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Algorithms for Burning Number of Special Graph

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Abstract

The burning number $b(G)$ of G is the least number of attempts to burn all the nodes either by set a burn to node or spread the burn to unburnt neighbor node. It is observed the algorithm for burning number for special graph. Generalized for graph with $\Delta(G)$ is $n-1$ or $n-2$.

Keyword: Burning Number, Algorithm, Special Graph

Introduction

The graph theory is the blooming area in application. The burning number says that the least number of attempts to burn all the nodes either by set a burn to node or spread the burn to unburnt neighbor node [1]. Also burning number of G is the length of the shortest burning sequence. It is denoted by $b(G)$. Burning number of a cycle or path on k vertices is $\lceil\sqrt{k}\rceil$ [2]. Burning number of any graph is at most $\lceil\sqrt{2k}\rceil$ [2]. Let G with order k, then $b(G) = 2$ if and only if $\Delta(G)$ is $k-1$ or $k-2$ [2].

Special Graph

Fish Graph

A fish graph contains 6 vertices and 7 edges. It is denoted as F.$V(F) = \{u_1, u_2, u_3, u_4, u_5, u_6\}$ $E(F) = \{u_n u_{n+1}\} \cup \{u_2 u_3\} \cup \{u_{n+1} u_3\}$ where $n \in N$ and $n < 6$ [3].

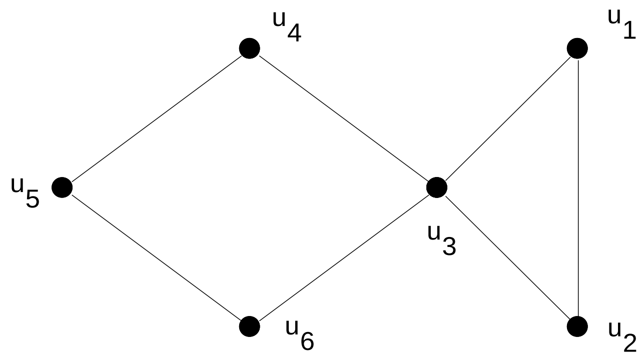

Figure 1: Fish graph

Cross Graph

A cross graph contains 6 vertices and 5 edges. It is denoted by C. $V(C) = \{u_1, u_2, u_3, u_4, u_5, u_6\}$ $E(C) = \{u_n u_{n+1}\} \cup \{u_2 u_{n+1}\} \cup \{u_{n+2} u_2\}$ where $n \in N$ and $n < 5$ [3].

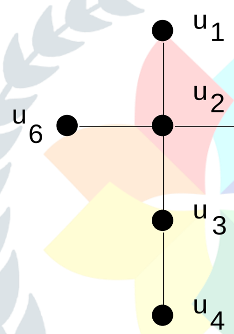

Figure 2: Cross graph

Bull Graph

The bull graph BG contains five vertices $V(G) = \{u_1, u_2, u_3, u_4, v_1\}$ and five edges $E(G) = \{u_i u_{i+1}; 1 \leq i \leq 3\} \cup \{v_1 u_1; 2 \leq i \leq 3\}$ [3].

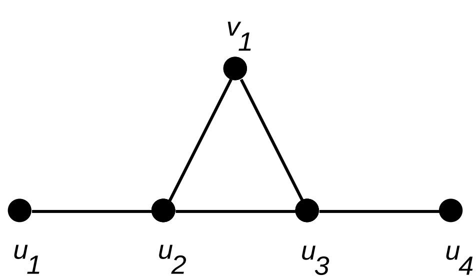

Figure 3: Bull graph

Fork Graph

The fork graph FG contains five vertices $V(G) = \{u_1, u_2, u_3, v_1, v_2\}$ and four edges $E(G) = \{u_i u_{i+1}; 1 \leq i \leq 2\} \cup \{v_i v_{i+1}; 1 \leq i\} \cup \{u_i v_i; i = 2\}$ [3].

