Theorem (2.4).
(7) Let G'= (V, E') be a maximum outer planar sub graph of a graph G=(V, E) which doe sot contains any triangle. Then |E| ≤3/2|v|-2.

Theorem (2.5).
(11) (Nosh- William s theorem)
Let G be a graph. Then γ (G) = max $\left\lceil \frac{m_H}{n_H - 1} \right\rceil$
Where H the minimum is taken all nontrivial sub graph of G.

3. New claim for arbor city
Claim (3.1).
Every outer planar graph G satisfies m≤2 (n-1) thus γ (G) ≤ $2\theta_0$ (G).

Proof
According to theorem (2-3)

m≤2n-3

M≤2n-3<2n-2=2(n-1) $\xrightarrow{\text{by theorem (2.3)}}$ γ (G) ≤$2\theta_0$ (G)

Conjecture (4).
θ_0(G) ≤ $\sqrt{\frac{m}{8}}$ + 0(1) for an arbitrary graph with m edges.

Theorem.
γ (G) ≤ $\left\lceil \sqrt{\frac{m}{2}} \right\rceil$ for an arbitrany graph with m edges.

Proof of theorem.
Sinceθ_0 (G) ≤ $\sqrt{\frac{m}{8}}$ + 0(1) (by conjecture) and by claim (3.1) then γ (G) ≤ $2\sqrt{\frac{m}{8}}$+ 20(1)= $\sqrt{\frac{m}{2}}$+20(1)= $\sqrt{\frac{m}{2}}$+0(1)= $\left\lceil \sqrt{\frac{m}{2}} \right\rceil$.

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