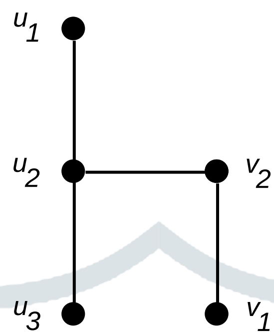

Figure 4: Fork graph

Diamond Graph

The diamond DG graph contains four vertices $V(G) = \{u_1, u_2, u_3, v_1\}$ and five edges $E(G) = \{u_i u_{i+1}; 1 \leq i \leq 2\} \cup \{v_1 u_i; 1 \leq i \leq 3\}$ [3].

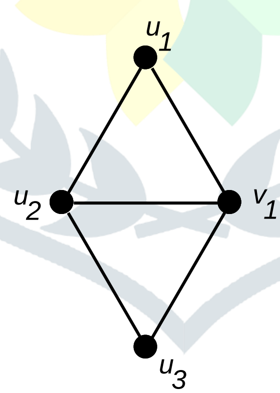

Figure 5: Diamond graph

Cricket Graph

The cricket graph CG contains five vertices $V(G) = \{u_1, u_2, u_3, v_1, v_2\}$ and five edges $E(G) = \{u_i u_{i+1}; 1 \leq i \leq 2\} \cup \left\{v_j v_{j+1}; j = 1\right\} \cup \left\{u_i v_j; i = 2, 1 \leq j \leq 2\right\}$ [3].

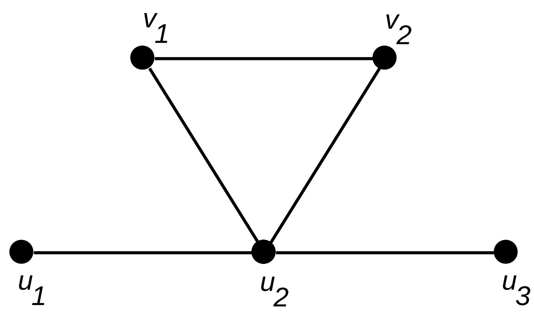

Figure 6: Cricket graph

Algorithms for Burning Number of Special graph

Algorithm 1

Input: The fish graph F

Algorithm:

Step 1: Burn the $\Delta(F)$

Step 2: spread to step 1's neighbor and set a burn to unburnt vertex.

Output: $b(F) = 2$

Algorithm 2

Input: The cross graph C

Algorithm:

Step 1: Burn the $\Delta(C)$

Step 2: spread to step 1's neighbor and set a burn to unburnt vertex.

Output: $b(C) = 2$

Algorithm 3

Input: The bull graph BG

Algorithm:

Step 1: Burn the $\Delta(BG)$

Step 2: spread to step 1's neighbor and set a burn to unburnt vertex.

Output: $b(BG) = 2$

Algorithm 4

Input: The fork graph FG

Algorithm:

Step 1: Burn the $\Delta(FG)$

Step 2: spread to step 1's neighbor and set a burn to unburnt vertex.

Output: $b(FG) = 2$

Algorithm 5

Input: The diamond graph DG

Algorithm:

Step 1: Burn the $\Delta(DG)$

Step 2: spread to step 1's neighbor.

Output: $b(DG) = 2$

Algorithm 6

Input: The cricket graph CG

Algorithm:

Step 1: Burn the $\Delta(CG)$

Step 2: spread to step 1's neighbor.

Output: $b(CG) = 2$

Conclusion

Here I conclude that steps to $b(G) = 2$ is initial burn the maximum degree $\Delta(G)$ then either it spread to neighbor or set a burn to unburnt vertex.

Reference

[1] Bonato, A., Janssen, J. and Roshanbin, E., 2014. Burning a graph as a model of social contagion. In *Algorithms and Models for the Web Graph: 11th International Workshop, WAW 2014, Beijing, China, December 17-18, 2014, Proceedings 11* (pp. 13-22). Springer International Publishing.

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